

Iron Age Settlements in Kintyre:

Kildonan Bay.

Horace Fairhurst.

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THE GALLERIED DÙN AT KILDONAN BAY, KINTYRE

BY

H. FAIRHURST, M.A., F.S.A.ScOT.

Reprinted from the Proceedings of the Society of Antiquaries of Scotland,
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THE GALLERIED DUN AT KILDONAN BAY, KINTYRE.

BY H. FAIRHURST, M.A., F.S.A.Scot.

On the landward side, the old kingdom of Dalriada and its modern counterpart, Argyll, present to the outside world a rugged mountainous aspect in the massifs around the head of Loch Long and of Loch Awe, and around Glen Coe. But within these bastions there is a land of lower elevation, of long inlets, peninsulas, and islands, where the relief, though rugged, is on a smaller scale. It is a less repellent country from the point of view of human settlement, and one of great natural charm. Main roads and railways and the traffic going down from the Clyde pass this region by, and at the present time it has an air of remoteness which is surprising in view of its close proximity to the densely populated Lowlands near Glasgow. In early times it was quite otherwise, for from the Mull of Kintyre to the Glens of Antrim there is a channel not 15 miles wide, and our region was in close contact with Ireland. By reason of its position, its mild climate, its sheltered valleys and inlets, it seems to have offered an attractive home to early settlers, and for the archæologist it is indeed a happy hunting-ground.

Kintyre is a characteristic sub-region; it is an island except for a narrow isthmus between East and West Loch Tarbet, but it is best

considered as an incomplete bridge on the way to and from Ireland. It is hilly, but rarely rugged; the interior is mainly moorland, but the raised beaches and the narrow coastal districts are mild and sheltered, and have attracted settlers from Atlantic times onwards. The archaeological sites are numerous, and, in view of the close connection with Ireland, may prove to be of great significance.



Fig. 1. Map 1.—The immediate surroundings of the Kildonan Fort, drawn from data compiled by Dr J. Orr (heights in feet above Ordnance Datum).

Upwards of sixty forts of various types have been located within Kintyre,¹ most of them in close proximity to the sea. Three of these, all marked on the 1-inch Ordnance Survey Map, are to be found on the shores of Kildonan Bay,² on the east side of the peninsula and some 7 miles north of Campbeltown. The coast here is rather low and rocky, but from the head of the Bay the land rises rapidly to Sgreadan Hill (1298 feet) 2½ miles away. The northern side of the inlet is formed by Ugadale Point, on the extremity of which stands a small ruinous stack fort; the southern side, half a mile away and opposite the farmhouse of Ballochgair, consists of

¹ Information from Mr J. R. Cunningham, Askamill End, Campbeltown.

² Misspelled "Kildonald Bay" on the Ordnance Survey Maps.

another rocky point, which is the site of another fort of large dimensions and once enclosed by a single rampart, now very ruinous. At the head of the Bay, below the 50-foot contour, the ground is broken into a series of crags and hillocks of mica schist, separated by deep clefts and gullies, the whole being overgrown with whin and bracken, grass and nettles. Upon one of the largest of these crags or hillocks, at a height of about 40 feet above sea-level, stands the Kildonan fort (Pl. LXXII, 1).

The hillock rises steeply from the water's edge (see fig. 1) and then the ground falls again on the landward side more gently to a great bed of yellow irises, only to rise again after 20 or 30 yards to a terrace and then a hill slope which obstructs the view on this western side. To the south the land is more open, but on the north there is a series of crags and clefts, which again drastically restrict the view. For an attacking party there was cover to within a stone's throw on the north, but the immediate natural defences were strong. Only to the west does the ground fall away gently from the top of the hillock, for on the south and seaward slopes the approach is steep and rocky, while on the north it is precipitous. Part way down this latter slope there is, incidentally, a small natural cave half-filled with fallen rock.

Before excavations commenced, traces of a single stone rampart, built of local mica schist, could be seen surrounding the top of the hillock amid the debris and undergrowth (see fig. 2). It appeared to be from 10 to 15 feet thick, and to enclose a heart-shaped area measuring some 63 feet along the major north-south axis, and 42 feet at the maximum at right angles to this. The enclosure was a saucer-shaped hollow, with banks of debris along the inner face of the rampart, thickly overgrown with bracken, briar, and nettles, but with signs neither of hut-circles nor of interior walling. The outer face of the rampart showed clearly along the seaward side, and rose at one point to a height of 6 feet; two great holes had been dug into the rampart on this side in the recent past, and had spoiled the appearance of the monument. On the other three sides the outer face could not be followed except in two short stretches. The inner face was quite obliterated on the east and south, but was easily followed on the west and north, where it showed sometimes for a course or two, sometimes as a steep grassy bank, and in one stretch in the north stood 5 feet high as a well-constructed face. The entrance was obviously located in the south-west sector of the rampart, where there was a marked depression, through which led a modern path, and two short lines of stones indicated the position of the passage walls. On the south side of this depression another great hole had been dug into the rubble core of the rampart (probably in search of a lost ferret) and had exposed a large horizontal flagstone with suggestions of walling on either side, as though there had been a gallery or cell within the rampart. Five feet to the south

of this, the top of an outward facing wall appeared above turf-level for a distance of 6 feet, and presumably formed the continuation of the cell or gallery opening into the entrance. In the north-east sector of the rampart there were the remnants of a small oval cell similar to those

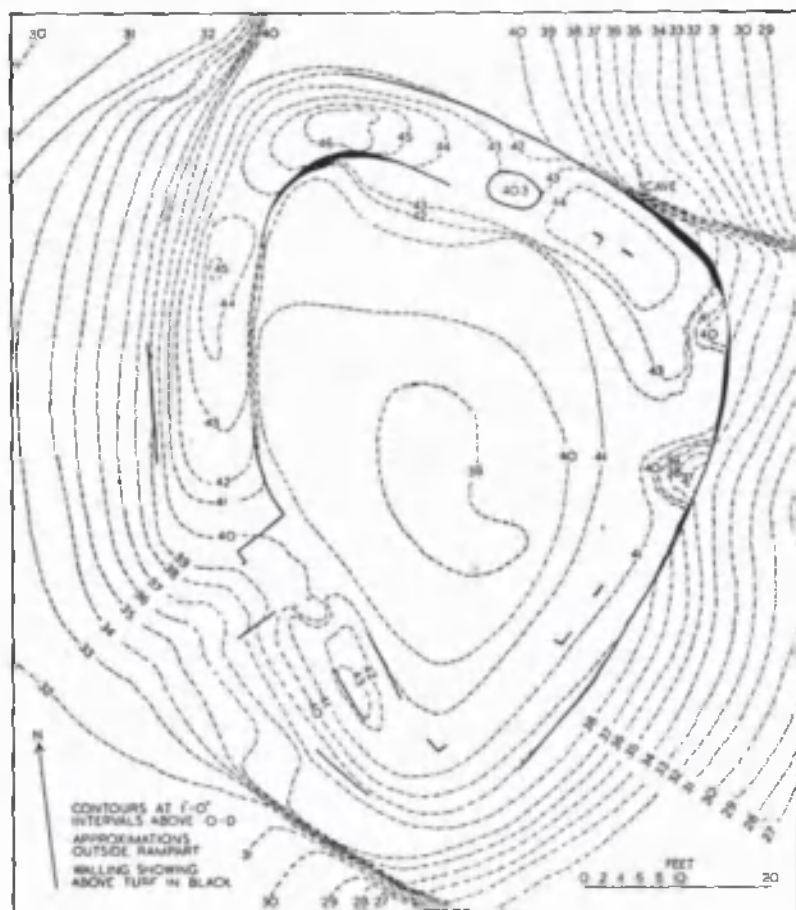


Fig. 2. Map 2.—The site of the Kildonan Fort before excavations.

found in the brochs. Commencing 3 feet south-east of the cell was another stretch of walling facing inwards, running parallel to and half-way between the inner and outer revetments of the rampart; in addition, there was a short cross-wall forming a right angle with it, and running as though to abut on the inner face. A similar right-angled corner was exposed in the south-east sector. Furthermore, the alignment of an occasional stone on top of the rampart along the seaward side suggested more walling half-way across, running parallel to the inner and outer revetments.

Traces of what appeared to be a kitchen-midden had been detected, by members of the Kintyre Antiquarian Society, in the cleft which runs along the south side of the hillock between the iris bed and the beach.

THE EXCAVATIONS (GENERAL).

Early in 1936 the members of the Kintyre Antiquarian Society invited me to conduct excavations at a selected site in Kintyre, and promised to supply paid labourers; it was their initiative, continued financial help, and encouragement which made these investigations possible. The site at Kildonan, which we chose without much hesitation, provided a far larger task than was originally contemplated either by the Society or myself, and it is a real pleasure to place on record my most sincere thanks for the original invitation, and for the most generous support which the members have given to me.

After permission had been granted by his Grace the Duke of Argyll, excavations commenced in June 1936, and were continued for a month. Two periods of work were undertaken in 1937, in July and September, and a fourth in June and July 1938. In all, nearly eighteen weeks were spent on the site, but of this period a number of days were completely lost through wet weather, the curse of the excavator in the west of Scotland. Two labourers were employed in 1936 and 1938, and three, and sometimes four, during 1937. Professor V. G. Childe was present during the first week, and a number of friends provided help during 1937 and 1938. The labour force was kept low, as an increase would have involved inexperienced workmen, and the site was too complex to consider this course.

Some rebuilding was undertaken along the outer face of the rampart, especially on the landward side, not as attempted reconstruction, but simply to preserve the fabric from collapse. The result is not gratifying, partly because of the almost complete absence of suitable building stones, all of which had apparently been removed to construct the modern dykes along the road, and partly because of the impossibility of matching the excellent masonry of the original without a large and highly trained labour force.

THE STRATIFICATION (GENERAL).

Within the area enclosed by the rampart the various strata and surfaces were as follows, commencing from the top:—

1. The surface before excavations started, referred to as "turf": large stones jutting through to give a very irregular surface.
2. Earth and stones, referred to as "debris," immediately below turf, representing a stratum formed since the last occupation.

3. The strata of the fourth occupation (Kildonan IV).

IVa—material accumulated during the fourth occupation resting on the 4th floor.

IVb—the stones and earth forming the 4th floor.

(In practice, IVa was nowhere distinct from debris.)

4. The strata of the third occupation (Kildonan III).

IIIa—a very thin occupation deposit.

IIIb—a floor of cobbles and earth, with two hearths and traces of walling.

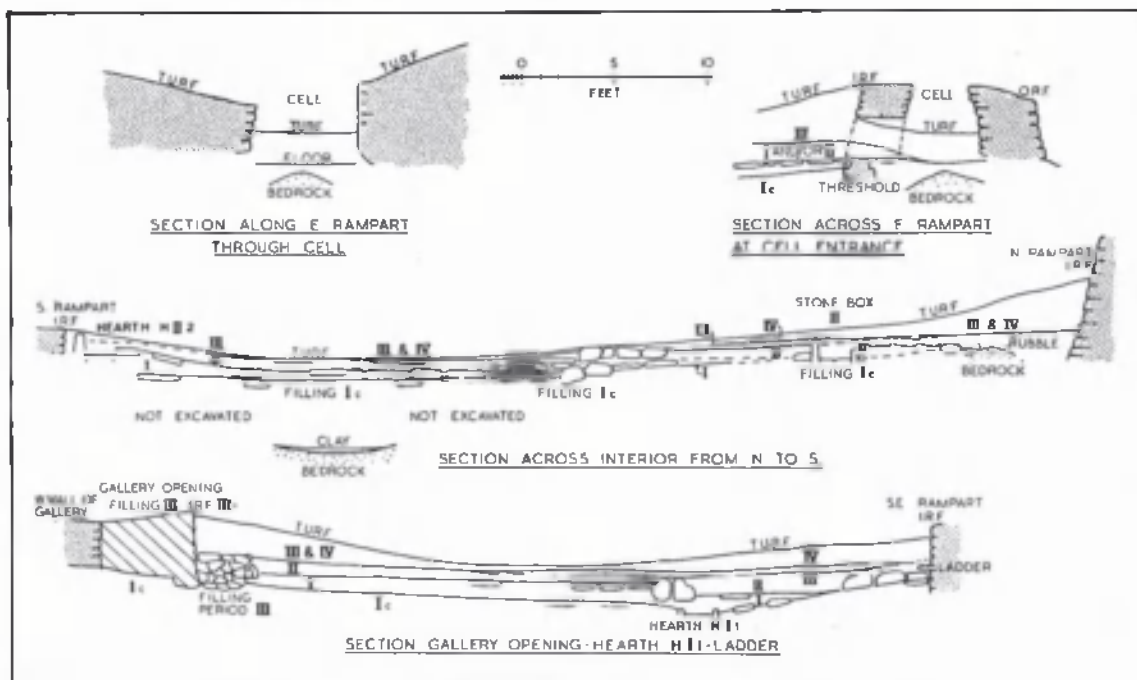


Fig. 3. Sections to show the stratification in the interior of the Kildonan Fort, and the form of the Cell.

5. A light brown loamy layer, completely devoid of relics, and found over most of the fort: since floor IIIb rested upon it, for reference it becomes IIIc.

6. The strata of the second occupation (Kildonan II).

IIa—the occupation deposit, difficult to separate from the strata below.

IIb—the 2nd floor, of earth, and flagging stones, on which were two hearths and traces of walling.

7. The strata of the first occupation (Kildonan I).

Ia—the occupation deposit, grading into IIa and IIb.

Ib—earth, stones, flagging, and pebbles forming the 1st floor, on which were three hearths and further traces of walling.

Ic—a coal-black soil below the 1st floor and resting directly on 8.

8. Virgin soil or bedrock—a yellow clay or, far more commonly, mica schist.

The task of stripping these strata presented considerable difficulty; the various horizons were far from horizontal, and sometimes dipped quite steeply independently of each other, so that *IVb* sometimes lay less than 1 foot above *Ib*, but sometimes was 3 feet above; in places floor *IVb* was almost 6 feet above bedrock, and subsidence seems to have occurred, distorting some of the lower strata; re-levelling took place at three periods; structures were often inset into strata below the true horizon, and stones on end were encountered which actually projected above turf-level, yet penetrated downwards into the *Ic* stratum. To disentangle this complex stratification in some cases was impossible, and the maps of the fort for Periods I, II, and III are not complete, and embody a certain amount of conjecture.

THE ORIGINAL FORT: KILDONAN I.

The Rampart.—When the hillock was first selected as the site for the dūn there were several disadvantages apart from the restricted outlook on the north and west sides. There was a long narrow projection on the north side of the hillock, and to have included this within the rampart would have resulted in a long and irregular-shaped fort. This extension was already difficult of access and was left outside without appreciable loss of security; it now appears as a narrow platform dominated by the rampart in the north. Furthermore, the top of the hillock was fearfully irregular, as the mica schist was broken into a number of great rounded blocks or bosses, generally smooth on top but with cracks and fissures on the sides, and separated from each other by deep clefts. These bosses all rose to within a foot or so of 40 feet L.D., and were disposed around a deep and irregular hollow in what is now the south central part of the fort, which fell in places below 34 feet L.D.¹ The rampart was constructed so that the foundations of the inner face passed either across the actual summits of the bosses or, more often, a little outwards from the top, while the foundations of the outer face lay somewhat downhill on the outer side. The idea, of course, was to make the enclosure as large as possible while

¹ *Local Datum* is a horizontal plane 40 feet below the topmost point of the boss of bedrock lying immediately by the inner face of the rampart just to the south of the junction with the south wall of the entrance passage. This point is in fact 41·7 feet above Ordnance Datum, as measured from the nearest bench-mark at 43·1 feet on the corner of the barn of Ballochgar Cottage, quarter of a mile along the main road to Campbeltown. All levels will be quoted in relation to Local Datum unless otherwise stated, and therefore lie 1·7 feet higher with reference to Ordnance Datum.

utilising the bosses in the construction of the rampart. The surface of the enclosure which resulted was so irregular that the builders adopted the obvious expedient of infilling the deep hollows nearly to the level of the

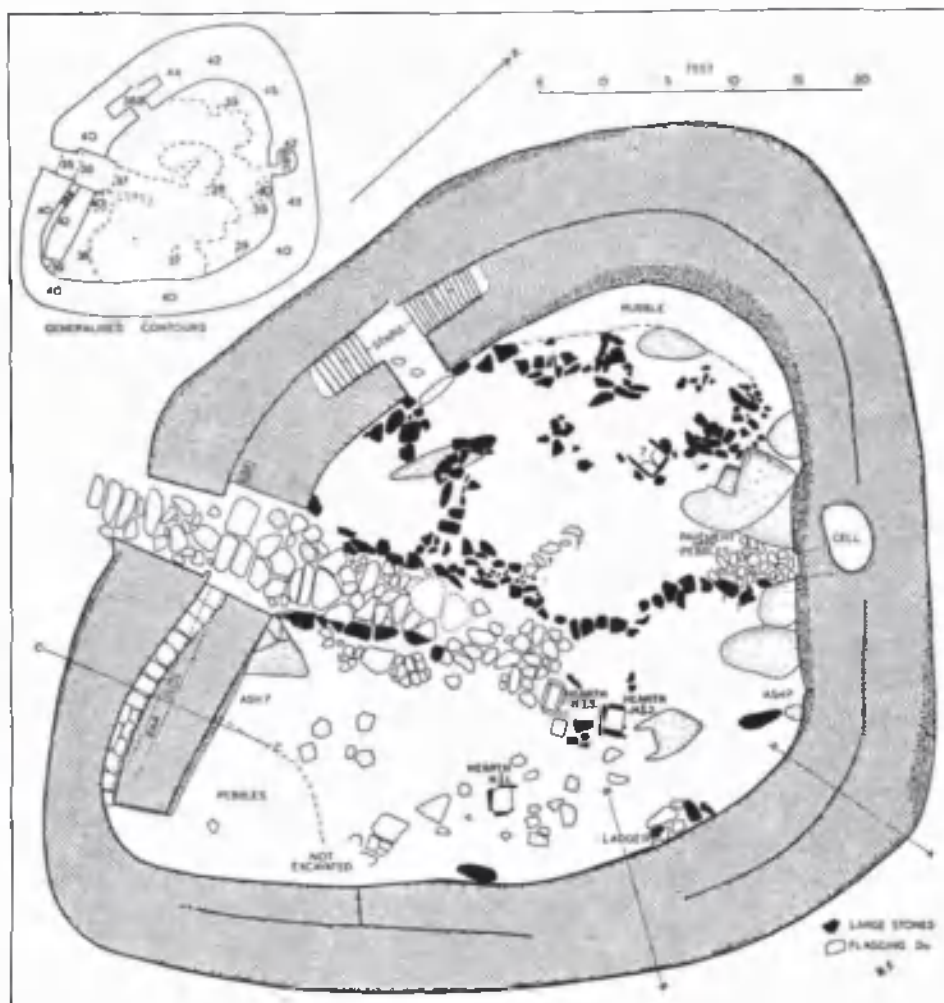


Fig. 4. The Kildonan Fort, Period I.

tops of the bosses—hence the coal-black Ic deposit, resting on bedrock and beneath the primary (Ib) floor. Subsidence in this infilling appears to have occurred during Periods I and II, and at present the bosses project well above the general level of the Ib floor.

The rampart reaches its maximum thickness of about 14 feet in the extreme north; it is about 13 feet near the entrance, 9 to 11 feet along the

seaward side, and narrows to 8 feet in the extreme south. The height at present varies considerably. The inner face stands 3 to 4 feet above the approximate level of the primary floor for the most part, but rises in the north to over 7 feet, and from the presence of what appeared to be "capping stones" in this section and also on the south side of the entrance it would seem possible to estimate the original height of the *inner face* as not much more than 7 feet above primary floor-level. The outer face varied in height in accordance with the irregularities of the hillock; along most of the west side, where it is badly ruined, it now stands no more than a course or two high (apart from our extensive rebuilding), but along parts of the eastern face the original masonry still rises to upwards of 7 feet, and was once much higher. There are some indications that a form of breastwork existed on the outer half of the rampart,¹ and, if this were so, then the outer face must have stood over 15 feet high in one or two places along the seaward side, and over 12 feet at the entrance.

A complete section was cut across the rampart in the eastern sector, 12 feet south of the cell, utilising one of the great holes which so much disfigured the monument on this side (see section A-A, fig. 5). The outer face was founded on bedrock, and consisted of large roughly trimmed blocks, half a yard square and 8 inches thick on the average; just north of the section it stood 8 feet high when the debris at the foot was cleared, and had a marked batter of 1 : 4,² rising near the base to 1 : 3. It formed a revetment to a rubble core. The inner face, again founded on bedrock, was much more roughly built of uncoursed masonry, with no appreciable batter, and again formed a revetment to a rubble core. About half-way across the rampart—that is, 4 feet 6 inches outwards from the inner face—another revetment was found, consisting of a vertical wall, facing inwards, roughly built of smaller stones than those even of the inner face, and dividing the rubble core into two compartments. The rubble of the inner core was more loosely packed than that of the outer. The middle revetment, or "median face" as we named it, was founded, not upon bedrock, but on a layer of slabs 1 foot 6 inches thick, which formed the base of the outer and inner cores: in no sense did this slabby layer resemble a paved floor, but a pile of whelk shells was found resting on it, and piled against the median face. The section suggested that an early rampart represented by the outer revetment, outer rubble core, and median face had been subsequently thickened by the addition of the inner face and inner rubble core. Unfortunately in the section only the strata of Periods III and IV abutted against the inner revetment.

To elucidate the situation a second section was cut some 16 feet south

¹ The presence of a *tain* staircase is easily explained in this way, as the breastwork, rising from the casing-wall, would preclude movement along the rampart walk, past the staircase.

² I.e. it inclined 1 foot from the perpendicular for a rise of 4 feet.

of the first, utilising the other great hole on the east side of the rampart. The result was almost exactly the same (see section B-B, fig. 5), save that the median face rested on bedrock, though the slabby layer and the whelks were present. Yet all the strata from Ic to IV abutted without any sign whatsoever of disturbance against the inner revetment. Since the Ic infilling antedates slightly the primary floor, there can be no doubt that

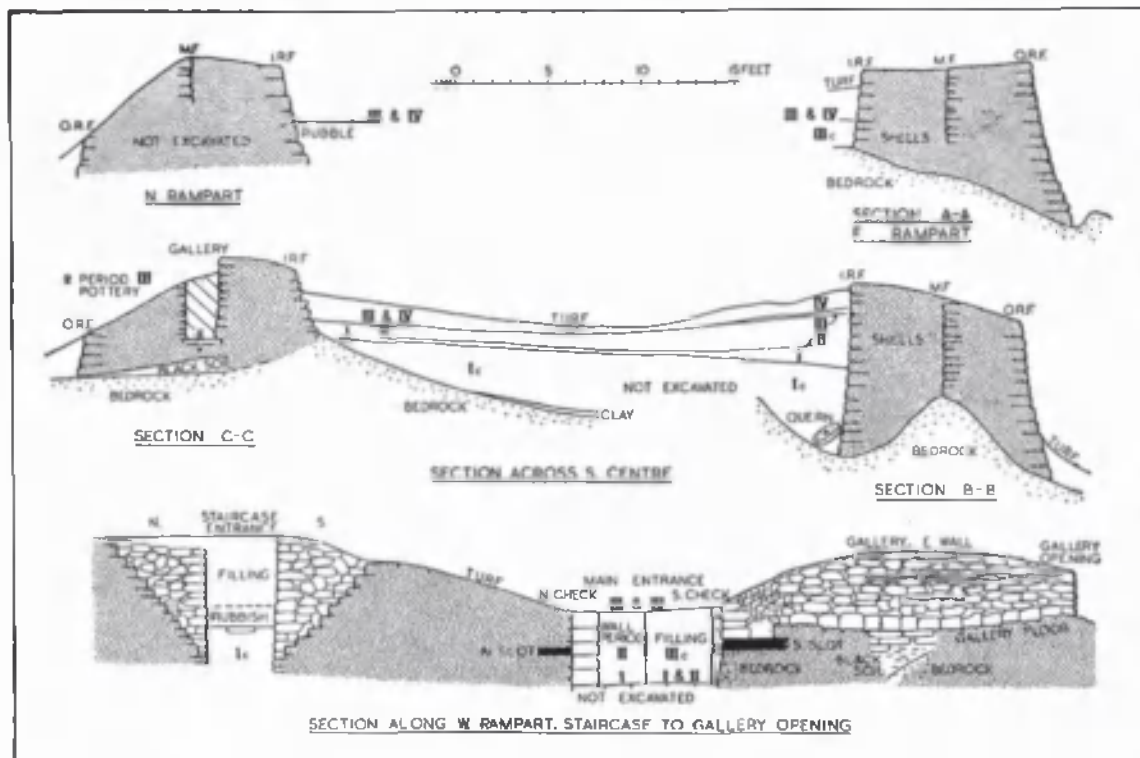


Fig. 5. Sections to show the structure of the rampart of the Kildonan Fort.

the rampart with its two rubble cores and partitioning wall or median face was constructed in the primary building operations. No evidence subsequently came to light to cause this conclusion to be modified.

The discovery of the median face led to extensive investigations on top of the rampart, and eventually the middle revetment was traced from the second to the first section (see fig. 4—Period I), and then to the edge of the casing-wall of the cell; it recommenced on the north side of the casing-wall and ran continuously through the northern sector of the rampart, formed the western casing-wall of the staircase, and ended at the door-check or rebate on the north side of the entrance. Reverting to the second section, this median face appeared to have been destroyed

by the vandals responsible for the great hole previously mentioned. It was picked up some distance to the south-west and was followed to the curious right angle formed by a short "cross-wall" facing north-east, and running through the inner rubble core to abut at right angles upon the inner revetment, where it appeared as a vertical joint in the masonry; the significance of this "cross-wall" will be discussed later. Thence, the median face continued for another 15 feet, but simply petered out in the rubble core just before the abrupt turn in the rampart in the extreme south of the fort: a short section was cut from the outside to verify this apparently casual ending.

The south-west sector of the rampart, south of the entrance, showed a different structure. Another section was cut 10 feet south of the entrance, commencing at the outside. The outer face was but 3 feet high, and once more formed a revetment to a rubble core. Five feet inwards the back of a wall was encountered and proved to be the western revetment of a gallery 2 feet wide, running within the thickness of the rampart (see section C-C, fig. 5). This gallery was filled with rubble of a smaller size than that of the outer core, and under this, resting on the flagged floor, sherds of pottery of Period III were discovered. No point was to be gained by continuing the section farther, especially as the inner half of the rampart was one of the finest sections in the whole fort. Obviously the gallery had been filled in during Period III, and we cleared away this rubble to expose the original structure. It began on the south side of the entrance (see fig. 4), 3 feet above the floor of the passage and over one of the schistose bosses incorporated within the rampart. At this northern end the gallery was 1 foot 10 inches wide, with a horizontal floor carefully flagged; the casing-walls, after the first 4 feet, where they were badly ruined, were vertical, uncoursed, and rather roughly constructed, so that the masonry was suggestive of the median face rather than either the outer or inner face of the rampart. Curving slightly, the gallery widened to 2 feet at the section, and then rapidly narrowed until it was but 6 inches wide. In this southern section the casing-walls were very rough, with projecting angular stones, and the slabbed floor was most uneven. After the constriction the western casing-wall (see map) curved evenly round and became the inner revetment of the south sector of the rampart (Pl. LXXIII, 1). The east wall turned an acute corner, and ran transversely to meet the inner revetment running southwards from the entrance. The floor of this curious funnel-shaped "gallery opening" dropped steeply from the flagging in the gallery to the *Ic* infilling at the foot of the inner revetment. When the gallery was filled in during Period III, a blocking wall was constructed across this gallery opening, so that the inner revetments of the south-west and of the south sectors of the rampart met at a right angle.

The gallery, from the entrance to the constriction at the head of the gallery opening, is 18 feet long, and the casing-walls at present stand 3 feet to 4 feet 6 inches high; since no trace of a deposit earlier than the Period III infilling was found on the floor, the only possible conclusion is that it was originally roofed over. If our estimate for the original height of the inner half of the rampart be at all correct, the gallery cannot have been more than 5 feet high at the most. In the northern half, where it is 1 foot 10 inches to 2 feet wide and carefully flagged, it might possibly be described as a passage or storage place, but as for the southern half, narrowing to 6 inches, with an extremely irregular floor and with angular stones projecting from the casing-walls, nothing could be less suggestive of a storage place or a passage.

The obvious conclusion is that both the median face and the gallery serve a similar structural function. Had the rampart been built simply with two revetments and a rubble core, the loose infilling above a plane rising at about 45° towards the centre of the rampart from the foot of the revetments would have pressed downwards and outwards, just as a heap of grain or the scree on a mountain-side tends to find its angle of rest. The resulting thrust in a structure of this height and thickness would have been so great as to threaten the stability of the retaining faces. At Kildonan, too, the foundations of the outer face are generally a foot or two below those of the inner face, so that the thrust upon the outer revetment is increased by the additional volume of rubble tending to slip downwards and outwards in that direction. Both the median revetment, which invariably presents its strongest face inwards, and the gallery may be considered as supports for the loose rubble core, to lessen the thrust upon the revetments.¹ The gallery is the more efficient, since it is a double wall and its construction implies a smaller volume of rubble, but it was more difficult to build. It is interesting to note that the rampart through which the gallery runs is especially thick—possibly because it is near the entrance. Now, apart from the large volume of loose rubble involved, the rampart also traverses a cross-gully between the boss on the south side of the entrance and another on the north side of the gallery opening, so that cross-stresses in the rubble core would cause a still greater thrust than usual upon the outer face. Furthermore, the difference in level between the foundations of the inner and outer faces is very marked, especially just north of the actual line of the section. Perhaps the builders realised that in this particular sector the difficulties of constructing a thoroughly stable rampart were greater than usual, and preferred the device of the gallery to that of the simpler median face which was employed in the other six-sevenths of the length of the rampart. The median face

¹ This is an over-simplified interpretation, but Dr W. MacGregor of Glasgow University Engineering Department, with whom I discussed the principles involved, assures me that it is fundamentally correct.

would doubtless be continued upwards above the level of the inner face of the rampart to form the inner revetment of the breastwork, if that feature *actually* existed. The additional weight of this superstructure would, of course, have been a further incentive to strengthen the base by constructing the median face and gallery.

The entrance consists of a well-paved passage, provided with door-checks and bar-holes half-way along the side walls. Measured on the

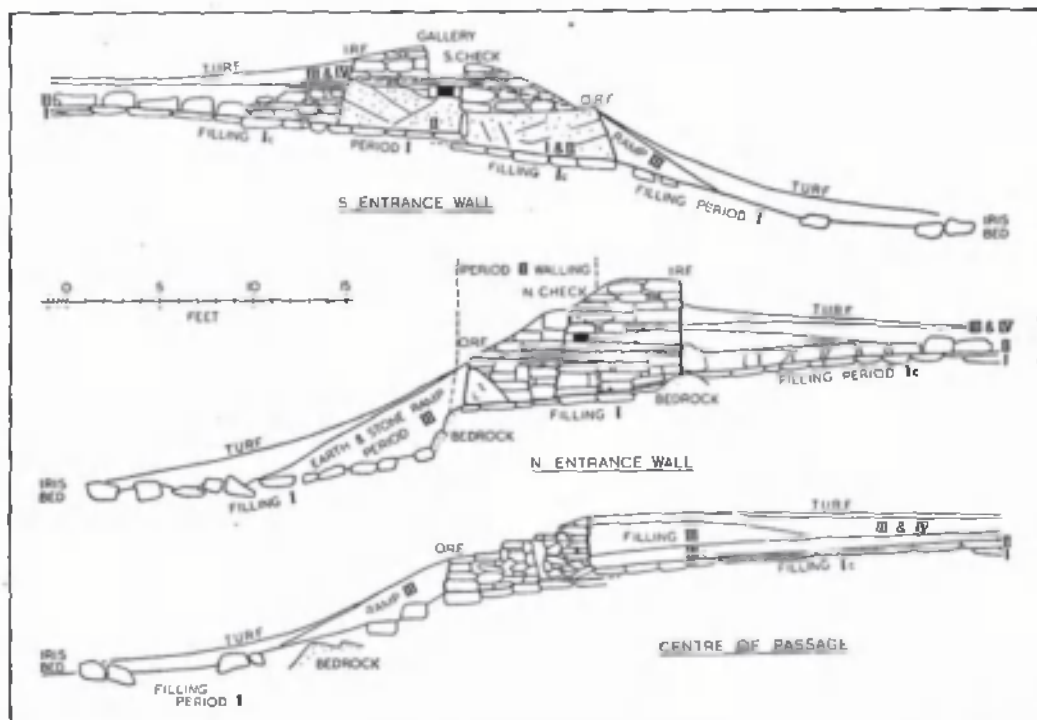


Fig. 8. Sections through the Entrance of the Kildonan Fort.

medial line, the passage is 13 feet 6 inches long; the width is 5 feet 5 inches at the outer end, whence it increases slowly to 5 feet 11 inches, and then, beyond the rebates, becomes 8 feet, reaching its maximum of 8 feet 6 inches at the inner end. The lower 2 feet or so of the southern wall consists of a face of bedrock, over which lies the end of the gallery (Pl. LXXIII, 1); the south door-check, 6 inches deep, is formed at the bottom, of an upright slab, and at the top of an extension of the western casing-wall of the gallery. Before rebuilding, this wall reached its maximum height of 4 feet 9 inches just west of the gallery. The north wall, part of which rises to a height of 4 feet 6 inches, is 3 feet shorter than the southern, for

the positions of the four corners of the passage appear to have been chosen in relation to the lie of bedrock, not for symmetry (see plan, fig. 4). The door-check on the north side is 1 foot 4 inches deep, and noticeably overhangs towards the interior of the fort at the rate of 1 : 6 (Pl. LXXIV, 1). The reason for this overhang may have been to accommodate a socket stone at the foot of the check for a swivel pin for the gate; no socket stone was found here, for there was rebuilding during Period II, but one of the type envisaged was actually discovered in this secondary walling. When closing the passage, the gate was held in position against the checks by a horizontal bar behind, for which slots were provided in the passage walls. It is significant, in the first case, that the bases of the two checks are not in alignment, though the tops would be brought strictly opposite by the overhang on the north check if the passage were 6 feet high; secondly, the slots for the bar, though directly opposite, are not equally spaced from the checks, for that on the north side is 8 inches inwards, and the southern slot is but $4\frac{1}{2}$ inches inwards from its associated check. It is a simple precaution to build a vertical check and to see that the two bar-holes are equally spaced from their respective checks, and unless we are prepared to believe that the builders purposely made an ill-fitting door we must accept the idea of a socket and swivel pin upon which the gate rotated on the north side of the passage.

The slot on the north side is merely a bar-hole 1 foot 10 inches deep, but that on the southern side extends 16 feet into the thickness of the rampart, and was obviously intended as a receptacle for the bar when not in use; it is curious to note that a pole 11 feet long would be ample to span the passage and allow purchase in the slots. Again, the alignment of the southern slot does not allow a bar to be slipped directly into the slot on the north side, which is 1 foot out of line (see plan, fig. 4), and to get the bar home requires an awkward swivelling movement which can be accomplished only with a length of about 10 feet. There is no indication of any gravitation outwards of the rampart as a whole, which might be suggested by these curious maladjustments, and even if the explanation for the overhanging check be accepted, we are still faced with the error in the alignment of the bar-holes; ill-fitting locks are apparently not a new phenomenon.

The pavement of the entrance passage slopes downwards from the interior of the fort rather steeply, with an average gradient of 1 in 5 or 6, and continues 3 feet beyond the line of the outer revetment. Then it gives place to an earth and stone ramp, leading down to the iris bed; the purpose of this ramp was not to ease the gradient down from the entrance, but to smooth out the irregularities of the rock surface on the side of the hillock. Many large slabs were found embedded in it, but whether these were part of the infilling, or slabs fallen from the rampart, or traces of outworks, it

is impossible to say with certainty, but after very careful study I came to the conclusion that outworks did not exist. Originally a path must surely have led westwards from the fort to the arable land on the hillside, but no sign of it was found. In the cleft at the base of the hillock on the south side, where traces of kitchen-midden had been detected, two sections were cut down to bedrock, and we were driven to the conclusion that the earth, stones, shells, bones, and refuse generally did not represent ordinary "kitchen-midden," but had been carefully placed in the cleft to provide a regular floor. In other words, the narrow steeply sloping gully curving round the south side of the hillock (see fig. 1) must be regarded as a sea-way or road from the entrance down to the beach. Overlooking the upper end of this cleft there is a narrow rock platform at the foot of the outer face of the rampart, which was probably used in the defence of the fort (see figs. 1 and 2).

The twin staircase was not visible before excavations began, as it had been walled up and filled in not very long after the construction of the rampart. The entrance to it is an opening in the inner face of the rampart 11 feet northwards of, that is to the left of, the main entrance; it is 3 feet 6 inches wide, and runs inwards between vertical walls for 3 feet 6-8 inches. Then on either side a set of steps leads upwards to the rampart top, while the floor continues between them to the western casing-wall. This is roughly built, and in fact part of the median face of the rampart as a whole; on the line of the north wall of the staircase entrance there is a great crack running up the masonry of this western casing-wall, and the part to the south seems to have slipped outwards by about 12 inches (see fig. 4). The two sets of steps are not identical and their measurements may be summarised as follows:—

	Length.		Breadth.		Foot.		No. of Steps.
	Ft.	In.	Top. Ft.	In.			
North	5	2	2	9	3	3	14
South	4	10	2	11	3	7	9 (1 missing from foot)

The steps on the north side are more numerous but more irregular, generally smaller individually, and the stones are less carefully selected and laid in position—in five cases the steps consist of two stones instead of a single slab (Pl. LXXIII, 2), on the south side all the steps are single slabs, and Nos. 2, 3, 4, 7, and 8, counting from the top, are to some extent bonded into the eastern casing-wall, though no such bonding occurs on the western side, nor in the north staircase.

Two curious features were discovered. In the first place, the foundations of the staircase entrance and the eastern casing-walls do not rest on bedrock, but are placed in the loam infilling. Secondly, the earth floor

of this entrance (floor Ib, above the infilling Ic) was at such a height as to cover the three lowest steps on the south side and the four lowest on the north side (see section along western rampart, fig. 5); there was no floor at the level of the lowest steps, but merely the Ic infilling. This latter point seems to prove that in spite of the minor differences in the appearance of the two sets of steps both are primary features. The explanation of the two anomalies just mentioned seems to be as follows. During the original building operations the outer half of the rampart as far as the median face was constructed first; later, but still during the original building operations, the two staircases were built, possibly by different gangs of workmen, on top of some refuse (now part of the Ic infilling) which had already accumulated within the fort. When the time came, still later, to level the enclosure within the completed rampart for the primary floor (Ib), the builders found that they had laid the bottom steps too low for the most convenient floor-level; after abstracting the lowest step on the south flight to serve as a threshold at the inner revetment (see fig. 4, Period I), the superfluous steps were buried amid the Ic infilling.

Almost at once the staircase appears to have been used as a receptacle for rubbish, and apparently not long after the completion of the fort the whole was filled in and walled up, possibly on the development of the great crack in the western casing-wall. It is rather disappointing to think that this really attractive feature of the fort, the twin staircase, was but little used, and soon proved to be an unsuccessful venture on the part of the builders.

Some 20 feet south of the cell there was found, against the inner face of the rampart, a flagged area about 3 feet square, directly over which, and 9 inches above it, a square slab projects from the revetment. This appears to be the lowest "rung" of a ladder or stile leading to the rampart top. Unfortunately the rampart here was too ruinous to trace the ladder beyond this lowest step.

The cell, entered by a small opening 2 feet 7 inches high, 2 feet 3 inches wide at the maximum, and 2 feet 6 inches long, is an irregular oval in plan, measuring 5 feet 10 inches parallel to the axis of the rampart, and 4 feet 8 inches at right angles to this line (see sections across the cell, fig. 3). It is clear that the casing-walls once converged to a corbelled roof, at a height of somewhere about 6 feet above primary floor-level. The earth floor of the cell showed signs of disturbance, and embedded amongst the infilling beneath this floor and resting on bedrock several potsherds of Period III were found. This might suggest that the cell itself may be an insertion into the rampart of Period III; furthermore, the casing-walls of the cell do not rest on bedrock, but on earth and rubbish. Again, on the inner face of the rampart,



1. The **Kildonan Fort** after excavations.



2. The interior from the **Entrance**, **Period I.**



1. The western half of the Fort, Period I. The staff in the Entrance marks the end of the Gallery.



2. The north Stairs, with the Staircase Entrance on the right.



1. The north wall of the Entrance, Period I.



2. The Entrance with the secondary walling, Period II.



1. The north-west sector of the Fort, Period II.



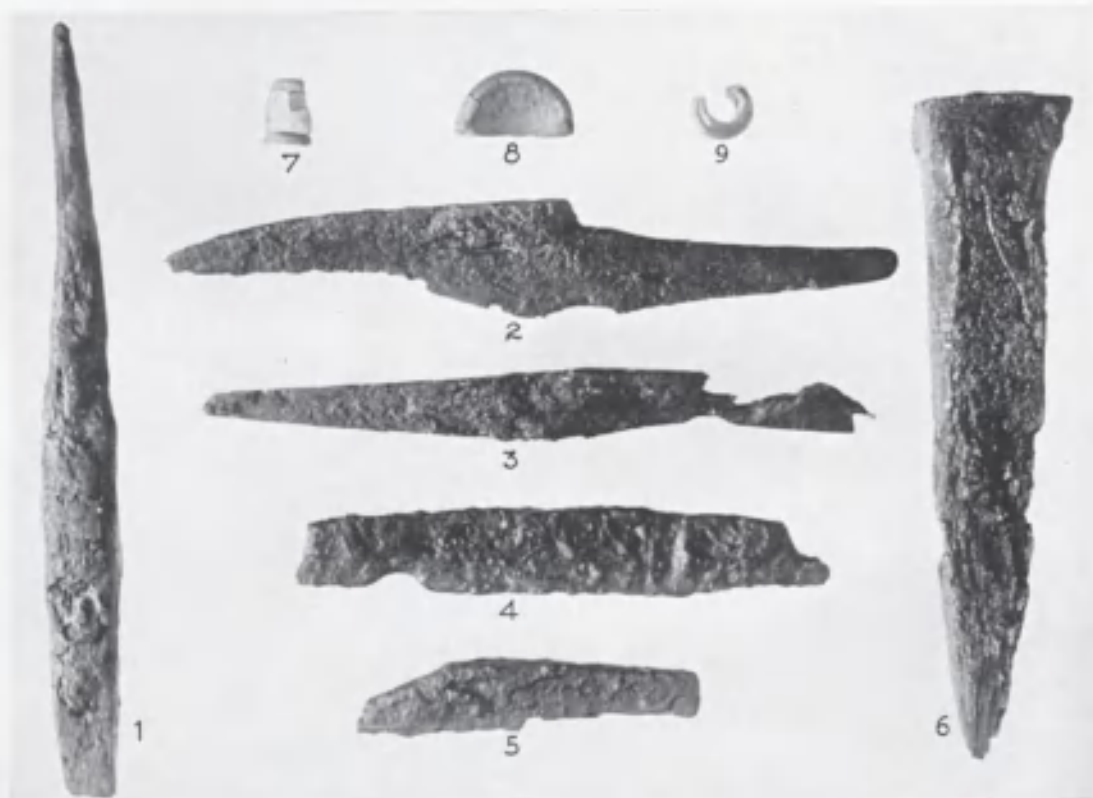
2. Sockets exposed at Period II horizon (Numbers 35 and 30), with the "stone box" to the right of the staff.



1. The north-west sector of the Fort, Period III. The staff marks the secondary walling across the Staircase Entrance.



2. The north-west sector of the Fort, Period IV.



Relics from the **Kildonan Fort**, Periods I and II. (1.)

1. **Awl-like implement**, Period I.
- 2, 3, and 4. **Parts of knives**, Period I.
5. **Part of a knife**, Period II.
6. **Part of a large pin**, or possibly a **chisel**, Period I.
- 7 and 8. **Parts of beads**, Period I or II.
9. **Piece of red enamel with yellow markings**, Period I.



Relics from the Kildonan Fort: stone discs and whetstones, Periods I and II, and a pot-lid (7), Period III. (A.)

- 1 and 4. Stone discs, Period I.
2. Toggle, Period I or II.
3. Stone disc, Period I.
5. Spindle whorl or weight, Period I.
6. Whorl or toggle, Period I.
7. Pot-lid, Period III.
8. Whetstone, Period I.
9. Whetstone, Period II.

6 feet 6 inches to the north of the cell mouth and 8 feet 5 inches to the south, there are two very conspicuous joints in the masonry; between these two joints the revetment follows a curve which is convex to the interior, in contrast to the rampart elsewhere (see fig. 4). Yet there is no evidence of disturbance along the inner revetment such as must have been apparent had the cell been inserted at this later period; secondly, during Period III there was a hearth at the cell mouth: again, the level of the interior of the fort was by this time so high that it was almost impossible to crawl into the cell. It is difficult to believe that the inhabitants of Kildonan III carefully built this chamber, and immediately half-buried the entrance, constructed a hearth at the mouth making ingress virtually impossible, and finally left no visible traces of their activities apart from the fireplace. The cell is almost certainly a primary feature, and for some reason not apparent the inhabitants of Kildonan III disturbed the earth floor and threw away some potsherds there. The "joints" on either side deserve special consideration elsewhere.

The outer face of the rampart appears to be of a consistent type of masonry throughout; large slabs, often measuring about 2 feet long, 12 to 18 inches wide, and 6 to 9 inches thick, have been carefully laid and roughly coursed, and many of them have been trimmed to shape. The face usually has a marked batter of somewhere about 1:8, rising near the foundations in places to 1:3, but sometimes falling, as in the north, to 1:12. The inner face, however, shows very marked variations. South of the entrance the wall consists of large roughly squared slabs, with the interstices carefully packed with small very thin slabs, or slats; the batter is about 1:2 near the foundations, but rapidly decreases upwards. Running obliquely across this masonry between the entrance and the gallery opening there are traces of a joint (Pl. LXXIII, 1). The passage walls of the entrance are vertical and built of well-trimmed slabs, not coursed, but packed with slats. The south and east sectors of the revetment are very much rougher in form, for there is no batter, coursing, nor packing with slats, and the stones are irregular in shape, though they present a smooth face at the revetment. Between the joints on either side of the cell the wall consists of well-laid and rather thin slabs, but to the north large blocks are characteristic, and there is to be found one of the finest stretches of masonry in the fort, making a wall with a marked batter of 1:4 (Pl. LXXII, 2). Near the staircase the wall is more vertical and the stones more irregular in shape, and "slatting" occurs. There are again traces of a joint running obliquely up the masonry between the staircase entrance and the main entrance, at about the line of the south set of steps (Pl. LXXIII, 1).

The primary floor abutted apparently without signs of disturbance upon all these types of masonry, so that there is no evidence that the variations are due to reconditioning in later phases of the occupation of

the fort. The joints on either side of the cell and the variations in the masonry thus constitute particular cases of a general problem.

We would suggest an explanation along the following lines. The outer half of the rampart between the outer revetment and the median face, together with stretches of the foundations of the inner half, as for instance in the south-east sector, were constructed by the builders first of all. Then the individual features, such as the cell, the staircases, the entrance and the gallery, were erected one at a time, often after some rubbish and chippings from the masons' hands had accumulated within the enclosure. This would account for the presence of the whelk shells at the foot of the median wall, in the sections cut across the rampart in the south-east, and for the fact that some of the walling rests in the Ic infilling, not on bed-rock. Finally, the gaps between were built up,¹ and trouble was not taken to see that the masonry was everywhere the same on the inside of the fort. Perhaps gang work is indicated, or the type of walling was a response to the quality of the building stone available, for, while well-trimmed slabs were thought necessary for the outer face of the rampart, "seconds," i.e. irregular blocks, appear to have been used to complete the inner revetment.

It is to be borne in mind that the builders were probably not working to a detailed pre-arranged plan of operations, as the Kildonan fort does not follow a more or less stereotyped form such as the Broch, and, judging from an examination of upwards of fifty forts which I myself have seen in various parts of Argyll, there is no strictly parallel type nor set model which the builders can have used as a prototype. It may be that closer parallels will be revealed by future excavation or that they exist in Ireland, but on the whole I am tempted to think that the form of the dún is to a considerable degree a response to the conditions of the site, and that the final arrangement was arrived at by empirical methods. Mistakes may have been made, as with the alignment of the bar-hole and the height of the steps in the staircases, and possibly the curious "cross-wall" in the south sector of the rampart was the beginning of some structure which was never completed. Nevertheless the rampart appears in its final form as a well-constructed, integrated whole, and, although the form may be unusual, it does not seem to be freakish. Nowhere is the impression given that the builders were expressing in their dún half-understood principles and lingering ideas of a decaying tradition.

THE INTERIOR OF THE FORT IN PERIOD I.

One of the most interesting features of the Kildonan fort is the presence beneath the primary floor of the infilling (Ic), to which reference has

¹ The curious right angle showing on top of the rampart just south of the cell before excavations began (see page 188) probably represents one of the temporary ends of a "section" of the masonry.

repeatedly been made. This deposit is in places 4 to 5 feet deep, and usually rests directly upon bedrock, but in the great hollow which originally existed in what is now the south central part of the fort there intervened a layer of bright yellow clay, 2 to 3 inches thick. This *le stratum* is normally almost coal black in colour and is made up of rather fine soil in which are embedded numerous large stones; pot-boilers and cracked stones occur frequently, and large quantities of animal bones were found in the south central hollow. The builders apparently did not trouble to make a level surface everywhere within the enclosure, for some of the upstanding portions of bedrock were left jutting above the primary floor as the great "bosses" previously mentioned; it is difficult to estimate the original floor-level owing to the fact that subsidence has probably occurred. Apart from these bosses, the infilling was encountered everywhere inside the fort and beneath the pavement in the entrance passage, but it was not excavated throughout. The task would have been one of considerable magnitude, and there was the difficulty of preserving the pavements and other structures on the primary floor, while, judging from the sections which were investigated down to bedrock, the deposit was extraordinarily poor in relics, apart from the animal bones.

It seems an obvious expedient to fill in the hollows in the bedrock to form a convenient floor-level, and yet at Druim an Duin, near Loch Sween, and at King's Cross Point in Arran, where the bedrock slopes almost as steeply, the excavators seem to have found no traces of such a deposit; in the present state of our knowledge an infilling on the scale of that at Kildonan must be considered an unusual feature.

The investigation of the deposits associated with the primary occupation (Ia and Ib) presented considerable difficulty. In the first place, the primary floor was far from horizontal; the occupants of Kildonan II had systematically razed the buildings which undoubtedly existed in Period I within the enclosure formed by the rampart, presumably when they were attempting to form a level surface for a new floor; and, finally, these inhabitants of Kildonan II added to the confusion by inseting the foundations of their own buildings into the older strata (Ia, b, and c).

From the meagre evidence available we provisionally obtain the following picture for Period I: A pavement ran inward between two walls, from the entrance to the central area of the fort, where it ended on the far side of a small hearth (H I 3 on the map). Around this pavement there were half a dozen or so small huts, the boundaries of which could not be precisely defined; in at least two we found hearths (H I 1 and 2) formed of a horizontal slab and a low curb. No passages appear to have led either to the staircase, cell, or ladder, all of which opened from one or other of the enclosures. The huts were presumably small hovels, in contrast to the fine rampart around them; the foundations, which remain, are not

altogether unlike those of the much later sheilings which one sometimes encounters on moorland walks. The hut walls probably consisted of stone and turf, laid upon stone foundations, and apart from a vague tendency to branch or radiate from the central area they did not conform to a regular design.

KILDONAN II

In the general discussion of the deposits within the fort (page 189) reference was made to a sterile loamy layer (IIIc) which underlay the occupation debris of Period III. During the time which elapsed between the original building operations and the beginning of the accumulation of this loam the interior of the fort was radically altered. At first sight this might suggest an entirely different occupation, but the changes which were made were probably not all simultaneous, and there is nothing in the stratification of the intervening deposits between the Ib floor and the IIIc loam to indicate a gap in the occupation of any length of time. The simplest explanation seems to be that the inhabitants of Kildonan I themselves made some alterations—possibly the walling up of the staircase is one—and that newcomers later razed the old interior walls, constructed new huts, and introduced a new hearth type; perhaps there was a short period during which Kildonan was uninhabited, or perhaps the fort was captured, suffered some destruction, and was immediately reconditioned. An attempt will now be made to describe the site as it was just before the IIIc loam commenced to accumulate. For convenience the reconditioned fort will be referred to as Kildonan II, and the time during which it was occupied as Period II, but it must be borne in mind that there is no satisfactory evidence for assuming that there was an interval between the primary occupation and this later phase or period: in practice it was often quite impossible to differentiate the soil and rubbish (and relics) which accumulated in Periods I and II.

The form of the entrance had been considerably changed, and door-checks and bar-holes were apparently out of fashion in Kildonan II times (Pl. LXXIV, 1 and 2). A solid block of masonry had been constructed to reduce the outer two-thirds of the passage to half the original width (see map, fig. 7). This secondary masonry was roughly built, except for the western face, which consisted of large slabs, and was continuous with the outer revetment of the rampart to the north. The new masonry commenced about a foot outwards from the old outer north corner of the entrance, and ran inwards so that it just covered the bar-hole on the north side. The new passage between the secondary masonry and the old south wall was reduced to 2 feet 8 inches at the outer end, and to 3 feet 8 inches where the constriction ended (see map); the inner third of the passage continued to be 8 feet to 8 feet 6 inches wide as before, but it was repaved and the

old slope made practically level. At the junction where the old floor in the narrow portion ran beneath the new paving there was a marked step upwards of about 6 inches, which was, however, masked by three large

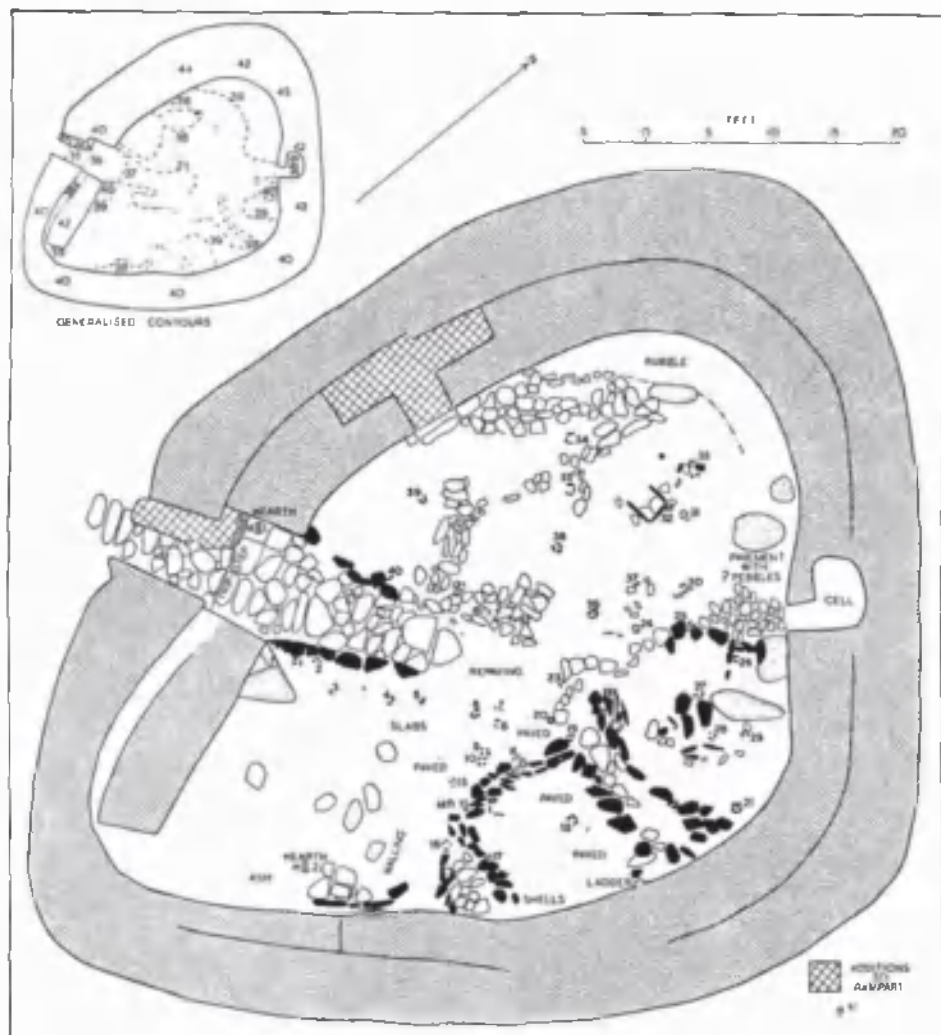


Fig. 7. The Kildonan Fort, Period II.

slabs in a row across the passage and lying aslant on the step. The flagging stones of the new paving were so arranged as to leave a sunken hearth (H II 1) in the corner between the old north wall and the eastern face of the secondary walling; it measured 2 feet along the old wall, and was 1 foot 6 to 9 inches wide: there was no curb, but it was floored

by a horizontal slab nearly 6 inches below the surrounding pavement, and when discovered was filled with brown peat ash. Presumably a guard was stationed in the wider portion of the passage in the shelter of the secondary masonry, and this "guard-room" had been refloored and provided with a hearth: the three stones crossing the inner end of the narrow part of the passage were probably to form a "trip step."

An almost exactly similar type of hearth was found just by the cross-wall in the south sector of the rampart: this second example (H II 2) has been left intact within the fort. Horizontal flagging stones form three sides of a sunken floor measuring 1 foot 8 inches parallel to the rampart, and 1 foot 3-6 inches wide; it was again floored by a horizontal slab 6 inches below the pavement around. The back consists of large thin slabs set on end in a row, parallel to the inner face of the rampart and about 7 inches away. When first uncovered there were quantities of brown peat ash in the hearth and on either side, almost as far as the gallery opening on the west but only for a foot or so to the east, where a line of stones running inwards from the rampart indicated the position of a wall.

This hearth (H II 2) lay almost immediately below the IIIc loamy layer, and was more than a foot above the level of the primary floor (39.1 feet as against 37.9 feet L.D.), so that there was no difficulty in recognising the two horizons. Elsewhere within the fort, flagging stones occurred at the horizon corresponding to that of hearth H II 2, and repaving was detected almost immediately below the IIIc deposit in the central area; in various places too, especially in the south-west part of the fort, isolated slabs were lying at this "Kildonan II" horizon (IIb), as though somewhat casual attempts had been made to improve the earth flooring. But when this secondary paving was absent the soil between the primary floor and the IIIc layer consisted of a uniform deposit, very dark brown in colour, with plentiful signs of occupation throughout. In other words, the distinction between the Ia occupation soil and the IIa-b deposits was arbitrary, and hence the difficulty of separating the relics into Periods I and II. A further complication arose from the fact that the difference in level between the primary and secondary floors was often less than 6 inches, the considerable thickness beneath hearth H II 2 being quite exceptional.

At this "IIb" horizon there occurred a number of what appeared to be sockets to support upright posts or poles (Pl. LXXV, 2). The best-preserved examples consisted of three or more small stone slabs set on end, corner to corner, to enclose a small rectangular or triangular space 6 to 8 inches across; a number of these have been preserved within the fort. The upper edges of these stones projected well into the IIIc stratum, and some were actually incorporated in the IIIb floor, but the lower edges

often reached down to the Ib horizon, and many penetrated the Ic infilling. Of a total of over forty possible examples it can be said with certainty that the great majority were in use in Period II, and had been inset into the lower deposits; in some cases the primary pavements had been clearly disturbed in the construction. Although the remnants of a number were not encountered until the Ib floor was excavated, it is highly probable that all belong to the later period, though it must be stated for accuracy that some *may* belong to the lower horizon.

The sockets and large slabs which occurred at the same level give a moderately clear indication of the lay-out of the Kildonan II fort (see fig. 7, Kildonan II).

It would appear that the fort was entered by a very narrow passage, at the inner end of which was a trip step, and then came a "guard-room" provided with a hearth. From the entrance, a pavement between two walls supported by upright posts led to a very small central courtyard, whence a narrow roughly paved passage led to the ladder in the south-east. On the south side there were two enclosures, one in the south-west provided with a hearth, and one a small semi-circular hut south of the ladder. North of the ladder passage there was another enclosure extending to the cell; it is very doubtful whether a passage led to the cell mouth from the central courtyard. On the north side of the central pavement there may have been two enclosures near the staircase, but there was no passage to the staircase entrance, which in all probability had been walled up during Period I. Finally, a roughly rectangular structure surrounded a "stone box" framed by three thin slabs on end rising from 6 inches to 1 foot 2 inches above the floor in the north central part of the fort. The comparative absence of an accumulation on the floor, apart from the sterile loam, seems to suggest that the fort very quickly went out of use after the reconditioning which has just been described. It may have been partially destroyed, but the re-levelling of Period III makes it impossible to say with certainty, and the interior may simply have fallen into ruin, as is suggested by the survival of the sockets and the "stone box."

KILDONAN III.

Above the IIb floor and its associated structures there was found, almost all over the interior of the fort, the stratum of light brown loamy soil (IIIc) to which reference has previously been made. It was completely devoid of relics and of signs of occupation, and presumably was formed during a relatively long gap in the occupation of the Kildonan site. After this interval the whole of the interior was once more roughly levelled, and either flagged or cobbled with stones up to about 9 inches long. On this pavement a new set of huts came into being in the northern half of the

fort. The gallery was filled in and walled up at the "gallery opening" at this time; we discovered that the foundations of this short but well-built wall had been laid as deep as the Ic infilling, and for once the disturbance of the strata between Ic and IIIc was clearly distinguishable.

The entrance (see map, fig. 8) was restored to its original width, but was repaved at a higher level, about the height of the old bar-holes. The secondary masonry of Period II had been reduced in height, while the old guard-room and narrow part of the entrance had been filled in with large stones set on end to form the new pavement, which was thus about 3 feet above the old floor-level of Kildonan I and II (figs. 5 and 6). A low wall was discovered running for about 3 feet across the inner end of the passage from the inner south corner, but it had been damaged in the recent past, and in any case had suffered at the hands of the inhabitants in Period IV; its purpose was not apparent. The pavement near the inner end of the entrance too had been disturbed before excavations started; the outer part, westwards from the old gallery, was in better condition, and descended by four large rough steps to the line of the outer revetment to the rampart, and then gave place to an earth-and-stone ramp, leading downwards with a gradient of about 1 in 5 to the iris bed at the foot of the hillock (see sections, fig. 6). There was nothing to indicate that this new passage was roofed, and almost certainly it was open.

The passage gave access to what appears to have been an open yard occupying the whole of the southern half of the fort (see map, fig. 8); it was well paved near the entrance, but after about 10 feet or so gave place to a roughly cobbled floor stretching to the rampart on the south and south-east. There were no signs of walling nor of hearths, though stones of the walls of Period II sometimes projected through the cobbles. In the corner, at the old gallery opening, quantities of whelk shells and a few potsberds were found.

A wall of some form or other seems to have run inwards along the north edge of the well-laid pavement from the inner north corner of the entrance; the evidence, however, is rather doubtful, and the actual foundation-stones shown on the map for Period III are in reality the foundations of the earlier wall of Periods I and II. Clear traces of walling ran to meet this line from the wall blocking up the old staircase, long ago filled in. In the enclosure so formed there appeared to be a hearth (H III 1) against the rampart half-way between the entrance and the staircase. It consisted of a more carefully paved area than the cobbles around, measuring 3 feet 6 inches by 3 feet, and was 2 or 3 inches above the general floor-level, from which it was separated by a low curb; no ash was found.

Another hearth (H III 2) was discovered on top of the boss on the north side of the cell mouth. A rough curb about 3 inches high was found on the north and west sides, but on the south side we found only the

trench where the curbstones had once been set; the enclosure so formed measured 2 feet by 2 feet 3 inches. The whole area was covered

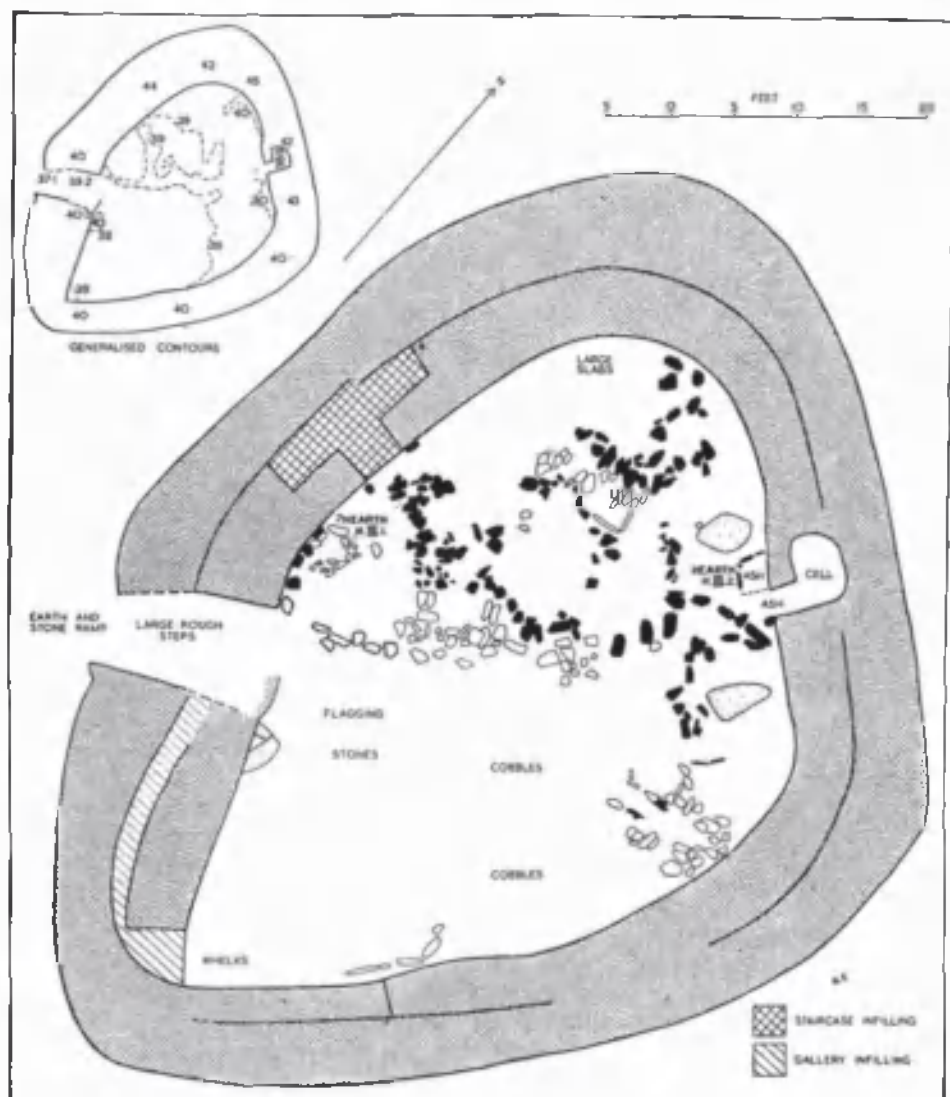


Fig. 8. The Kildonan Fort, Period III.

with brown ash, presumably from peat, which ran into the cell mouth, and was traceable on top of the earth floor of the cell chamber. The hearth itself was floored, as it were, by five large rounded pebbles, chipped with heat, measuring up to 5 or 6 inches across. Now stones of an exactly

similar size and shape, showing signs of chipping, had been found at various levels within the fort, and had been classed as "hammer-stones," but this situation appears to show that their true purpose was in connection with cooking operations, possibly for providing heat for an oven; they were certainly not hammer-stones or pounders.

This hearth (H III 2) appeared to lie in a small hut enclosure around the cell mouth (see map, fig. 8), the shape of which seemed to be given by a line of stones running inwards from the south jamb of the cell entrance to another line of stones, parallel to the rampart and about 8 feet away; the north-western wall ran to the rampart, so far as could be made out, about 13 feet north of the cell mouth. Between the enclosures of hearths H III 1 and H III 2 there were traces of possibly two other dwellings or huts (see map, Period III), of which the western appears to have had two very small annexes, by the north-east wall of the enclosure immediately north of the entrance. Yet another structure appears to have existed against the rampart on the south side of the cell mouth, but the traces are so vague that the dimensions cannot be given; it was probably about the same size and shape as the enclosure around hearth H III 2.

Although the gallery was filled in at this period and the entrance altered, there is nothing to suggest that the rampart as a whole was extensively reconditioned; some rebuilding may have been undertaken, but we had no criterion by which to recognise masonry which was later than the original.

Judging by the half-dozen small huts and the comparatively large open yard, the inhabitants of the fort were few, even by comparison with the numbers living on the same site in the two earlier occupations. It would seem to be more in accordance with the facts to designate Kildonan III as a small fortified hamlet within the old rampart rather than to class it as a "castle" of late mediæval times, within which Period III clearly falls.

KILDONAN IV.

Immediately after the close of Period III, which cannot have lasted long, the whole of the interior was levelled to form a very roughly cobbled floor; this involved the almost complete destruction of the existing walls, though it was not carried out so thoroughly as when the walls of Period I were razed. No hearths, walling, or anything else suggesting building occurred on the more or less horizontal floor which resulted; the cobbles lay just beneath turf in many places, and a tangle of bracken, briar, and whin roots had formed an almost impenetrable cover. In view of the disturbance which these roots had caused, and the rough character of the pavement itself, it was very difficult to differentiate the cobbles

from the debris above. There is no doubt of their actual existence, however, and the best explanation seems to be that the settlement of Kildonan III was levelled and the interior of the fort used simply as a cattle-pen.

THE RELICS.

During the discussion of the deposits within the fort emphasis has been placed more than once upon the difficulty of separating the relics of Period I from those of Period II, and there was the same problem with regard to Periods III and IV; the presence of the sterile IIIc loamy layer over most of the interior made it much easier to distinguish horizons II and III, but, even so, the change was not always clear. The following list indicates as far as possible the horizon at which the various objects were found, but in some cases the classification into four periods has perforce been abandoned.

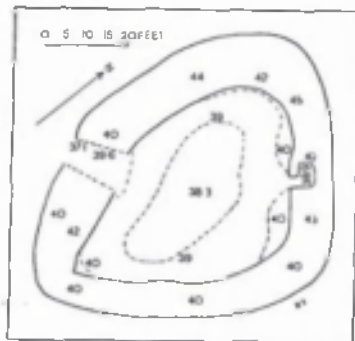


Fig. 9. The Kildonan Fort, Period IV (the cattle pen).

PERIOD I.

Domestic Pottery.—Almost completely absent except for a small sherd, 1 inch across and .6 inch thick, of coarse reddish ware.

Terra sigillata.—One small, very much battered sherd, .8 inch across and .4 inch thick, with faint traces of the red glaze on one side. Found at the Ib horizon, but close to an alignment of slabs inset in Period II. There is a possibility, as Professor Childe has suggested to me, that this sherd might have been treasured for centuries as a charm or amulet. *Terra sigillata* has been found on a number of West Coast sites of the Iron Age as far north as the Hebrides, and nearer Kintyre, at the forts of Ardifuair and Dunadd, and at Keil Cave, near the Mull of Kintyre.

Small Cup or Crucible.—Seven fragments of baked brown clay, rather soft, apparently forming parts of a small thick cup, roughly shaped, about 1.5 inch high and 2.5 inches across externally (see sections, fig. 10, 5).

Clay and moulds for casting metal objects. Large patches of soft reddish clay were found frequently where Ic gave place to Ib. Small pieces of reddish half-baked clay occurred commonly. Sixteen fragments of baked reddish clay, with smooth shaped surfaces, forming parts of moulds, or the clay binding for moulds, were found, and several fragments of baked grey clay, one resembling a nail head.

Bronze.—Two small pieces, probably parts of a needle from near the eye section, measuring 1.3 inch and .4 inch long by .08 inch to .1 inch thick.

Iron Objects.—These occurred commonly, but some were too corroded for treatment.¹

1. Awl-like implement with a flattened blunt tang, 4.1 inches long and

¹ I am very much indebted to Miss Annie S. Robertson, M.A., and Mr N. McIntyre of the Hunterian Museum, Glasgow University, who undertook the task of cleaning the iron objects.

- 4 inch by ·3 inch at the thickest at the junction of point and tang (Pl. LXXVII, No. 1).
2. Small tanged knife with curved back, portion measuring 2·8 inches long, ·6 inch at the widest, and ·12 inch thick at the back (Pl. LXXVII, No. 2).
 3. Knife, part of a blade, 2·2 inches long, with a curved back.
 4. Tanged knife, fragment, mostly tang, 3·6 inches long (Pl. LXXVII, No. 3).
 5. Small tanged knife with curved back, portion of blade 2·7 inches long (Pl. LXXVII, No. 4).

These knives are similar to those obtained from Dunadd (see *Proc. Soc. Ant. Scot.*, vol. lxiv. p. 118).

6. Part of a large pin, or possibly the butt end of a chisel, measuring 3·5 inches long and ·7 inch by ·5 inch at the butt (Pl. LXXVII, No. 6).
7. Spear head, fragment at the junction of blade and open socket, 1·7 inch long.
8. Nail, head and part of the shaft, 1·2 inch long.
9. Nail or rivet heads. Four examples, the heads being about $\frac{3}{4}$ inch across, and the shafts not more than $\frac{1}{4}$ inch long.
10. Part of a metal plate (?), with a rivet at the edge, 1·0 inch by ·6 inch.
11. Hollow tube, ·2 inch long and ·5 to ·7 inch thick.
12. Needle-like object, 2·4 inches long and ·05 to ·07 inch thick.
13. Seven thin lengths of iron, 1 to 2 inches long.
14. Three curved lengths of iron 2·6 inches, 2·0 inches, and ·9 inch long.

Iron slag occurred commonly, frequently in small pieces, but several flattened cone-shaped masses as much as 6 inches across were found. From the presence of the slag and the moulds there seems no doubt that the inhabitants of Kildonan I were iron-workers. Two fragments of limestone had been carried within the fort.

Enamel or Paste.—Half of a small disc, ·6 inch diameter, of dull red material with dull yellow markings in two places on the upper edge. The bottom side is rough and flat, the upper side smooth and hollowed, so that the disc is ·1 inch thick at the edge and ·06 inch at the centre (Pl. LXXVII, No. 8).

Spindle Whorl or Weight.—A perforated disc of mica schist, thicker at one edge (·25 to ·6 inch) and flattened at the thicker edge, with a diameter of 1·75 to 1·85 inch. The perforation, ·25 inch diameter, is nearer the thickened edge. One surface suggests that the object may have been split diagonally, and was originally ·6 inch thick (Pl. LXXVIII, No. 5).

Whorl or Toggle.—Thin disc of schist, chipped at one edge, 1·8 inch in diameter, ·2 inch thick, with a small central perforation, ·15 inch in diameter. Eight radial lines are traceable on one side. The perforation seems too small for a whorl, and possibly the object is a toggle or button, affixed by a single cord, knotted at one end (Pl. LXXVIII, No. 6).

Stone Discs.—Shaped discs of various sizes were found.

1. Mica schist, 3·4 inches in diameter and ·4 inch thick.
Fragments of two others of slightly smaller diameter.
2. (a) Shale, 1·9 inch diameter, ·15 inch thick (Pl. LXXVIII, No. 1).
(b) Shale, 2·0 inches diameter, ·2 inch thick (Pl. LXXVIII, No. 4).
(c) Schist, 1·5 inch diameter, ·2 inch thick.
3. Schist, 1·1 inch diameter, ·13 inch thick.

In addition, upwards of a dozen round flat beach pebbles of much the same size as 2 and 3 were found. The first group resemble pot-lids, but 2 and 3 are

too small and may have been used in a game; the smallest (3) will spin like a coin when tossed.

Whetstones and ? Polishers (Pl. LXXVIII. No. 8).—Whetstone of mica schist, 7.5 inches long, rectangular in cross-section (fig. 10, No. 1), with rounded edges, and tapering from 1.2 inch by 1.0 inch at the centre to 1.0 inch by .7 inch at the end. .5 inch from one end, which is broken a little, there is a neat perforation, .2 inch in diameter.

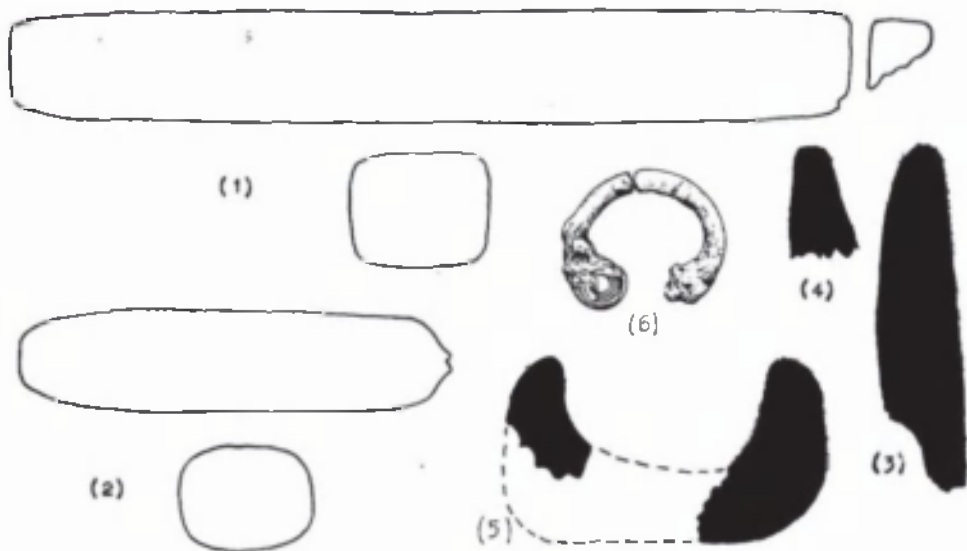


Fig. 10. Relics from the Kildonan Fort. (1.)

1. Sections along and across the Whetstone, Period I.
2. Sections along and across the Whetstone, Period II.
3. Rim, red pottery from beneath the pavement in front of the Cell, Period I (?).
4. Rim, fragment of pottery, Period II.
5. Cross-section of clay cup or crucible, Period I.
6. Bronze Brooch, Period I or II, drawn by H. E. Kilbride-Jones (see Appendix I).

There were found, both at this horizon and the other three, a number of elongated stones about the size of a whetstone; some were very rough, others smooth and rounded at the ends, and might be whetstones or polishers. At the completion of excavations we had a series grading from smooth bars down to rough stones and large pebbles. At Period I horizon they occurred in two sizes:

- (a) From 4 to 6 inches long, and up to 1.7 inch thick.
- (b) About 2 inches long, and up to .7 inch thick.

Five examples of type (a) and three of type (b) may be classed as reasonably certain implements, while eight very doubtful examples are to be recorded.

Flint.—Chips and flakes occurred at all four horizons, and twenty-nine may be associated with Period I. They are usually grey or buff in colour, one or two were reddish, and two showed signs of heating. One may show secondary flaking (a scraper). The size varies from a grey flake, 2.8 inches by 1.9 inch by .7 inch, to very small chips, and most are less than 1 inch. In all probability they were used as strike-a-lights, and examples showing signs of working are

probably the remnants of older implements found by chance and brought within the fort for strike-a-lights.

Querns.—Discussed under a separate heading.

Bones.—Many fragments were found, but only one showed signs of working—an antler from which a tine had been sawn (see Appendix III).

Carbon.—Occurred commonly (see Appendix IV).

In addition, pot-boilers, heated and cracked stones, occurred commonly, and sling stones were found. "Hammer-stones," or pounders, or perhaps they may be referred to as heating stones, were sometimes encountered. Quartz chips were scattered throughout the soil at this and the second and third horizons.

PERIOD II.

Domestic Pottery.—Three sherds of thick, coarse, reddish brown ware, showing traces of a smoothly rounded rim (fig. 10, 4).

Moulds.—A dozen fragments of baked clay, probably from moulds.

Lead.—Two pieces of lead rolled into small tubes or cylinders.

1. From a piece .05 inch thick, rolled into a tube .2 to .3 inch in diameter and .7 inch long.
2. From a piece .08 inch thick, rolled into a tube .7 inch in diameter and .7 inch long. A similar fragment was found at Dunadd.

Iron Objects.

1. Knife with curved back, fragment 1.8 inch long (Pl. LXXVII, No. 5).
2. Hollow tube, .7 inch long and .5 inch in diameter. Parts of others were also noted.
3. Nail, broken at the point, 2.9 inches long.
4. Nail head with shaft .7 inch long.
5. Piece 2.5 inches long, .3 inch wide, and .1 inch thick at either end, and a third of the way along there is a sharp shoulder and then a gradual tapering to the other end. Mr A. J. H. Edwards suggested that it was part of a lock.
6. Curved length, 1.5 inch long and .3 inch thick.
7. Loop, much corroded, but apparently about 1.5 inch by 1.2 inch. Fragments of others were noted.

Spindle Whorl.—Of baked clay with no glaze, maximum diameter 1.1 inch, height .6 inch, perforation .25 inch in diameter. Lower side gently rounded, upper side rising markedly near the perforation.

Whetstones and ? Polishers.—*Whetstone:* Greater part of a perforated whetstone, now 4.5 inches long, smooth, oval in cross-section (see fig. 10, No. 2), measuring 1.2 by .9 inch. It is broken off at the perforation, but the other end is smoothly rounded and slightly flattened (Pl. LXXVIII, No. 9).

Smooth elongated stone, 5 inches long, which may represent a whetstone or polisher, and two doubtful examples of a similar nature.

Stone Discs, all schist.

1. 2.5 inches in diameter and .2 inch thick (Pl. LXXVIII, No. 3).
2. 1.0 inch " " .15 " "
3. 1.2 " " " .3 " "
4. .8 " " " .2 " "

Two round flat pebbles.

Flint.—Forty-one pieces were found, of which two may show signs of secondary flaking. Colour: grey, buff, or reddish. Twenty-one occurred together in a corner of the enclosure in front of the cell in a space of about

2 square feet, most of them being large flakes varying from 2·7 to 1·5 inches. Of the remaining twenty only three were more than 1 inch long. One was a small scraper. A small piece of pitchstone was found.

Carbon.—Occurred commonly (see Appendix IV).

Bones.—Fragments, usually small (see Appendix III).

Pot-boilers, heating stones, cracked stones, sling stones, quartz chips were frequently encountered.

PERIOD I OR II.

Domestic Pottery.—A large piece, 3 inches across and up to ·6 inch thick, coarse in texture, and reddish brown in colour; the rim is plainly rounded (see fig. 10, No. 3). Found under the pavement with pebbles. It strongly resembles the sherds of Period II, so that the pavement itself may be of Period II date.

Hollow Tube or Neck of Pottery.—A fragment, in colour bluish grey, red on the outside. About 1 inch across, ·2 inch thick, with a diameter of the tube about ·8 inch.

Bronze Brooch.—Found separately in two halves, forming a penannular brooch of the late seventh century A.D. (see Appendix I). From slightly above the level of the Ib floor, but below the IIb horizon; traces of walling in the neighbourhood may indicate some disturbance. While apparently belonging to the Ia horizon, it may in fact date Period II.

Toggle.—A light perforated disc of black shale, 1·2 inch in diameter, ·1 to ·15 inch thick, with a central perforation ·2 inch in diameter. Found at the same horizon as the brooch (Pl. LXXVIII, No. 2).

Beads.—Part of a dark-blue glass bead, ·3 inch in diameter, perforation ·2 inch in diameter; exterior slightly rounded and ·2 inch long (Pl. LXXVII, No. 9).

About a quarter of a thin cylindrical bead of vitreous paste. The complete bead was probably ·3 inch in diameter, ·35 inch long, with narrow dull yellow raised bands at the two ends, and a blue ground crossed by white bands in the centre (Pl. LXXVII, No. 7).

Large Stone Objects.—The following were found at the II horizon, but in each case appeared to have been incorporated in walling or pavement, and probably belong as artifacts to Period I.

Bar Mould.—Slab of schist, 12 inches by 9 inches by 3 to 7 inches thick. From one edge of the upper surface run two deep grooves, one $3\frac{1}{2}$ inches long and 1 inch wide, the other $1\frac{1}{2}$ inch by $\frac{1}{2}$ inch. From the adjacent side runs another groove, $2\frac{3}{4}$ inches by $\frac{3}{4}$ inch.

Mortars.—

- (a) Slab of schist, 1 foot 9 inches by 1 foot 6 inches by 5 inches, with a hollow worn in the centre of the upper side, 10 inches across and $2\frac{1}{2}$ inches deep, and another on the under side, 6 inches across and $\frac{3}{4}$ inch deep. This stone was used in the trip step across the entrance in Period II.
- (b) Irregular piece of schist, 1 foot 5 inches by 1 foot 3 inches and 4 to 10 inches thick, with a deep hollow worn at one end, 8 inches across and 4 inches deep, but partly broken away. Found in the walling on the north side of the ladder passage in Period II.
- (c) Slab of schist, 1 foot 9 inches by 2 feet 7 inches, with a shallow hollow near one edge, 5 inches across and 1 inch deep.
- (d) Irregular piece of schist, 10 inches by 14 inches, with a large hollow on one edge where it is obviously broken across.

Socket Stones.—A slab of schist measuring 1 foot 5 inches by 1 foot 3 inches by 4 inches, split into two parts, and one end broken away. At the broken end there was a perforation, $2\frac{1}{2}$ inches across, and near the opposite end there is a deep socket, $1\frac{1}{2}$ inch wide at the top. Found in the secondary masonry in the entrance in Period II, and may be the socket stone for the gate in Period I; it could be held in place by a peg driven through the perforation.

Fragments of three other socket stones.

On two stones there were deep markings which may have been natural, but on another, 12 inches by 10 inches by 5 inches, there is a curious pear-shaped hollow, 2 inches by 3 inches across, and it may be another bar mould.

Staircase.

The rubbish in the twin staircase probably accumulated in Period I, but owing to the impossibility of establishing this the relics, such as they are, have been listed separately.

Bones in quantity; shells, including whelk, limpet, mussel, and oyster; some carbon in fragments; pot-boilers, heated and cracked stones, sling stones, quartz chips, limestone, and occasional slag.

The Seaway.

A very doubtful whetstone or polisher; three round flat pebbles; fragments of two discs, possibly pot-lids; bones in quantity; shells, including whelk, limpet, mussel, and oyster; pot-boilers; heated and cracked stones; baked clay; and quartz chips.

PERIOD III.

Domestic Pottery.—Two wares found.

1. Light grey ware, upwards of 90 sherds. Found in the interior, in the cell, gallery, and entrance, and on the earth ramp sloping down from the entrance.
2. Light reddish ware, about two dozen fragments. One piece was found immediately under the IIIb floor, on top of the IIIc deposit; all the others came from the cell.

A report on this pottery by Mr G. C. Dunning will be found in Appendix II. He dates it to the end of the thirteenth or to the early fourteenth century A.D.

Iron Objects.—Much-corroded iron occurred occasionally. Only two pieces showed any recognisable shape after treatment.

1. Large roughly oblong piece, 2.5 inches long, 2 inches wide at one end, $1\frac{1}{2}$ inch at the other, .5 inch thick at the wide end, .35 inch at the other.
2. Rather similar wedge-shaped object, 2.7 inches long; the thick end is 1.5 inch wide and .6 inch thick; the thin end is curved outwards, and is 1.8 inch wide and .2 to .3 inch thick.

Iron slag occasionally.

Half-baked clay, a few fragments.

Stone disc, a flat round pebble.

Whetstones or ? Polishers.—No indubitable examples, but two smooth elongated stones, 5 inches and $6\frac{1}{2}$ inches long.

Flint, four small chips.

Jasper quartz, one fragment.

Quern stones (see separate heading).

Pot-boilers, cracked stones, heating or hammer stones, sling stones; bone and carbon in very small pieces, both relatively uncommon; quartz chips.

PERIOD IV.

Three pieces of very much corroded iron; seventeen pieces of slag; two flint chips; a very doubtful example of a whetstone or polisher; a few fragments of carbon and bone; a few shells, mainly whelk; some sling stones and pot-boilers, but comparatively rare; quartz chips.

A small piece of sandstone with two "cup-markings" was found in this pavement. Cup-marked stones are common in Kintyre, and this fragment is probably part of one of these old stones.

All this refuse may simply be overturned Period III material.

The Cell.

The relics are listed separately in view of the fact that the floor had apparently been disturbed in Period III.

Pottery.—Twenty-four small sherds of light red ware and about a dozen of light grey ware, both associated with Period III.

Pear-shaped flint with secondary working—a leaf-shaped arrow-head.

Mould.—A few fragments of baked clay.

Slag.—Fragments of iron slag and a piece of dark glassy slag.

Bones in quantity and large pockets of whelk shells.

Quern Stones.

A number of rotary quern stones were obtained, but owing to the fact that most of them had been incorporated into later walling or pavements after they had been worn out or broken, it is impossible to divide them into periods. The following list indicates the position in which each was found. Sections have been drawn of all the stones which are not too much damaged, i.e. 1, 2, 4 to 7 (see fig. 11).

1. Nearly complete stone of schist, with a central perforation, countersunk, and near the edge a handle hole, 1 inch in diameter, slanting upwards and inwards towards the centre. The under side at the handle hole was broken. Diameter 16 inches, thickness $2\frac{1}{2}$ inches near the handle, and $3\frac{1}{2}$ inches at the opposite side. Found in the Ic infilling, resting against the foundation of the inner revetment to the rampart and 5 feet below the Ib floor.

2. Complete stone of schist, 14 inches in diameter, 2 to $2\frac{1}{2}$ inches thick, no handle hole. Found on floor Ib.

3. Circular stone of schist, 16 inches in diameter, but upper and lower faces too much damaged to estimate the thickness or shape.

4. About a quarter of a sandstone quern, $3\frac{1}{2}$ inches thick, with a radius of about $5\frac{1}{2}$ inches. The edge much less rounded than the above and smaller in diameter. Found at the IIb level.

5. About a third of a sandstone quern stone, $2\frac{1}{2}$ inches thick with a radius of about 4 inches, the central perforation apparently very wide—about 2½ inches; the edge scarcely rounded, and generally similar to No. 4. Apparently from level III.

6. A third of a stone of schist, radius about $6\frac{1}{2}$ inches, and $2\frac{1}{2}$ inches thick. Found in the IIb pavement.

7. About a third of a stone of schist, radius 8 inches, 2 to $2\frac{1}{2}$ inches thick. Found at turf-level.

8. About half of a much abraded quern stone of schist, diameter about 14 inches, and $2\frac{3}{4}$ inches thick. Found at turf-level.

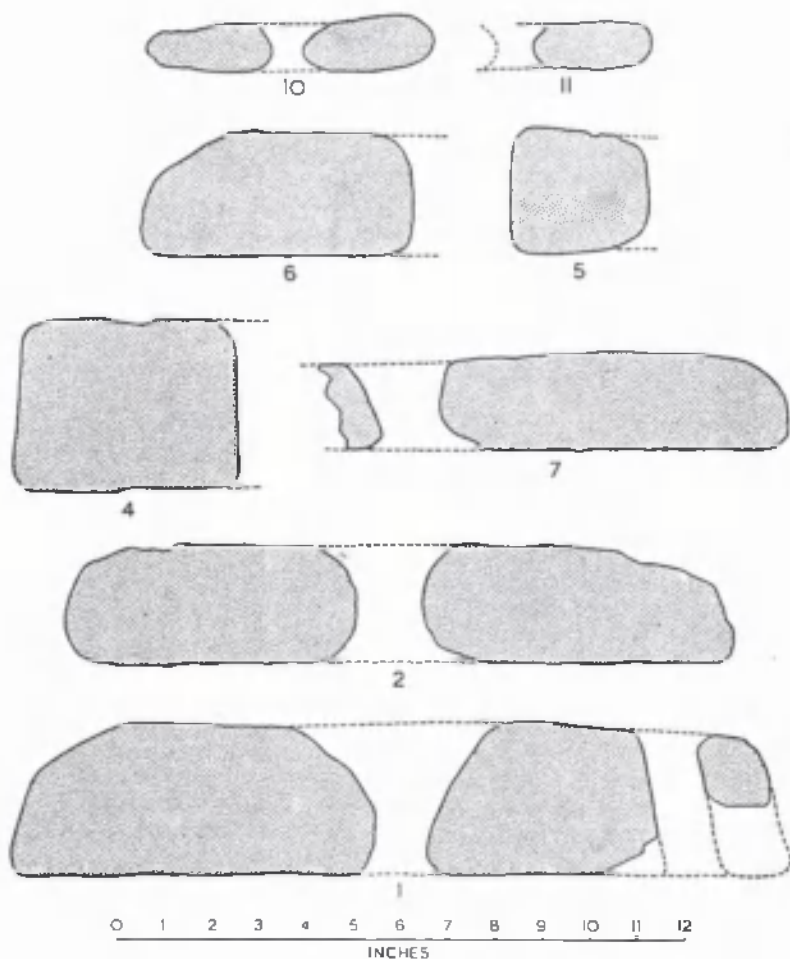


Fig. 11. Sections of Quern Stones and Weights (?) from the Kildonan Fort (see text).

9. About half of a stone of schist, much worn, but apparently about 18 inches diameter, and the hole for the pivot about 1 inch from the centre. Found in the IVb pavement.

These querns seem to fall into two types. Type *a*, 1 to 3 and 6 to 9, probably belongs to Period I; Type *b*, 4 and 5, may possibly be associated with Period III.

In addition, there were found at the Ib horizon two much smaller stones of schist, roughly circular, and perforated approximately at the centre.

10. Diameter 6 inches, thickness up to 1 inch. Countersunk in the centre

for a pear-shaped perforation, .55 to .7 inch across; both surfaces are very rough.

11. About a quarter of another, with a circular perforation, apparently .7 inch across, but the stone itself cannot have been quite circular as the radius varies from $2\frac{3}{4}$ to $3\frac{1}{4}$ inches. Thickness about 1 inch, and with smooth upper and lower faces.

Both may be net sinkers or, just possibly, the remnants of very small rotary quern stones.

A circular stone of schist, about 11 inches in diameter and 3 inches thick, found in the Ib floor, resembled an unperforated quern stone; another, 13 inches in diameter and 3 inches thick, was found in the IIIf pavement. Both may be unbored quern stones.

THE DATING.

One of the most striking facts revealed by the excavations is the length of time which elapsed between the construction of the fort and the final occupation. Within this span of many centuries there are four periods or phases to be distinguished and dated as nearly as possible. These four periods add to the interest of the site in many ways, but considering each individually the presence of the other three is a definite disadvantage, since the disturbance caused by successive reconditioning has destroyed much that would have been of great interest on the three lower floors, and, as regards the uppermost, where the chances of survival were better in this respect, we appear to be dealing with nothing more than a cattle-pen. The disturbance is doubly regrettable in that it has rendered the dating very problematical; this matter would have been less serious had relics been found in large numbers, but the poverty of the inhabitants during the whole time the fort was in occupation has been made only too clear in the foregoing survey of artifacts, and the total number of dateable objects is woefully small.

Period III alone can be placed with accuracy from the two types of pottery found at this level; this reconditioning occurred in the late thirteenth or early fourteenth century A.D. Period IV, if it may be so termed, apparently followed immediately, but there is no indication as to how long it lasted. The depth of the IIIc sterile loam would seem to show a comparatively long gap between Periods II and III, presumably of some centuries.

The difficulty of distinguishing the relics of Period I from those of Period II, and the absence of evidence on stratigraphical grounds for a lengthy gap between the two phases, makes it imperative to consider both together. There are but two objects whose manufacture can be dated with any accuracy, the *terra sigillata* and the penannular brooch. They merely indicate that the fort was occupied until after the seventh century A.D., and may have been built before the second century A.D.

The general similarity of the other material to that obtained from Dunadd, occupied perhaps until the ninth century A.D., is more striking than any vague resemblances to rubbish from early Iron Age sites where occupation ceased much earlier. Furthermore, the amount of rubbish and soil associated with the Ia and IIa-c strata is certainly not in such quantity as to suggest a continuous occupation from the second century onwards to perhaps the eighth century. Assuming that the *terra sigillata* had survived as an amulet for a long time, one is tempted to suggest on these grounds that Periods I and II covered approximately the seventh and eighth centuries A.D.

There are, however, a number of difficulties. In the first place, *terra sigillata* has been discovered on a number of Scottish sites which belong to the centuries about the beginning of the Christian Era, and it is barely justifiable to attach so little significance to the sherd from Kildonan. Secondly, the brooch may have been displaced from its true horizon, and date the second phase alone. Thirdly, whatever the relics alone may suggest, the general character of the fort considered separately would, on the whole, indicate an earlier date than the seventh century; this latter point must be considered in some detail.

The position, size, and general proportions of the *dùn* differ in no very significant ways from the small stone forts of the west of Scotland which Professor Childe has called collectively "Castles,"¹ and which appear to belong to the early Iron Age. Now the Broch type, which seems to be a specialised form of a "Castle," was normally provided with galleries, cells, a staircase, and an entrance with door-checks and bar-holes. The development of this specialised type has never been worked out, and at the beginning of excavations at Kildonan it was hoped to throw some light upon the problem, so striking were the superficial indications of a fort closely related to the Broch. It is quite clear, however, that Kildonan is too late to be of significance in this respect, since the round towers were fully developed by Roman times. Furthermore, the divergences from this highly specialised type are too great to establish a direct relation, and to find the true antecedents to the *dùn* at Kildonan we must look elsewhere.

It is to be remembered that cells occur in the "Castle" at Ardifuair, the south fort on Luìng, and at Druim an Duin, to quote well-known examples near Kintyre; galleries have been noted at Dunburgidale on Bute, at Castlehaven in Kirkcudbright, and in the "Galleried Duns" of Skye and the Hebrides; staircases occur at South Luìng, Ardifuair, and elsewhere; an entrance with door-checks and bar-holes is quite a normal feature in a "Castle"; the "median face" may be far from rare, in view of the fact that so few of these stone-built ramparts have been investigated.

¹ V. G. Childe, *The Prehistory of Scotland*, p. 187.

It might be suggested that the parallels to the Broch are equally parallels to the parent "Castle" type. Since the specialised Broch form was fully developed by Roman times, there is a marked hiatus if we are to place this specialised Kildonan type as late as the seventh century. Again, emphasis has more than once been placed upon the fact that Kildonan is a carefully integrated or co-ordinated structure, with a singular freshness of the individual features, and it is hard to conceive of it as a late freakish survival, or to assign a date seven centuries after the "Castles," though appearances may be misleading.

Accepting, then, this rather obvious conclusion that the builders of Kildonan embodied in their dūn a number of traits current at the time of the "Castles," to turn now to the divergences from the ancestral type. The twin staircase is unusual, but not a startling development; the "median face" may be a comparative rarity, but is merely a simplification of the gallery; the overhanging door-check would seem to be abnormal, but in the present state of our knowledge it would be unwise to attach too much importance to it; the Ic infilling may be more reminiscent of a mediæval castle than a prehistoric fort, but it is an obvious expedient, and the absence of parallels in Scotland, though not in Ireland, may be due to lack of knowledge or faulty excavation in the past—the records of the excavations at Druim an Duin and King's Cross Point are regrettably vague on this point. In short, the divergences from the early "Castle" type are notable, but scarcely so marked as to suggest a long evolutionary period.

The obvious parallels to the "Galleried Duns" have not been stressed, in view of the fact that these forts are an unsolved problem in themselves.

Summarising, all that the writer can say is that the fort at Kildonan may be as late as the seventh century, but that there are indications of an earlier date, though hardly before the second or third century A.D., since the relics as a whole are not typical of the normal early Iron Age sites in Scotland. It is within this period that the Scots from Ireland were crossing to Argyll, and Kintyre and Antrim became parts of the same cultural province. A consideration of the historical background allows several alternatives from which to choose:

1. That the fort was erected by the natives possibly as a defence against Scottic raiders or invaders; Period II was presumably a Scottic reoccupation.

It will be remembered that the dūn is fairly well hidden at the head of the bay, and it is one of the remarkable features of the site that from the rampart there is a magnificent view of the sea from near the Mull to a point far up Kilbrannan Sound; it is an almost uninterrupted sea horizon of nearly 180°. The bay itself is very rocky to act as a haven, and far better landing-places can be found within a mile; the products of trade or

piracy are almost non-existent: the inhabitants appear to have been agriculturalists and stock-raisers, and possibly longshore fishermen.

2. That the Scots themselves erected the fort, and Period II was a reoccupation about the time of the Norse raids, or merely a later phase of the Scottic period.

The "castle complex," Childe has suggested, may have been a cultural drift from the south, and the resemblances to the "Castles" may be more directly to those of Ireland than Scotland.

3. That the fort was erected after the Scottic migrations, and represents a blending of native and Scottic influences.

Neither alternative solves what is perhaps the major problem—that of the Galleried Duns in general, and, in particular, why the inhabitants of Kintyre built a fort for which there are apparently no local parallels. Galleried Duns certainly seem to be comparative rarities, and while excavation might reveal further examples, diligent search in Argyllshire has left the writer unrewarded, though one or two sites are suggestive. It was in the hopes that others might find the data valuable in this respect that the surface indications of the Kildonan dun, before excavations commenced, were plotted with care.

CONCLUSION.

To draw conclusions from a site of such complexity is to skate upon extremely thin ice. The archaeology of the Dark Ages is in its infancy, and perhaps in the future, after further excavations in the west of Scotland, the Kildonan site will assume its true perspective. Had a long series of relics been placed on record, the various occupation levels would have provided a most useful series for reference purposes; as it is, the fort must be taken as an earnest of things to come. Yet several points have emerged and must not be overlooked when an *impasse* with regard to the dating has been reached.

In the first place, the investigation has shown that the technique of fort construction could be more involved than our knowledge has on the whole led us to believe. The gallery and median face, the suggestions of a breastwork, the twin staircase and ladder, the entrance with its peculiar gate arrangements, the cell, the deep infilling below the primary floor, and the seaway, all occurring together, suggest a type of fort which might almost vie with the Broch as being one of the supreme achievements of the "castle complex," as Childe has named it. It appears to represent, not an epilogue to the Broch phase, but another specialisation and development of the parent culture. The fort was clearly occupied more or less in its pristine state until perhaps the eighth or ninth century, and this strongly

suggests that the "age" of the small stone forts of the west of Scotland must be prolonged until the beginnings of what is often thought of as the "age" of the mediæval castle. The first reference to a stronghold at Dunaverty near the Mull of Kintyre takes us back apparently to the eighth century, since when the site was occupied more or less continuously until the massacre of the Macdonald garrison in 1647. Clearly it is possible to envisage a gradual transition from the stone forts of the "castle complex" to the strongholds of the type of Kildonan, which continued in occupation until the period when authenticated examples of "mediæval castles" were founded. It seems a far cry from Early Iron Age fort to Edwardian castle in the south of England, but in the west of Scotland the connection between stone fort and mediæval stronghold may be much more direct.

Secondly, the study of types of ramparts is carried perhaps a stage further. The median face may not be a new discovery, but at Kildonan it is a prominent feature and a most illuminating example. Again, the gallery, in the writer's view, is to be considered primarily as a structural feature, and that the *structural* significance of a gallery was known and appreciated at this time may not be without importance in the study of the Broch.

Thirdly, the individual features of the fort, such as the entrance, cell, staircase, and gallery, hark back to the pre-Scottic period, yet it is at least possible that the fort at Kildonan was post-Roman by some centuries; we are on very uncertain ground, but there may be an indication that the irruption of the Scots into Argyll did not produce such a marked change as some of our history books would suggest.

Fourthly, the apparent poverty of the occupants of the dūn at Kildonan throughout its long history deserves comment in view of the magnificence of the rampart. It may be more than a coincidence that the archæology of the late pre-historic period and the Dark Ages in Scotland has so long remained obscure.

Finally, a fifth conclusion must be added to this speculative review. The two forts on either point of Kildonan Bay, within a quarter of a mile from the galleried dūn, provide a complementary study. If they are by some strange chance contemporaries, the excavation would throw some light upon Kildonan itself, and would carry interesting implications with regard to the density of population. If not, as is far more probable, then with the three occupations at Kildonan a long series of "cross-sections" of the cultural history of one locality would have been established—no small achievement in the present state of the archæology of the west of Scotland.

ACKNOWLEDGMENTS.

Often during the last three years have I wished that the first excavations of which I have personally been in charge had been conducted on a site of less complexity than Kildonan, and I have asked and received help from so many quarters that a full list of acknowledgments would far surpass the limit of editorial tolerance. To his Grace the Duke of Argyll for permission to excavate; to the Members of the Kintyre Antiquarian Society, and especially Mr J. R. Cunningham, for their financial help, encouragement, and hospitality; to Professor V. G. Childe for his continued interest and most valuable help, advice, and financial assistance; to my numerous friends, especially Mr N. J. H. MacCulloch and Dr J. Orr, who have assisted on the site, and to Mr A. Wilson and Mr S. Galbraith, my workmen; to Mr J. H. Mackenzie, Curator of Campbeltown Museum; to Mr J. S. Richardson, Mr A. J. H. Edwards, Mr H. E. Kilbride-Jones, Mr G. C. Dunning, Miss A. S. Robertson, Miss M. I. Platt, Mr M. Y. Orr, for their help with the relics; to Mr and Mrs J. Semple of Ballochgair Farm, with whom I stayed; to those especially, and to all who have helped to make this report possible, I offer my most sincere thanks.

APPENDIX I.

REPORT ON PENANNULAR BROOCH FROM KILDONAN.

By H. E. KILBRIDE-JONES.

The brooch is in an extremely poor state of preservation, and the right half is considerably more weathered than is the left half. The brooch is also unusually small, measuring only 32 mm. in greatest diameter. Little remains to serve as a guide to its date except a small uncorroded portion of the left-hand terminal. The terminals were round, and they were ornamented with three concentric circles in relief, and done in the *kerbschnitt* technique, surrounding a slightly domed centre. The hoop, like the terminals, is flat on the reverse side, and midway between the two terminals there appear to be indications of the former existence of a small decorated panel. These details can be most nearly paralleled on the eighth-century brooch from Croy, Inverness-shire (*Arch.*, 65, 236, fig. 174). There is little doubt, however, that the Kildonan brooch is more closely related to a type of native-made brooch showing Frankish influence, and represented by a specimen from Co. Antrim (*B.M. Anglo-Saxon Guide*, 133, fig. 174), a type which, in Britain, probably does not long post-date the Migration Period. Perhaps it belongs to the early seventh century, in view of the technique employed in decorating it, and also since ornithomorphic fibulae in the Frankish style produced no lasting effect on

contemporary art in Britain, although that effect tended to persist in Ireland. The Kildonan brooch is approximately the same size as the Co. Antrim specimen, but the hoop has thickened and the terminals have lost the beaks. Sparse though these data are, it would nevertheless probably be correct to say that the Kildonan brooch belongs to the latter half of the seventh century.

APPENDIX II.

REPORT ON MEDIEVAL POTTERY FROM KILDONAN FORT,
CAMPBELTOWN, KINTYRE. By G. C. DUNNING.1. *Cooking-pot from filling of Cell.*

Fig. 12.—Cooking-pot restored from fragments of rim and upper part of shoulder, and separate fragments of base. The ware is light red to buff in section, mixed with fine sand, and the surface is smooth and buff, discoloured grey by fire round the rim and on the base; the inner surface has a white coating, probably to render the vessel less porous. The pot is carefully wheel-turned, the sides are thin, and the outer surface on the shoulder is marked by horizontal rilling or fluting made whilst the pot was turning on the wheel. The rim is everted, thickened, and angular, and almost square in section; it has an internal bevel and a small beading on the inner edge. The base is deeply sagging and the base-angle is sharp. The pot is $4\frac{1}{2}$ inches rim diameter, about $6\frac{1}{2}$ inches shoulder diameter, and about $6\frac{1}{4}$ inches high.



Fig. 12. Cooking-pot,
Period III. (†)

It is possible to date the pot within fairly close limits. In southern England cooking-pots of similar proportions and with similar angular rims are dated to the middle of late thirteenth century.¹ In Scotland the closest analogy is a small cooking-pot remarkably similar to the Kildonan vessel, but with green glaze on the shoulder;² it was found at Ayr, and contained coins of Alexander III., John Baliol, and Edward I. Cooking-pots of the same character found elsewhere in Scotland are referred to the thirteenth or early fourteenth century.³ The period 1250–1350 may be suggested as the most probable date for the Kildonan cooking-pot.

¹ Rayleigh Castle, Essex, where occupation ceased shortly before 1277 (*Trans. Essex Arch. Soc.*, N.S., vol. xii. p. 182, fig. 7). Bungay Castle, Suffolk, pottery from layer dated 1294 (*Proc. Suffolk Inst. of Arch.*, vol. xxii. p. 834, figs. 1–5).

² *Proc. Soc. Ant. Scot.*, vol. lvi. p. 30, fig. 4, 3.

³ *Ibid.*, figs. 1, 4, and 5.

2. *Jug from Level III.*

Fig. 13.—Jug restored from fragments of rim, neck, joined pieces of shoulder and side, and fragments of base. The ware is light grey in section, yellow or buff towards the outer surface, and mixed with fine dark-coloured grit which speckles the surface. The inside is grey and shows wheel-marks, the outer surface is yellow with buff tones and is discoloured grey in patches. The neck and shoulder fragments have well-marked external fluting, similar

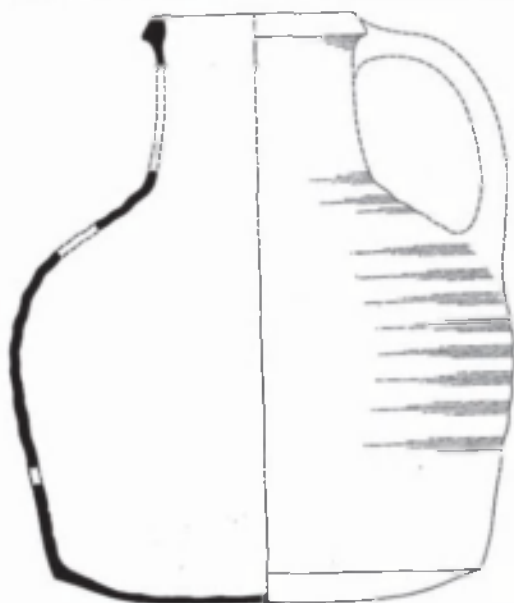


Fig. 13. Jug, Period III. ($\frac{1}{2}$.)

but more pronounced than on the cooking-pot from the cell filling. Moreover, glaze is present on a fragment of neck and the upper part of the shoulder; the glaze appears to be only in patches, but is rather decayed, and is fairly thick and even, dark brown in colour.

The rim is vertical with rounded lip, and is thickened outside to form an angle. The neck appears to have been fairly cylindrical, passing gradually into a high rounded shoulder. The base sags deeply with sharp base-angle, of which there is sufficient to show that thumb-pressing was absent unless it was abnormally widely spaced. One large shoulder fragment has a thickening for the lower end of a

handle, and the inside of the wall is pressed out by the potter's fingers in securing its attachment to the pot. It is possible to obtain rim, shoulder, and base diameters independently, so that the only approximate measurement is the height; the jug is $4\frac{3}{4}$ inches rim diameter, $10\frac{3}{4}$ inches shoulder diameter, and about $12\frac{1}{2}$ inches high. The restoration could be made slightly taller, but not shorter.

The stratigraphical evidence at Kildonan indicates that the cooking-pot and jug are of about the same date, for sherds of both classes were found amongst the stones forming the pavement of Period III in the cell. This evidence is substantiated by the similar general character and technical finish (fluting) of both vessels. The jug is therefore referred to the same period as the cooking-pot—that is, to the late thirteenth or early fourteenth century. Analogous jugs of this date are known from Scotland. Com-

parison may be made with a jug found at Carsphairn, Kirkcudbrightshire,¹ containing coins of not later than the early fourteenth century. This vessel is similar in proportions to the Kildonan jug, and has a cylindrical neck, squat globular body, and partial thumbing of the base-angle. Close parallels for the rim-section of the Kildonan jug are provided by sherds from a mound at Kidsneuk, Irvine, Ayrshire,² assigned to the thirteenth or fourteenth century.

APPENDIX III.

THE BONES AND SHELLS.

Miss M. I. Platt of the Natural History Department, the Royal Scottish Museum, Edinburgh, very kindly undertook the laborious task of identifying the bones and shells which were obtained during the course of the excavations. Small fragments of bone, sometimes burnt, occurred at all four occupation levels, and larger pieces and sometimes whole bones were very common in the Ic filling, and in the filling of the cell, seaway, and staircase. Only one piece showed signs of working; it was a portion of red deer antler (found in the Ic filling) from which a tine had been sawn. One ox horn-core was found (in the seaway), and proved to be of the short-horn variety. One bone (Period I) was a phalanx of the common seal, *Phoca vitulina* L. The classified list below has been constructed from the data provided by Miss Platt.

	Ox.	Red Deer.	Sheep.	Pig.	Pony.	Seal.	Shells: <i>Littorina littorea</i> (L.), "Whelk."	<i>Helix aspera</i> , Müller.	<i>Palæda vulgata</i> L., "Limpet."	<i>Oscaea edulis</i> L.	<i>Buccinum undatum</i> <i>littorale</i> , King.	<i>Gemma clancaria</i> .
Period I	x	x	x	x	x	x	x	x	x	x	x	x
Period II	x		x				x		x			
Periods I and II	x		x	x			x		x			
Cell	x		x	x			x		x			
Seaway	x	x	x	x			x		x	x	x	
Staircase	x	x	x	x			x		x	x		
Period III		(fragments of bone)					x		x			
Period IV		(fragments of bone)					x		x			

¹ *Proceedings*, vol. xlviii. p. 398, fig. 2.

² *Ibid.*, vol. lii. p. 68, fig. 3.

APPENDIX IV.

THE CHARCOAL.

The fragments were submitted to Mr M. Y. Orr of the Royal Botanic Garden, Edinburgh, who has grouped them as follows:—

	Willow- Poplar.	Hazel.	Birch.	Oak.	Ash.	Lime.
Period I	50	12	6	4	1	1?
Period II	12	3	..	1	1	..
Periods I or II	34	3	..	2
Period III	3

Willow and poplar cannot be easily distinguished.

There is some doubt as to the authenticity of the fragment of lime of Period I, not to the identification.

The preponderance of willow-poplar is probably to be explained by the nature of the ground, which is badly drained on the south and west. Hazel, ash, oak, and birch grow on the hillside behind the fort.

Thesis presented to the University of Glasgow for the
Degree of Doctor of Philosophy.

By Horace Fairhurst M.A.

April, 1940

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IRON AGE SETTLEMENTS IN KINTYRE: KILDONAN BAY.

1. "The Galleried Dun at Kildonan Bay, Kintyre".

Reprinted from the Proceedings of the Society of
Antiquaries of Scotland, Volume LXXIII (1938 - 1939).

Pages 185 - 228.

2. Additional Photographs illustrating the site of
the Galleried Dun at Kildonan Bay.

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3. "The Stack Fort on Ugadale Point, Kildonan Bay."

Typescript pages 19 - 31.

**Additional Photographs to illustrate the Report on the
Excavations at the Galleried Dun at Kildonan Bay, Kintyre.**

Horace Fairhurst.

Additional photographs to illustrate the Report on the Excavations at the Galleried Dun at Kildonan Bay, Kintyre.

During the course of the excavations at the Galleried Dun, over a hundred photographs were obtained. Of these, the Society of Antiquaries of Scotland published ten; the cost of production was so high that additional illustrations could not be considered. A further sixteen are now included to bring up the total to adequate proportions. Some are simply to illustrate the account of the excavations, and the others have been placed in permanent record because the constructions which they show had to be removed during the course of the excavations. The remainder are of little interest save to the excavator personally, as most of them were taken with no idea of publication, but to amplify the field notes for accuracy of description when the report came to be written.

The quality of the photographs sometimes leaves much to be desired, but the difficulties were considerable. Apart from bad weather, and the necessity for rapid preparation to avoid undue interference with the work of the labourers, the space was exceedingly cramped. It was discovered that the best results were to be obtained by working in the somewhat diffused sunlight about eight or nine o'clock in the morning after a night's rain.



1. The hillock as seen from the beach to the south east.



2. View along the western rampart showing the south staircase, and the beginning of the gallery on the far side of the entrance.



3. View along the south rampart, showing the median face exposed near the "cross wall", and to the right, the gallery opening in the south corner of the fort.



4. The wall, built in Period III, blocking the gallery opening; foreground excavated to the top of the infilling.



5. The bar-hole and door check on the south wall of the entrance. The gallery with the rubble filling of Period III, appears immediately to the left of the door check.



6. The entrance during excavations. The large steps on the left represent the Period III horizon.



7. The entrance from the outside, Period II. The masonry on the left, constructed in Period II, reduced the passage to half its original width.



8. The entrance from the outside after rebuilding to preserve the stability of the gallery and staircase. In the foreground, a section has been cut across the artificial ramp leading up to the fort.



9. The pavement of Period III near the entrance. The walling immediately below the labourer, was constructed part way across the inner end of the entrance passage in Period III.



10. The stratification in the interior of the fort.
In the foreground, the pavement of Period II;
Behind, rough cobbling of Period IV, immediately
below the turf.



11. The mouth of the cell, with the hearth of Period III (H III 2), to the left, and stones on end, probably of Period III, to the right. (See page 201 of the Report, top paragraph.)



12. The hearth (H III 2) of Period III against the rampart just north of the entrance.



13. The hearth (H II 2) of Period II, against the rampart in the south of the fort; nearby, a small heap of pot-boilers.



14. The interior of the fort by the cell, during excavations. Immediate foreground, the "stone box". In front of the cell, the "pavement with pebbles" To the right of the cell, remnants of interior walling. The joints in the masonry on either side of the cell, are discussed on page 201 of the Report.



15. A well preserved "socket" of Period II (No. 21) near the rampart in the east.



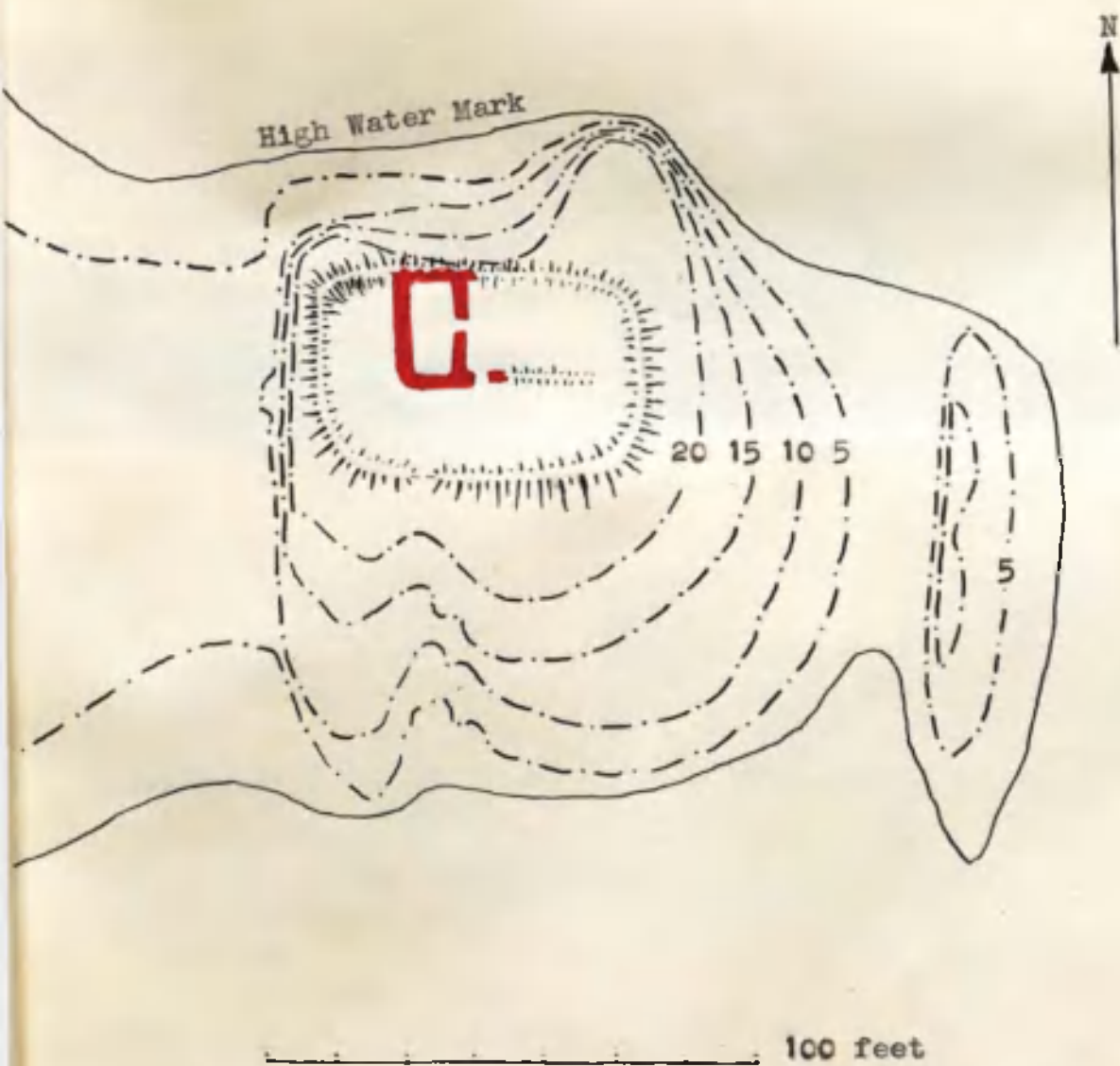
16. The interior of the fort, Period I horizon, viewed from the rampart in the south, and showing hearths H I 1 in the foreground, H I 2 in the upper right centre, and H I 3 in the upper left centre.



17. The interior of the fort at the Period I horizon,
viewed from the rampart in the south.

The Stack Fort on Ugaale Point,

Kildonan Bay, Kintyre.



Rough Sketch Map of the Stack Fort on Ugadale Point,
Kildonan Bay.



1



2

1. Ugadale Point and Fort, viewed from Kildonan.
2. Ugadale Fort from the south west.



3



4



5

3. The Interior before excavations.
4. The rectangular dwelling from the south east.
5. Lines of stones traversing the "yard" in front of the rectangular dwelling.

The Stack Fort on Ugadale Point, Kildonan Bay, Kintyre.

At the extremity of Ugadale Point, which forms the northern side of Kildonan Bay, there is to be found a small fort surmounting the top of a stack of rock which rises above and overlooks the lowland forming the peninsula as a whole (see fig. 1). It lies within half a mile of the galleried dun at the head of the Bay. The stack is in itself a very strong natural defence, and the ramparts need never have been more than a subsidiary obstacle. On the north side, the rock drops precipitously to the beach, some 25' below, and on the east, the descent is again steep, but irregular, and leads down to a very rocky foreshore. On the south side, the slope is not quite so abrupt, and in addition, a broad cleft or fissure in the mica schist runs up the side of the stack and forms a natural ramp leading to the flattened summit. On the west, there is a low cliff some 12' high at the minimum, overlooking the lowlands of the Point (see fig. 2).

Most of the top of this steep sided hillock is occupied by a small enclosure formed by a single rampart surrounding an oval area measuring about 40' along the main east-west axis, and 30' at right angles to this. The rampart itself now appears as a low and rather narrow bank of earth and large stones, almost completely grassed over; it is continuous, but rarely rises more than 3' above the interior. The entrance seemed to be located on the south side of the fort, at the head of the natural ramp running up

on the beach. The saucer-like enclosure (see fig. 3) was quickly overgrown with nettles, and was honeycombed with rabbit holes. Traces of interior walling could however, be detected running along the major axis in the eastern part of the fort.

The general appearance of the structure suggested that it was badly denuded, and it did not seem to promise much to the excavator. The reasons for the choice of this site for investigation were twofold. In the first place, it was in very close proximity to the Galleried Dun of Kildonan, and was obviously a complementary study, as was suggested in the report on the latter site (page 223). Secondly, forts of very similar type, both as regards situation, size and form, are very numerous in Argyllshire; the writer has inspected a considerable number of them in the coastal districts south of Loch Etive. Practically all of these sites appear to be in the same very ruinous condition as that of Ugadale, and none have been excavated. In view of their frequency, a study of at least one of them would be a useful contribution to the archaeological survey of the west of Scotland. Excavations were therefore commenced in June, 1939, and were continued for three weeks. No paid labour was employed, but the writer was assisted by three friends, two of whom had had previous experience at Kildonan and elsewhere. Much still remains to be done, but a provisional report is called for in view of the fact that it may be some years before operations can be resumed, and especially as the results are of interest in connection to the report on the Galleried Dun.

A section about 20' wide was demarcated, running directly across the fort from the north rampart, crossing the eastern end of the interior foundations on the major axis, and running to the south rampart on either side of the entrance; the first 6' of the entrance passage were also included. It would be both tedious and unnecessary to describe the course of the excavations in detail, especially as operations in the section were not completed. Furthermore, the rabbits had produced worse confusion than was feared, and the stratification was difficult to follow; modern shot-gun cartridge cases were found deep below the turf, while objects of considerable antiquity lay near the surface. The results so far obtained will be briefly summarised.

It was soon ascertained that the section ran across the western end of a rectangular building constructed against the rampart in the north and east, and occupying about a third of the fort (see fig. 4); this had been anticipated when the area for excavations had been selected. The north wall of this dwelling was formed by the rampart itself, and so, in all probability is the eastern wall. The western wall, or the gable end of the building, jutted out at right angles from the north rampart, and ran southwards for 13', at which point it joined the southern wall of the dwelling. The junction between the two was curious; the trend of each lay at right angles, but instead of meeting sharply, the masonry curved evenly to form a beautifully rounded corner. The south wall continued to the extremity of the section in the east, and could be traced as a low bank amid the nettles

Almost to the eastern rampart. Just within the section, and about 9' from the rounded corner, what appeared to be the main doorway into the dwelling was discovered; it was between 5' 5" and 2' 9" wide. These external walls were on the average just over 2' thick, and rose about 18" high; the masonry was formed of flat slabs, carefully laid but without any attempt at coursing. There was no doubt that the walling was far superior in construction to anything which had appeared within the enclosure at Kildonan, whatever the period. Just west of the main doorway, a partition wall of poorer construction and only 1' 8" wide, traversed the dwelling from north to south. Half way along this wall, there was a doorway 2' 6" wide, giving access to what appeared to be the end room of the dwelling; this measured 13' from north to south, and was 6' 6" wide. It was floored with earth and small stones stamped hard, but no traces of a hearth were found (see fig. 4).

Between the walls of the rectangular dwelling and the rampart on the west and south sides of the fort, there appeared to have been an open yard. This was cleared of debris in the south part of the section, and an attempt was made to establish the line of the inner face of the rampart. In spite of every effort, no built face could be found on either side of the entrance. Two explanations are possible; either the rampart had long ago collapsed to a heap of stones, or, more probably, the dwelling and the yard were later in date than the rampart, and the latter had been thrown down in this area when the reconditioning was undertaken, to form a rough

platform or scarpment, overlooking the south side of the
back.

Running across the yard, there were lines of large
stone slabs on edge and end to end, almost completely
bedded in the earth floor, and suggestive of older walling than
that of the rectangular dwelling. These lines of stones
were laid bare by excavation, but no clear pattern could be
distinguished, and at this point, operations had to be
discontinued. It seems highly probable that these are the
remnants of early structures of a type somewhat similar to
those detected within the enclosure of Kildonan. The
rabbit holes had caused such confusion that it was almost
impossible to see any traces of a lower occupation level,
and the obvious expedient is to widen the whole section
outwards in the hopes of finding a less disturbed area;
the fact that the inner face of the rampart shows clearly
above the turf a little to the east, seems to promise better
conditions.

The entrance consisted of a gap through the rampart,
rather ill-defined, but apparently about 4' 6" wide, and
leading to the natural ramp from the beach. The rampart on
the other side was so ruinous that it was only with great
difficulty that even the foundation stones of the passage walls
could be found. The floor of the passage seems to consist
of a series of large and irregular steps, formed by flat
stone slabs.

The list of relics which were discovered is not
 ressive, especially as some of the objects may be modern, but
 compared with those from Kildonan, and bearing in mind
 short~~xx~~ space of time during which the excavations lasted,
 re is no doubt that Ugadale is the more productive of the

One is tempted to suggest that the inhabitants were
 so poor. The list of finds must now be briefly reviewed.

n objects. Nails, and two pins, one with a double looped
 head, the other with a rounded head and a
 collar; a fragment of a knife similar to those
 from Kildonan I.

nze. A needle, similar to that from Kildonan I.

ver. Two coins.
 a. A penny of James IV, minted in Edinburgh.
 b. A threepence of Elizabeth, dated 1579.

ndle whorls. Three fragments of ~~two~~ small stone whorls,
 one elaborately carved.

a objects. Portions of three armlets were found. One is
 circular in cross section, while the other two
 are flattened on the inside, as with many
 examples of Early Iron Age date in Scotland.

uciples. Large portions of two small crucibles, somewhat
 suggestive of those from Dunadd.

ads. Three examples.
 a. Small. round. light blue.
 b. Small round, dark blue.
 c. Large dark blue bead, generally round,
 but with a collar at either end, at
 the perforation, and with four small
 conical projections from the body, each
 decorated with a thin white spiral.

tttery. Five different wares were found, being red,
 xbrown, yellow, black and green in colour;
 The sherds were few and small, and some may
 be modern. All were hard baked, and it is
 not very likely that any predate the coins.

int. Numerous chips.

nes, whelk and limpet shells, and fragments of charcoal were
 occasionally found, as well as pot-boilers and cracked stones.

It is impossible to form definite conclusions at the present stage of the investigations, but probably two occupation periods are involved. The jet armlets, the crucibles, the bronze needle, the beads, and possibly the iron pins, are suggestive of either an original foundation of the fort in the Early Iron Age, or more probably, in the Dark Ages. The form of the fort and the character of the relics do not indicate any close correlation with Kildonan or II, but whether the original occupation is earlier or later, remains to be discovered. A reoccupation, with extensive reconditioning of the fort, and with the construction of the rectangular dwelling, evidently occurred sometime about the fifteenth century, judging from the dates on the coins. It would seem probable that the top of the stack was relevelled to form the floor of the rectangular dwelling and the yard, and that the rampart suffered to some extent in the process. Several potsherds perhaps belong to this period, but some are probably modern.

Surprise was expressed in discussing the late date to be attached to the reoccupation of Kildonan in periods I and II, but in Ugadale "II", we appear to be dealing with a still later period. That two sites in such close proximity were reconditioned in the later Middle Ages, certainly suggests that the "age of the forts" in the west of Scotland must be prolonged far beyond the Dark Ages. At Ugadale, we are well within the period of recorded history, and it has been possible to discover to whom the lands belonged. Mr Torquil Macneale

Ugadale has sent the following extract from a letter which received from his lawyer, Mr J. Richardson, Chambers, Rutland Square, Edinburgh :-

The earliest Charter..." (to be found amongst the titles to Ugadale) "...is a Charter under the Great Seal of King James VI Donald and Euir McCay Moir of the Office of Coroner of Kintyre with the lands of Arnagill and Ugadill dated 26th December 1615. This Charter narrates that the lands have been held beyond memory of man by Mackays and then refers to a Charter of King James V confirming Euir McCay Moir and his heirs in the Office of Coroner of Kintyre with the four penny lands of Arnagill and Ugadill in Mid-Kintyre as belonging to the said Office. I have got from the Signet Library a copy of the Black Castle manuscripts relating to the Clan Mackay and, when dealing with the Mackays of Argyllshire, the earliest Charter is a Charter of Confirmation by Robert I Gilchrist MacYmar McCay for his homage and service. The land is described as the "two penny lands of Schamnacartas Kintyre, viz:- the lands of Arydermede, Balloscalfis, Illewillan and Seskamonsky". As a condition of holding these lands McCay had to furnish two archers in the King's name. This Charter is dated 31st March 1329. I cannot identify any of these lands with Ugadale. There is evidence, however, of Mackays in Argyll in the fourteenth century and I think we may take it that there were Mackays at Ugadale a considerable time before the reign of James V. My recollection is that before that date there were constant raids on Kintyre followed by fire of the dwellings and no doubt any Charters

plier than this date were destroyed. This is all the more probable as the Charter of James V is a Charter of Novodamus, which is a Charter given to replace a former Charter that have been destroyed. My own opinion is that the fort the early residence of the Mackays and that any fifteenth century remains that have been found are referable to their residence in the fort"

It is interesting to note that in the Inventory of the Outer Hebrides and Skye, published by the Royal Commission on Ancient Monuments (Introduction, page xl) reference is made to a number of forts located on very small islands. In each case, the whole island was surrounded by wall, and built up against this rather flimsy "rampart", there was a rectangular dwelling with rounded corners, not dissimilar, apparently, from that at Ugadale. It is true that the stack at the latter fort is not surrounded by water, but it rises like an island above the mainland. The Inventory suggests a Mediaeval date for the Hebridean examples, but it is not impossible that an older fort was reconditioned to form a very similar structure at Ugadale.

Evidently, the main interest of the sites centres around the late occupation, as so much of the earlier fort has been destroyed. Further excavation should lengthen the list of relics and might allow the date of the original foundation to be estimated more accurately, but it is highly probable that there will be much opportunity of establishing the original lay-out of the fort. In respect of the intention

throwing light upon the problem of the small forts of
Wiltshire generally, the choice of Ugadale has proved
fortunate, but the data concerning the late occupation
is incomplete.

Additional Papers.

Horace Fairhurst.

Additional Papers presented with the Thesis for the
Degree of Doctor of Philosophy.

By Horace Fairhurst.

1. Types of Settlement in Spain".

Reprinted from the Scottish Geographical Magazine,
Volume 51, September 1935.

Pages 283 - 296.

2. "The Natural Vegetation of Scotland: its character
and development".

Reprinted from the Scottish Geographical Magazine,
Volume 55, July 1939.

Pages 193 - 212.

3. "The Geographical Limits of the Iron Age Settlement
in Scotland".

Typescript pages 1 - 23.

TYPES OF SETTLEMENT IN SPAIN

By H. FAIRHURST, Department of Geography,
Glasgow University

(*With Diagrams*)

OVER most of the British Isles the presence of isolated farms and cottages scattered over the countryside is such a common feature of the landscape, that it is often assumed to be the normal form of rural settlement, the necessary complement, so to speak, of the nucleated village. But in many parts of Europe such dispersed dwellings are quite exceptional, and all the houses are to be found grouped into compact villages. These and other differences in the form of rural settlement have attracted much attention of recent years, especially among Continental writers. It was at first suggested that "Ethnic" factors should be invoked to explain some of the variations in settlement pattern, and attempts were made to correlate the areas characterised by dispersed dwellings with regions formerly occupied by the Celts, and to associate agglomerated settlements with "Germanic" colonisation.¹ Now it is realised that many factors are involved, and the mode of life of the people, the rural economy, the historical background, and especially the geographical setting, must all be considered. In western

* For all references see list at end of article.

Europe, for instance, agglomerated settlement is usually to be found in regions where an open field system of arable farming was in existence until comparatively recently; isolated houses are often to be encountered in areas where the good land occurs only in small patches, or where cattle-rearing is more important than cereal-growing, where, in fact, an open field system of co-operative arable agriculture had little basis for development. Again, in districts where the underlying rock is very permeable, the houses may be concentrated around deep wells or springs. Consequently, in attempting to understand forms of settlement, the nature of climate, relief, soils and water supply becomes of vital importance when studied in relation to the rural economy and the historical development.

In the following pages an attempt will be made to indicate some of the outstanding settlement types which are to be found in Spain, and to consider briefly whether the generalisations which have been made for central and north-western Europe are valid for this south-western peninsula. As might be expected in a land where there are such marked contrasts between the larger natural regions, wide variations occur in the forms of settlement, some of which are rather striking in character. The data for this study come largely from the topographic map of Spain on the scale of 1 : 50,000, which is as yet far from being complete; the numbers of the sheets from which examples have been taken will be stated for reference purposes whenever it seems necessary. To introduce some degree of unity, the maps will be discussed in conjunction with a cartogram (Fig. 1), which calls for a preliminary explanation.

Statistics are available which give by provinces for the whole of Spain the number of people living in groupings of more than, and less than, 100 buildings ("aglomerada en entidades de mas (menos) de 100 edificios o albergues").² The average number of people for each building is 4. In considering these figures, it must be borne in mind that, from the point of view of the student of settlement types, there is a great difference between isolated farms and villages of 400 inhabitants, both of which are included within the same category in this classification. Any calculations which may be made, can have little value for purposes of comparison with regions outside Spain, as nothing in the nature of a true coefficient of dispersion is possible. Furthermore, it is not easy to determine exactly what is meant by a grouping of 100 buildings, as settlements may be very loosely agglomerated, and the distinction between isolated farms and outlying houses on the fringe of a village may be arbitrary.

The figures show that 25 per cent. of the total population of Spain dwell in "groupings of less than 100 buildings"; in the individual provinces the extremes are 89 per cent. in Lugo and 4 per cent. in Madrid, Toledo and Valladolid. In only five of the forty-eight provinces does the percentage rise above 50, and in



Fig. 1. Cartogram showing percentage of population of Spain dwelling in settlement units of less than 100 ha.

fifteen it falls below 10. In an almost purely agricultural country like Spain these figures are extraordinarily low, for there are few large industrial centres to swell the total of people living in nucleated settlements, except in Catalonia. In the cartogram (Fig. 1) the provinces have been classified according to the percentage of the population dwelling in agglomerations of less than 100 buildings; a further distinction has been made between provinces with more than, and less than, 110 persons to the square mile, though by making this division it is not intended to suggest that there is a connection between density of population and degree of agglomeration. Regional variations within the country are at once evident, and there is clear illustration of the fact that, over much of Spain, the population is sparse, and yet for the most part collected into villages of at least three or four hundred inhabitants.

Perhaps the most striking feature is the high percentage for the provinces forming Galicia and the Asturias (Lugo 89 per cent., Pontevedra 78 per cent., Coruña 75 per cent., Oviedo 70 per cent. and Orense 66 per cent.). Unfortunately, very few sheets of the topographic map of Spain in this area have as yet been published, but there is one available for the district of Betanzos, in the province of Coruña (Sheet 45). This tract of country lies around the heads of the Rías of Betanzos and Burgo. It is a much dissected plateau, the higher parts of which rise to over 1000 feet, with broad valleys along the larger rivers; the upper slopes are mainly rough pasture, scrub and woodland. As the tracing in Fig. 2 shows, the houses are scattered widely over the countryside, and except for Betanzos itself, hamlets and isolated houses are the characteristic form of settlement. Quite a large number of the buildings are situated along the main roads, others occur along the sides of the valleys, either singly or in small "open" clusters, but not in true nucleated villages. This constitutes a type of settlement which is unusual in Spain, as the cartogram clearly indicates. It is impossible to generalise from such a small area as that covered by the single sheet of the 50,000 map, but this dispersion is in fact typical of much of Galicia.³

The country in the north-western region of the Iberian Peninsula is for the most part built up of very old crystalline rocks, and now forms a dissected upland. Except in a few favoured localities, the arable and good pasture land is rarely continuous over wide areas, but occurs in patches along the valleys, and it would appear that the houses are scattered over the countryside on or near those irregular stretches of good land. Then, too, the precipitation in the north-west is much higher and more evenly distributed seasonally than in many parts of the Peninsula. There are about 150 rainy days each year on the average, as compared with approximately 90 over much of the Meseta, and less than 60 in parts of the south-east⁴; also, no period of drought occurs, as a rule, in the summer. With an ample supply of water available throughout

the year, there is to be found no grouping of the houses around deep wells or springs, as is often to be observed in regions where water is not easily obtained. Again, the high precipitation makes possible much better pastures than those which are to be met with over most of Spain, and, in marked contrast to the Meseta and the Mediterranean districts, milch cattle are important in the rural economy. It is most inconvenient to move herds of cows long distances twice a day for milking, and in many regions such as

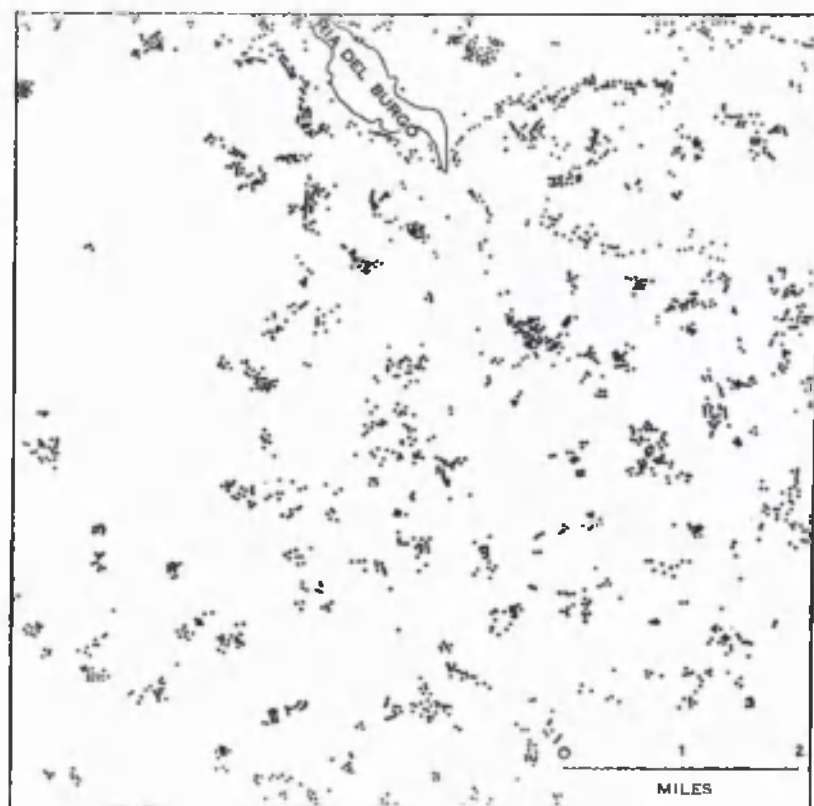


FIG. 2. Dispersed buildings in Coruna. (From Sheet 45, Betanzos.)

this, where dairying is an essential part of farm life, the houses are to be found scattered among the pastures, not agglomerated into villages. Finally, and in part because of the above conditions, the land holdings in Galicia are very small, and in many cases each small patch of land, held and worked by the same man, is provided with an isolated farm-house.

The cartogram (Fig. 1) indicates that the region of dispersed settlement extends beyond Galicia, along the coastal districts of northern Spain and into the Cantabrians, though the percentages

for the provinces covering this area are not quite so high as in the north-west. The physical conditions too, from the present point of view, are comparable with those of Galicia, and are in marked contrast to those presented by the Meseta to the south. No topographic maps have been published save two of the district around and to the west of Reinosa in the Cantabrians (Sheets 82-3): these show that the settlements are dispersed to a considerable degree.

The Meseta appears in the cartogram (Fig. 1) as a region characterised by a highly agglomerated form of settlement; the percentage for most of the provinces is below 10, and nowhere rises above 30. In the north-west the contrast with Galicia is very marked, for Valladolid with 4 per cent. is the extreme for the whole country, while Salamanca has 8 per cent. and Zamora 9 per cent. In León the percentage rises to 37, but the province includes in the north and west a tract of mountainous country which belongs to the Galician-Cantabrian region, not to the Meseta, and the same is true to some extent of the province of Palencia with 18 per cent. An examination of the available topographic maps shows that the settlements in the north of Palencia are in fact much more dispersed than those in the south; the change between the two forms takes place rather abruptly along the southern slopes of the mountains.

The physical setting in this central "Meseta" region is very different from that of the north-west; in place of the irregular relief of the Galician upland and of the Cantabrians, there are wide plateau surfaces cut by comparatively shallow though often steep-sided erosion valleys. Over much of the area, the old rocks forming the basic platform of the Meseta are covered with horizontally bedded Tertiaries; limestones occur in many places, and give rise to dry plateaux, though spring lines are to be found along the sides of many of the valleys. Climatic conditions, too, are very different. The number of rain days varies between 60 and 100, and the rainfall is much lower than in Galicia; whereas Coruña has 30 inches and Santiago 65 inches per annum, León has but 14 inches, Salamanca 11 inches, Madrid 17 inches, and Albacete in the south-east has 15 inches.⁶ The summers also are much warmer, and evaporation much more rapid; at Madrid, for instance, the maximum monthly temperature is about 12° F. higher than at Coruña, though there is a difference of altitude of over 2000 feet. Maize and rye, which are the important cereals grown in Galicia, are replaced by wheat, and because of the scarcity of good pasture, cattle are relatively few in number as compared with sheep. In view of the fact that the arable land often occurs in extensive stretches, and that cattle-rearing is not important, dispersed settlement does not offer the same advantages as in the north-west.

A number of sheets of the topographic map have been published

for León and Old and New Castile, though there are wide areas still uncovered. These sheets indicate that the characteristic type of settlement over most of the Meseta is one in which the houses are gathered into compact villages, with scarcely a building between one centre and the next. The agglomerations show no common plan or lay-out of the streets, and vary remarkably in size. There appears to be no direct relation between the density of the popula-

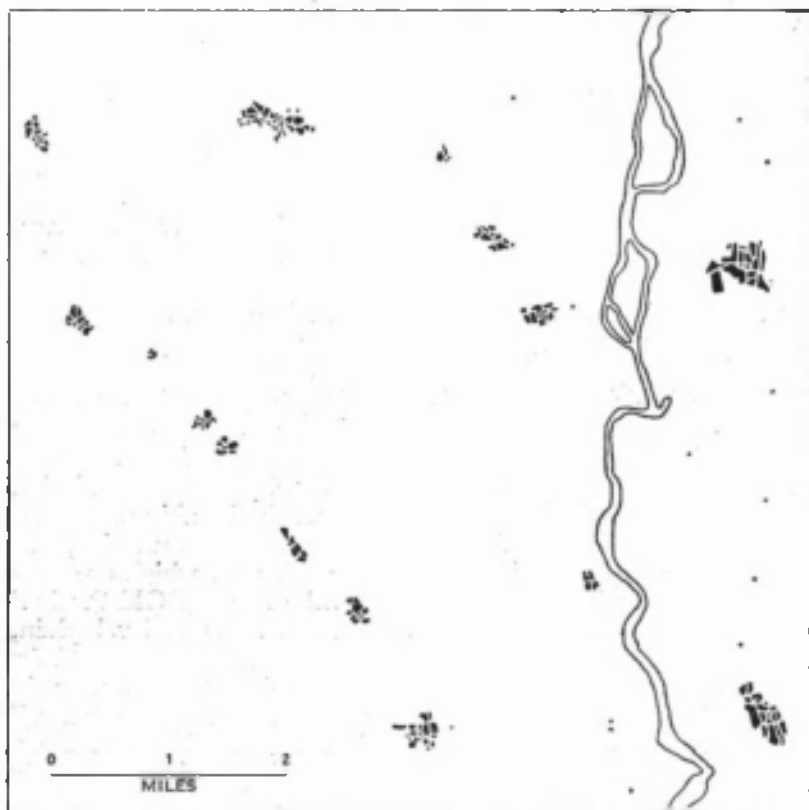


FIG. 3. Settlement type in León along Rio Esla. (From Sheet 194, Santa María del Páramo.)

tion and the magnitude of the villages within the sub-regions of the Meseta, for some sparsely peopled districts have very large nucleations, while others, with perhaps more inhabitants per square mile, have much smaller but more numerous groupings.

In the north-west of the Meseta, between the Douro and the lower slopes of the Cantabrians, a form of settlement obtains in which the houses are collected into quite small compact villages; this type is illustrated in Fig. 3. It is a rather striking characteristic of these settlements that they are often located along definite lines;

avoiding the higher and more exposed levels, the *páramos*, these strings of villages occur along intermittent water courses, or parallel to the banks of a river (e.g. Sheet 194), or along the foot of the Cantabrians where they rise from the plateau (e.g. Sheet 162). Sometimes, too, the villages are situated along the outcrop of some water-bearing stratum on the steep side of an erosion valley.⁶ In some districts another common location is along the edge of the flood plains of the larger rivers. Often parts of these valley floors have been transformed into *huertas*, which are intensively cultivated and irrigated gardens, producing vegetables and fruit. Huertaland forms extensive strips along sections of the Tagus valley (Sheet 583), but more frequently it occurs as isolated patches, as for instance along the Pisuerga. The "buildings pattern" of these villages with huertaland attached is not noticeably different from that of the more common type of village around, save that a small number of buildings are sometimes to be seen scattered amongst the *huertas*, in contrast to the almost empty spaces between the settlements away from the rivers.

In the region around and to the north of Manzanares (e.g. Sheets 631, 659, 687, 713, 740, 760), there appears a type of settlement which may be said to lie almost at the opposite extreme from that of Galicia. The type is not strictly limited to New Castile, as a somewhat similar form occurs in several more northerly districts of the Meseta, but the fullest development is to be found on the plateaux of La Mancha. The density of the population in this part of the Peninsula is low, and yet the inhabitants do not dwell in small villages, thinly scattered over the countryside, but in very large agglomerations, almost small towns, which are considerably greater than those of León and the north of Old Castile.⁷ Between each grouping there are great expanses of level plain, perhaps ten or twenty miles wide, where buildings are few and far apart. From these large compact centres, minor roads run out in all directions to the fields around, giving a curious "star-like" appearance on a map. Yet the main roads are few, and direct communication between neighbouring agglomerations seems in some cases a secondary matter. An example of this type of settlement is shown in Fig. 4. From the topographic map, it is evident that the wide spaces between these overgrown villages are not to be explained by discontinuity in the arable land, for on the contrary it stretches on for long distances with scarcely a break. The areas of the *ayuntamientos*, or districts surrounding each major settlement, are much greater than those of León and Old Castile, or of Galicia, and the agricultural labourers must often travel several miles to work in the outlying fields. Nor is there any modern industrial development to account for the size of the villages; the people are dependent upon wheat-growing, sheep-rearing, and upon the cultivation of the vineyards and olive groves.

The large area of cultivated land and the low population

density seems a paradox, but it is to be remembered that the total amount of rainfall is small, the relative humidity is extraordinarily low, and that dry farming methods must be used to conserve the moisture in the soil. Until quite recently a crop of wheat could be obtained but once in three, four, or even five years from the same piece of land, which in the interval had to lie fallow; nor was the yield of grain per acre high. Consequently each individual settle-

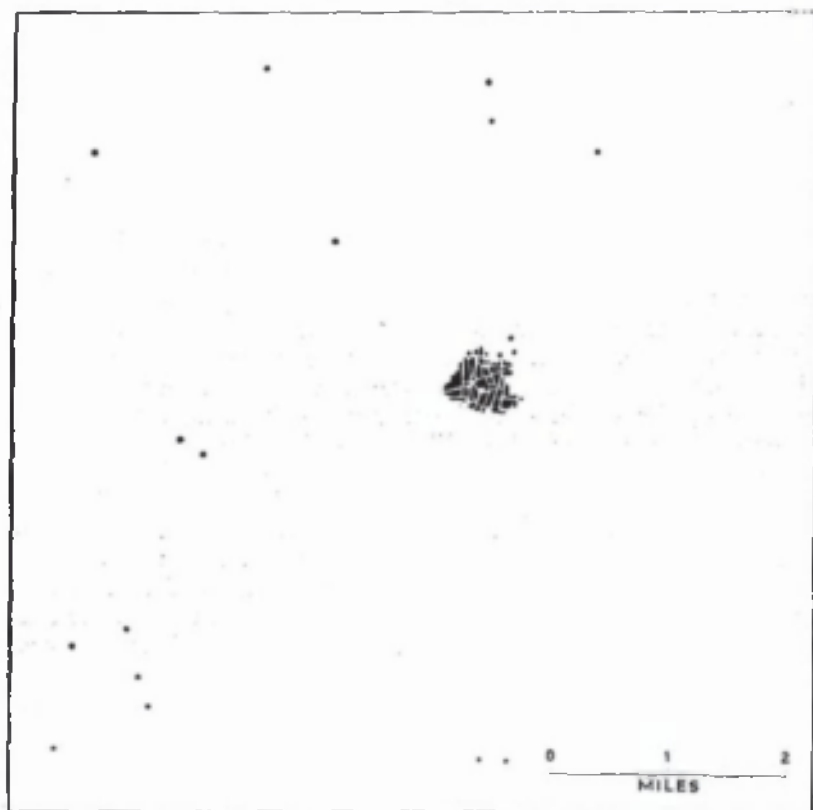


FIG. 4. Settlement type in La Mancha showing the village of La Solana.
(From Sheet 786, Manzanares, Ciudad Real.)

ment required a large area of arable land to make it self-supporting. At the present time new methods of cultivation are being slowly adopted, but "house patterns" are not altered in a decade or so.

In commenting on the peculiar characteristics of this type of settlement, certain aspects of the historical geography of the region should be considered. The southern parts of the Meseta were under Moorish rule until the twelfth century, and were for long a battleground between Islam and Christendom. After the Reconquest, when settled conditions were finally established, there was a great

development of sheep-rearing over large areas of Spain, especially in the south of the Meseta, where conditions are rather too arid to make the land very attractive to the agriculturalist ; this pastoral industry was fostered in every way by the Christian kings, who derived a great part of their revenue from taxes on sheep. Many of the flocks made long seasonal journeys, moving from the basins and lower plateaux to the high mountains during the scorching summer. These migratory sheep followed special wide grassy roads called *canadas*, which traversed large sections of central and southern Spain. Remnants of these ways are still to be seen in many places, and are frequently shown on the topographic map, though now they have gone out of use. In the later Middle Ages the owners of the migratory flocks formed themselves into associations which, after the unification of Spain, were combined into a national body called the *Mesta*. Supported in every way by the monarchy, this organisation became extraordinarily powerful, and under its influence strict laws were framed to prevent encroachment upon the common pasture land. The *Mesta* was at the height of its power in the fifteenth century, and thereafter declined, but although its influence steadily weakened, there was no great agricultural expansion, as might have been expected as the old constraining influence diminished, for Spain had fallen upon evil days, and general stagnation affected agriculture like everything else.⁸

In arid La Mancha there would be small possibility of new, and consequently small settlements coming into being during the period of *Mesta* dominance. Rather would any increase of population which might take place result in the enlargement of such old-established centres as had survived the troubles of the Moorish wars ; here mutual protection and support against the attacks and lawsuits of the *Mesta* would be possible in cases of dispute over the pastures. The effects of the conflicting interests of the shepherds and the agriculturalists may be recognised as a partial explanation of the great size and relative sparsity of settlements in the region around Manzanares ; but other factors must be taken into account, especially that of land tenure, which is of fundamental importance in any study of rural habitat,⁹ and nowhere more so than in Spain.¹⁰

Over much of southern Spain the land holdings are very large, and many of the inhabitants work as hired labourers on great estates. It is generally recognised that large holdings are frequently accompanied by closely agglomerated settlements, as landlords prefer to have their labourers living together, and prevent the spread of isolated dwellings which would tend to form starting-points for enclosure and encroachment upon the extensively farmed land of the demesne. Andalusia has often been quoted as a region of large holdings, and here again, as around Manzanares, the villages are large, and scattered farms are almost absent (e.g. Sheets 920, 942, 962-3, 985-6).

Returning once more to Fig. 1, the cartogram shows that the

percentages for most of the provinces of south-east Spain are somewhat higher than in the central districts. The greater degree of dispersion within this complex region arises from a number of causes, among which must be counted the *irregular relief* of the Betic Cordillera, which extends into most of the provinces concerned. But this factor can be only of secondary importance, for the percentage in *Granada* is considerably lower than in Murcia where the relief is much less rugged. There is also to be considered, however, the coastal lowlands which, though narrow, have very numerous settlements and must therefore play a dominant rôle in determining the percentages for the provinces bordering the Mediterranean. The physical conditions within this narrow coastal strip in many respects stand in sharp contrast to those of the Meseta. Although the climate is dry (Murcia 14 inches) and the summers hot, the winters are very mild, and whereas Madrid has an average January temperature of 41° F. and an average lower yearly extreme of 19° F., the corresponding figures for Murcia are 51° and 29°. This means that, although the growing season is very long, the agriculturalist must be dependent upon irrigation water if he is to utilise the possibilities of the region to the full. The presence of the coastal plain, with the perennial streams from the mountains, which, unlike the rivers of the interior, do not flow in deeply incised valleys, has made possible the development of great stretches of *huertaland*, from which extraordinarily high yields are obtained. Intense and skilful cultivation is a necessity, and since the labour costs are so great as compared with capital expenditure, large-scale capitalist enterprises are not usual, and the land holdings are in most cases quite small.

Only two sheets of the topographic map for this Mediterranean coastal region are as yet published: one of the district around and to the south of the town of Murcia, and the other of the area immediately to the south-east, showing a narrow strip of land along the Mar Menor (Sheets 934, 956). Three types of country are included: a narrow coastal lowland sloping from the Mar Menor up to the second zone, a much dissected sierra belt, which in turn gives place abruptly to the valley of the Segura, along which there is a broad strip of alluvial land. On the arable land of the coastal belt the buildings are for the most part grouped into compact villages, though there are a number of houses scattered among the fields and olive groves. The adjacent sierra country, with its steep slopes, provides little besides very poor pasture; the density of population is low, and such buildings as exist are dispersed at wide intervals. In very sharp contrast is the level floor of the Segura valley (see Fig. 5), which is a broad strip of *huertaland*, with olive groves, sometimes on the alluvium but more often on the lowest slopes of the valley. The density of population is high, and quite a number of nucleated settlements are shown even in the small area covered by the sheet of the topographic map.

Murcia itself, and several small villages near-by, stand in the midst of the *huertas*, but most of the agglomerations are strung along the edge of the alluvium at short intervals. Of outstanding importance from the present point of view, however, is the immense number of buildings which are scattered over the *huertaland*, usually at close intervals. Many of them are situated along the roads, so that there is something in the nature of a ribbon development along the

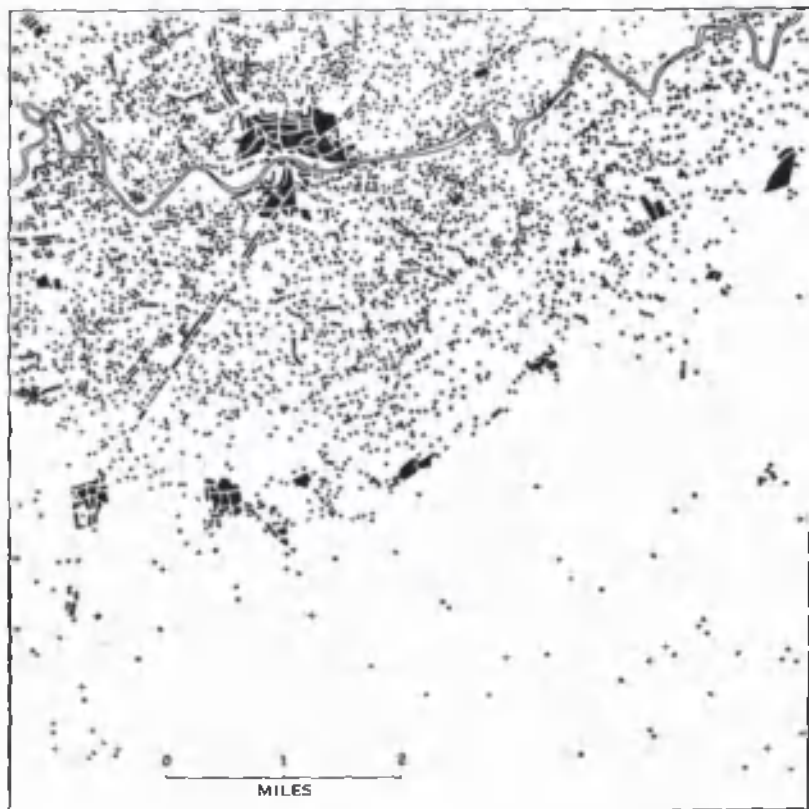


FIG. 5. Distribution of buildings in *huertaland* along the Rio Segura around Murcia, and in the hills to the south. (From Sheet 934, Murcia.)

routes leading out of the town of Murcia. This dispersion means that the people must often live on, or near to, the small patches of land which they themselves own and cultivate.

There remains to be considered north-east Spain, which would appear from the cartogram (Fig. 1) to stand apart from the central regions, and, as regards the proportion of agglomerated settlements, to form a more or less homogeneous province. Although the average figure for the area as a whole is not so low as for the Meseta, the difference is slight, and in most of the provinces the

percentage is less than 20. On the topographic map, the agglomerated village is the characteristic form of settlement, but the number of scattered dwellings is, in places, noticeably higher than in the Castiles, even in the Ebro Depression where the physical conditions are not very different from those of the Meseta; this dispersion is to be seen very clearly in the area around Saragossa (Sheets 354-5, 383-4), and Lerida (Sheet 388), where it is not confined to the huertaland. Perhaps the rather different historical background and a dissimilar form of land tenure are to be held responsible, but on the latter point it has not been possible to obtain exact information. Furthermore, there is included within this region of north-east Spain a large area of upland country, and an association between rugged relief and dispersed dwellings has already been noted elsewhere in Spain. Unfortunately, any regional variation between the hills and plains is masked in the cartogram, since many of the provinces extend across two or more of the natural divisions of the north-east.

The topographic map shows that the dispersion is more pronounced in the Catalan Chains which close in the Ebro Depression on the east (e.g. Sheet 444). But the pattern of the settlement in the four Catalan provinces has been profoundly influenced by the economic development of the region, which has proceeded along very different lines from that of the rest of Spain. While the country as a whole has remained predominantly agricultural, Catalonia has seen the growth of modern large-scale industry during the last century, and plays a most important part in the national economy through its textile manufactures, metallurgical works and associated industries.¹¹ Barcelona is by far the largest centre and acts as the focus for the whole region, but the industrial area extends along the coastal plain adjacent to the city and into the Catalan Massif behind. The water power which is available, is utilised to some extent, and many factories are situated along the courses of the rivers, but hydro-electricity from the Pyrenees and imported coal are the chief sources of power. The presence of the industrial population has also stimulated agriculture. Consequently, the density of population both in the coastal districts and in the uplands is relatively high. Most of the people live in agglomerated settlements, some of which, like Tarrasa, Sabadell, Manresa, and of course Barcelona, are of considerable size; in addition, there are a number of small towns, and, high up the valleys, the *colonias*, clusters of workmen's houses grouped around a factory. The agglomeration associated with this industrialism more than counterbalances such dispersion as occurs in the Catalan Chains, and in the cartogram, the percentage for this region is no higher than elsewhere in north-east Spain.

To analyse and interpret all the various types of settlement found within the Iberian Peninsula is far too long an undertaking for a brief essay, but from the foregoing survey it is hoped that

some indication will have been given of the relation between the settlement form, the physical conditions and the historical background in some of the diverse regions of Spain.

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THE NATURAL VEGETATION OF SCOTLAND : ITS CHARACTER AND DEVELOPMENT

By H. FAIRHURST, M.A.

FOR upwards of forty centuries the vegetation of Scotland has been continuously modified, purposely and indirectly, by human agency, and at present it is artificial to a degree that is not always realised. So profound have been these changes that it is difficult to form an idea of the character of the vegetation as it was under purely natural conditions. In the following survey, the results of research in a number of fields have been considered, and an attempt has been made to correlate and interpret the available data.

THE HABITAT : CLIMATE AND SOIL FACTORS

One of the major difficulties in making the reconstruction is to find firm starting ground. Rather than to rely upon statements made by Classical authors concerning the "Caledonian Forest," it would seem preferable to begin with an examination of some aspects of the present-day vegetation which are relevant to the study of the "natural vegetation." In the first place, Scotland lies well to the south of the northern limit of tree growth in Europe, and it is very doubtful whether any areas except the highest summits well above 2000 feet experience temperature conditions too low for trees to flourish. At first sight, this appears to confirm the statements made in some of our history-books, now considered to have been superseded, to the effect that the Romans found the country clothed to the tops of all but the highest hills with a dense "Caledonian Forest." It is now known, however, that even districts near sea-level may be treeless from purely natural causes and have been so since the remote prehistoric period. This absence of woodland can be explained in a number of ways.

Strong winds are responsible to a considerable extent for the absence of trees at high levels, and for their relative scarcity and stunted and bent condition in exposed coastal districts. The danger

of uprooting is obvious, but more important are the facts that transpiration is very greatly increased and young shoots are easily damaged, so that low-growing plants are characteristic of areas with very windy conditions. It is generally agreed that degree of exposure to strong winds, rather than low temperature, is the determining climatic factor as regards the altitudinal limit of tree growth in Scotland. This limit is of major significance in the general problem under discussion.

In the "Botanical Survey of Scotland" ¹ it is stated that in the Edinburgh district deciduous trees appear throughout the cultivated area but do not grow above 800 or 900 feet on the northern slopes of the Pentlands or above about 900 or 1000 feet on the southern. Coniferous trees attain 1250 feet, and sometimes 1500 feet, though at this elevation they are stunted. In Forfar and Fife, much the same limits are to be observed, save that in the Grampians, birch (*Betula*) and rowan (*Pyrus Aucuparia*) struggle up to 1750 feet. In northern Perthshire the upper limit is still higher and a few trees are to be encountered at elevations of over 2000 feet, while the Scots pine (*Pinus sylvestris*) ascends to 1750 feet. This quite clearly reflects the importance of exposure, for the Grampians provide sheltered places at much higher altitudes than the lower and more isolated Pentlands and hills of Fife, which are also subject to sea winds. The same factor produces a lower tree limit in the North and West Highlands, where growth seems to cease at 1400 or 1500 feet in many parts, and at a still lower altitude in the extreme north-west. From these observations it has been deduced that the extreme limit of tree growth in Scotland is about 2000 feet; but it must be pointed out that in the One-inch Ordnance Survey sheets covering the Grampians (Sheets 42, 43 and 48 of the Popular Edition), a number of instances occur in which plantations, not merely scattered birches along watercourses, reach a height of well over 2000 feet; and in one case, in Glen Lyon, a plantation is marked at 2400 feet, though this particular wood seems to have been levelled by gales in 1927.

Wind force appears to be equally important in restricting tree growth in some coastal districts. It is true that trees in a flourishing condition are sometimes to be seen at the edge of the beach, but invariably such woodlands are on sheltered inlets, or are protected by rising ground from the prevailing winds, as, for instance, those on the east coast of Kintyre. In places exposed to the full force of gales straight from the sea, the trees, if they occur at all, are low and stunted, while the crowns are planed off by the action of the wind, the "plane," as it were, rising gradually from the shore. The west coast suffers more in this respect than the east, and it is often maintained that the treeless aspect of the Hebrides, Shetlands, and some parts of the mainland of the west coast, is due entirely to the strong westerly winds. The general truth of this is apparent from the fact that single trees appear in sheltered hollows in all

but the bleakest areas, but other factors, such as the rapidity of peat formation (to be considered later), must also be taken into account.

There is no doubt that wind force was equally important in the past in restricting the distribution of "natural" woodland. It is quite impossible, however, to estimate where or in what areal degree: local conditions vary so greatly, and other factors were also at work; furthermore, when the natural forest had its greatest extent, struggling trees on the margins created a shelter-belt for adjacent trees which are now themselves marginal. These conditions no longer obtaining, the behaviour of an isolated specimen near the coast or at a high elevation cannot be taken without the greatest reserve as an indication of the true "natural" environment. With regard to this subject in general, it is necessary to protest against a distinction sometimes made between "woodlands" and "forest-free areas," as though the two could readily be separated by a line drawn on a map. The transition where one merged into the other must very often have been indistinct: with increasing exposure on ascending a mountain or approaching a windward coast, the trees would first disappear from the more exposed places and then become restricted to sheltered hollows or deep valleys.

Soil conditions are another factor limiting the development of woodlands. The screes and boulders at the summits of the higher mountains are obviously an unsuitable habitat, quite apart from climatic difficulties, and morasses again offer an extreme example of an unfavourable terrain; though in both cases the aggregate area of Scotland which is affected is not great. Other unfavourable soil conditions exist in the form of shifting sand, at Glenluce, for example, in Galloway, Tents Muir in Fife, or the Culbin Sands on the Moray coast, where special precautions have to be adopted to allow the establishment of plantations. In addition there are to be considered the shallow soils, which are so common in a rugged country such as Scotland and which are inimical to tree growth because of the difficulty of root development: shallow-rooted trees in exposed positions are soon blown down. In districts where high winds are common, soil depth may be the decisive factor in prohibiting the development of woodland, but further than this it is impossible to go; any visitor to the Highlands will have marvelled at trees growing on very thin and rocky soils, and a mountain climber can tell of others perched in seemingly impossible positions on narrow ledges or in the clefts of boulders. Patches of deeper soil frequently occur on slopes which at first sight appear almost precipitous. With regard to the "natural" vegetation, it is to be borne in mind that the indiscriminate felling of woodlands in the past has resulted in erosion and has extended the areas which have a thin covering of soil.

The constitution of the soil is of importance in relation both to possibilities of tree growth and to the nature of the vegetation

generally. It is controlled in the first place by the nature of the parent material, that is, by the rocks or glacial and fluvio-glacial deposits. One of the outstanding characteristics of Scottish soils is a marked deficiency in lime, as calcareous rocks occur only in restricted localities, and plant associations typically developed on soils with a high lime content, such as ash wood, for instance, are comparatively unimportant. On the prevalent acid soils, peat formation, which will be discussed later, is a widespread phenomenon, and has often led to the complete exclusion of woodlands.

With the relatively high rainfall and equable temperature conditions of this country, there is a strong tendency for soils to be leached; though partial redeposition of the soluble mineral salts may take place in the lower horizons, accompanied in some cases by the formation of hard pan. In coarse gravelly and sandy soils, especially in the wetter districts, this process has been rapid, and leached or "podzolised" soils are common; but in the more compact soils the process has been slower and may scarcely be traceable in a heavy clay. The leaching of the upper or A horizon is rarely if ever so marked or so deep as in itself to preclude tree growth; but its reaction is unfavourable and its influence is likely to be reflected in the nature of the plant cover. It has been noticed that the establishment of plantations on soils which have been deeply leached may offer considerable difficulty.² The formation of a hard pan in the lower or B horizon is inimical to tree growth, as it hinders the roots from penetrating beyond the leached layers. On leached soils with pan development the present vegetation is of a moorland type. It would be most unwise, however, to conclude that this treeless aspect is "natural" in the sense that it has been characteristic of these soils since the remote prehistoric period. The true "podzol" is developed in areas of coniferous forest, and again, the destruction of the forest cover by human agency must itself have reacted upon the character of the soil. Yet this tendency towards leaching in the upper horizon must be reckoned as one factor amongst others restricting the extension of "natural" woodlands.

Soil drainage is another factor of importance. Too rapid drainage in areas of sand-dunes or scree-like material is adverse to plant colonisation, and even when conditions are much less extreme, as over sandy or gravelly soils, the natural woodlands would appear to be of a more open type than on the moister soils. In Scotland, however, with the high rainfall, cool summers, and dislocation of the drainage produced by the Ice Age, an excess of moisture is far more common, and soils where the water-table is at or near the surface ("glei" type) frequently occur. These conditions again affect the nature of the plant cover, and may react unfavourably upon tree growth. When the waterlogging is more or less permanent and the water is relatively stagnant, aeration is impossible, and the difficulties may be so great that even with

modern methods of forestry, tree growth may be slow and irregular. It seems safe to assume that natural woodlands would not develop under these circumstances, which cannot have been uncommon when the ice sheets left this country.

Closely linked with soil drainage is the formation of peat, which takes place under cool climatic conditions when the drainage is poor, and results from the incomplete decay and gradual accumulation of plant remains. Peat bogs, or mosses, as the writer prefers to call them, considered from a genetic point of view, are usually classified in three main types in accordance with the conditions resulting in soil saturation. "Topogenous bogs depend on topographical features, *e.g.* filled-up ancient lakes; ombrogenous bogs are due to surface precipitation ('high-moors'); soligenous bogs are produced either by surface water flowing into the bog area from surrounding country, or by ground water rising up to the surface layers of the soil."³ A simpler classification into "climatic" and "basin" bogs has also been suggested.⁴ This accumulation of raw humus occurs sometimes as a layer only a few inches thick on top of the soil, as in some heaths, and sometimes under trees, where it is referred to as "forest peat"; but in favourable localities, such as the Moor of Rannoch, a mantle many feet thick may be found.

The presence of peat adversely affects tree growth in a number of ways: the waterlogged condition of the soil prevents root development; many species of trees do not flourish on such acid soils; and the raw humus itself does not offer an adequate food supply for most species, while it may yet be thick enough to cut off the roots from the minerals in the soil below. Conditions are particularly difficult for seedlings. It should be noted, however, that some conifers, including Scots pine, can grow on peat if it is well drained. The natural vegetation of these mosses, which are very extensive taken in the aggregate, consists of low-growing heaths, grasses and sphagnum. There is no doubt that this type of vegetation long predates the deforestation of the country by human agency, yet tree stumps are found at the base of many of the peat deposits. It would appear that trees once flourished there, but that raw humus gradually accumulated under the trees and in the end led to waterlogging, a dearth of seedlings, and finally to the destruction of the woodlands.

Any attempt to map the distribution of prehistoric woodlands is at present doomed to failure at the outset. Even were a soil map of the necessary type available—which it is not—it is quite impossible to estimate the influence of such factors as the exposure to winds, or the depth of soil, in the prehistoric period. Yet it is evident, from what has been said of the reaction of tree growth to present controls, that the country was not clothed to the tops of the highest mountains with forest. We know, that is to say, that at least the deep peat deposits, the very marshy or sandy areas, the thin soils in exposed places, and the very windy coastal

areas and hill-tops did not normally support woodlands. The aggregate area is certainly a not inconsiderable percentage of the whole, but to go further would be guesswork pure and simple.

NATURAL PLANT ASSOCIATIONS

It is theoretically possible to postulate for each species an optimum environment as regards soil and climate, but it would be an error to suppose that we can reconstruct the original distribution of any particular plant by locating the areas where the habitat closely approaches the ideal. Many kinds of plants show a considerable range of adaptation, and allowance must also be made for the factor of competition, whereby some species may be excluded by others of more vigorous habit which deprive them of light and adversely affect soil conditions. If, however, it can be discovered from observation which species are found together in similar habitats under more or less natural conditions, some useful data concerning the character of the "natural" vegetation will be available. The list below represents a summary of what has so far been discovered by examining these "natural" associations.

In considering these groups as indicative of past conditions a number of assumptions must be borne in mind. In the first place, we are assuming that in similar habitats the same species normally played a dominant rôle (with the implication that seeds travelled long distances⁵), that the vegetation had had time to reach a mature stage of development, and that chance variations, such as undoubtedly take place from one locality to another, were not so great as to overshadow generalisations. Secondly we must eliminate from the reconstructed "natural" vegetation all those plants which may at present play a dominant rôle but which have been introduced by human agency; the larch (*Larix*), for instance, spruce (*Picea*), fir (*Abies*), and beech (*Fagus*) amongst the trees, and, of course, all the cultivated crops and their associated weeds. It is also to be borne in mind that the classification adopted is of necessity broad. In such a country as Scotland where relief, climate and soils vary so much even within small districts, the associations in many cases cannot be sharply differentiated: "damp oakwoods" often grade into "dry oakwoods," and the latter into "oak-birch-heath," which, as its name implies, is of a heterogeneous character. Space permits only a statement of the dominant forms within these groups; and it has not been possible to go beyond the broadest generalisations concerning the probable distribution of these associations under natural conditions, partly because of the difficulties indicated in an earlier section, partly because the map showing the nature of the present-day flora has never been completed, and partly because it would be unjustifiable to speak with any approach to finality when so many variables enter into consideration.⁶

I. Woodland Associations

(a) Alder-Willow Association (*Alnus* and varieties of willow (*Salix*) dominant).

This type of vegetation occurs especially on the edges of lakes and rivers on saturated soils where the water is not stagnant and where acid peat has not formed. On the slightly drier areas, oak (*Quercus pedunculata*) and ash (*Fraxinus*) are found, and under very wet conditions and in shallow water, reed swamp occurs. This association must have been common enough in this country in the past, though only in narrow strips along the lakes and rivers. Acid peat is characteristic of many badly drained areas.

(b) Damp Oakwood (*Quercus pedunculata* dominant).

These woodlands are found in lowland areas of heavy clays, where the soils are usually wet, and they grade into the alder-willow association. The area within Scotland suited to such forest is restricted, even within the Central Lowlands; low-lying districts occupy but a relatively small part of the country, and of these, some are covered with peat, as in Flanders Moss along the Forth, while others, though mantled with glacial drift, are more sandy and gravelly than are, for instance, the clays of the Midlands or south-eastern England.

(c) Dry Oakwood (*Quercus sessiliflora* dominant).

This association develops on drier areas than the preceding form, and is found typically on well-drained slopes and on the more sandy and gravelly soils. It occurs within relatively lowland districts and rarely ascends to altitudes near the 1000 feet level; even at elevations of over 500 feet there is often a considerable admixture of conifers, which are better adapted to withstand the more rigorous conditions, and which finally become dominant. The undergrowth does not seem to be so dense as in the damp oakwood association. Large areas within the Central Lowlands provide a suitable habitat, as well as the lower slopes of the valleys in the Southern Uplands and the Highland glens. Under natural conditions, much local variation must have occurred within the woodlands of this general type; on the deeper, wetter soils, *Quercus pedunculata* and hybrid forms would appear, while in localities with thin, poor, sandy soils, birch (*Betula*) would be common in woodlands of a more open nature.

(d) Pinewood (*Pinus sylvestris* dominant).

Scots pine thrives under similar conditions to *Quercus sessiliflora*, but whereas the oak gradually becomes restricted to the more favoured localities at higher elevations, disappearing usually before elevations of 1000 feet, the pine has a wider range and can, moreover, flourish on well-drained peat. On the better soils, however, the oaks seem able to exclude the pines. When growing under

more or less natural conditions at the present time, as in the Forest of Rothiemurchus, the trees are often widely spaced, intermixed with some oaks and birches, and with a ground vegetation of ling (*Calluna vulgaris*). The distribution of pinewoods will be discussed in a later section, but the evidence goes to show that *Pinus sylvestris* was restricted to the higher elevations of the Grampians by the later prehistoric period.

(e) *Birchwood* (*Betula* dominant).

Birchwood often occurs as the dominant association on thin, poor soils, especially where there is a tendency to form hard pan, and where pine and oak cannot thrive; localities of this nature are a common feature in many parts of Scotland within the altitudinal limits of oak and pinewoods. But birchwood is also characteristic of the higher hill slopes, above the limits reached by almost all other trees. Formerly, it must have had a wide extension in regions above about 800 to 1000 feet, and even now single trees may be encountered in sheltered places up to elevations of 2000 feet in the Grampians.

(f) *Oak-Birch-Pine-Heath Association* (*Quercus sessiliflora*, *Betula*, *Pinus sylvestris* and *Calluna vulgaris* co-dominants).

This is a transitional type of vegetation and is found on the poorer soils where oaks and pines have a struggle to maintain themselves. It would appear that under natural conditions there is a tendency for the birches to become dominant over the oaks and pines, and at a still further stage in the succession, especially on the poorer soils, for ling to replace the birches. This association must have been common enough in Scotland in early times on land which is now rough pasture or moorland.

In this discussion no mention has been made of ash or beech woods, though both *Fraxinus* and *Fagus* grow well in this country at the present time. All the evidence goes to show that the beech is not native to Scotland, and both are characteristic of calcareous soils which occur but locally. Ash trees in all probability were an ingredient of the mixed woodlands, but they did not form a common association.

II. Associations not dominated by trees

Below the arctic-alpine zone, the natural vegetation appears to have consisted in the main of grasses and ling (*Calluna vulgaris*) over the areas which have thin or very poor soils, or which are very much exposed to the wind; patches of whin (*Ulex*) and juniper (*Juniperus*), especially in the south-east, also seem characteristic; and it may be supposed that bracken (*Pteris aquilina*) was common. A similar type of vegetation appears to have occupied the very sandy areas, such as "fixed dunes." Bracken covers quite extensive areas at the present time; but this appears to be merely

a phase in the natural regeneration, since many areas involved are suited to the growth of oak, pine or birchwood. The well-known spread of this plant is apparently a development of the last century or so, and may be related to the fact that cattle have been replaced by sheep on the rough pastures of many districts. Cattle were formerly more numerous and more important in the rural economy of many counties, and whereas sheep avoid bracken,⁷ cattle were able to trample down the fronds and prevent its spreading. Again, "the destruction of heather and the overgrazing of the better areas have led to an extensive spread of mat grass (*Nardus stricta*)."⁸

The arctic-alpine zone, which occurs at elevations above c. 2000 feet in the Grampians, can have changed but little from its natural condition. This zone is indicated by a marked decrease in the frequency of ling (*Calluna vulgaris*), by the absence of trees, and an increase in the number of saxifrages, dwarf willows and blackberry (*Vaccinium*), with the occurrence of species of an arctic type; among the grasses, *Festuca ovina* is common. At the summits of many of the higher peaks, the bare rocks and screes are almost devoid of vegetation except, perhaps, for mosses and lichens.

The moorland associations cover wide areas on the peat deposits and may be divided into three main types. The first is *Scirpus* moor, which appears as the climax vegetation in the west and north-west of the country, where the rainfall is high, and the relative humidity consistently great. It is dominated by deer grass (*Scirpus caespitosus*), with ling (*Calluna vulgaris*) as the co-dominant. Towards the north-east, *Calluna* moor is typically developed, with ling as the dominant, and tufted cotton grass (*Eriophorum vaginatum*) as the chief subsidiary. In the south of the country, *Molinia* moor is characteristic, and purple moor grass (*Molinia caerulea*) covers wide areas and sometimes "obliterates with its huge contiguous tussocks all other plants."⁹

HISTORICAL ASPECTS

A study of the factors controlling the nature of the vegetation and an examination of the character of the natural plant associations give some idea of what is sometimes referred to as the "primitive vegetation." This expression has been carefully avoided, firstly because the word "primitive" is unsuitable, since we are concerned with the plant cover no older than the Quaternary Ice Age, and secondly because there is implied in the expression the idea of an untouched, unchanging vegetation, which has been transformed from its pristine state by human agency alone. The concept of a "primeval state of nature" is so much of an over-simplification that it leads to gross misunderstanding. It has long been realised that the plant cover of any region, whether subjected to "development" by Man or not, must be studied as being "alive," changing and developing of its own accord, and the idea of "plant succession" has become a fundamental concept of Ecology.

Though we are far from knowing in detail the changes which have taken place in the vegetation of Scotland since the Ice Age, the investigation of the plant succession has given results of great interest, and has, moreover, thrown light upon the character of the vegetation itself. A review of these data forms an integral part of our subject. The story will be followed to the period at which Scotland assumed an aspect closely resembling that of the present day, and will, of course, involve a consideration of the changes introduced by Man. At first sight this may appear irrelevant; but a comprehensive survey seems necessary for the sake of completeness, to make clear the difficulty of speaking of a "primitive vegetation," and to facilitate the examination of a number of inferences concerning the natural vegetation which have been put forward by historians and students of place names and which are best reviewed in their proper setting. It might also be pleaded that the later stages of the evolution are of interest to the historical geographer. On these grounds, then, it seems justifiable to treat this aspect of the study in greater detail.

THE VEGETATION IN POST-GLACIAL TIMES:

I. FROM THE GLACIAL PERIOD TO NEOLITHIC TIMES

It has long been known that the peat deposits in many localities are not homogeneous from the base upwards, and that the type of plant remains which have been preserved often varies to a marked degree from layer to layer. Some thirty or forty years ago, attempts were made to reconstruct the history of the vegetation from an examination of these plant remains,¹⁰ but since that time the story has had to be entirely rewritten, as more fruitful methods of approach have been found. Besides drawing inferences from the remains of the more resistant plant tissues forming the peat, it is now possible to calculate the relative frequency of the forest tree pollen which has survived in a fossilised form, and by this means the evolution of the vegetation in the vicinity of peat deposits can be traced in some detail. Correlation of results has allowed a tentative reconstruction of the succession of woodlands in post-glacial times, and the results of these investigations, in so far as Scotland is concerned, are briefly reviewed below.

The evolution of the present vegetation has been traced back to the closing stages of the Quaternary Ice Age. Whether it is true to say that all plant life was blotted out during the last great re-advance of the ice, or that some hardy species maintained themselves in certain possibly ice-free districts, has not yet been decided to everyone's satisfaction;¹¹ but in any case, such species as survived cannot have played an appreciable part in the evolution of the present vegetation. With the retreat of the ice sheets, there came a tundra-like vegetation on the lowlands, at a time when local glaciers probably still existed in the mountains. Varieties of

willow (*Salix*) and birch (*Betula*) seem to have been the first representatives of the forest trees to appear, and it is believed that soon after their immigration they became comparatively common in this country. Pine (*Pinus sylvestris*) entered shortly afterwards and spread far and wide. The pine and birchwoods thus formed are thought to have been of a comparatively open nature, and were soon invaded by the forerunners of the broad-leaved temperate forest; first came hazel (*Corylus*), which rapidly attained a position of dominance in many districts, though birch and pinewoods continued to be an important feature of the vegetation. Then came the development, in districts providing a suitable habitat, of the mixed oakwoods, including oaks (*Quercus*), elm (*Ulmus*) and alder (*Alnus*), while the birch and pinewoods were much restricted. A little later, the forests of Scotland reached their maximum extent.

Retreat followed, with an accompanying period of rapid peat formation. Before the forests were at their maximum, the formation of peat due to climatic conditions does not seem to have taken place on a scale sufficiently large to lead to the development of extensive mosses, though humus had accumulated under the trees to form "forest peat." Now, however, came a rapid extension of the mosses, largely at the expense of the woodlands; traces of these old forests have often been found. The accumulation of peat seems to have gone on until the present time, but there is some evidence to show that it has not been altogether continuous. Layers of tree stumps, usually of pine (*Pinus sylvestris*), are sometimes encountered, especially in the south of Scotland, showing that at one time the surface of the moss was sufficiently dry to allow of re-colonisation by trees. The pollen analyses, too, show that there was a secondary "pine maximum" long after the first (which came soon after the species immigrated). The stumps are of local distribution, and in some areas peat formation continued unchecked; yet the occurrence is sufficiently widespread to be of interest, especially as other deposits, without the actual stumps, show signs of drier conditions at what is thought to be the same horizon. This period of relative dryness, if a single period it was, appears to have lasted but a short time, and the temporary pinewoods once more gave place to peat moss vegetation more or less as it is to-day, while the pines themselves (*Pinus sylvestris*) seem to have been restricted to the Grampians.

This succession as a whole is a very interesting phenomenon, and its explanation is not a simple matter. In the opinion of the writer, much has been made obscure and the issue over-simplified by a precipitate correlation with events in the Baltic region, where it has been proved to the satisfaction of most students that fluctuations in climate, for which de Geer has elaborated a method of dating the various phases in terms of years, have occurred in post-glacial times. The climate of the Baltic countries is not exactly similar to that of Scotland, and it is possible that the

changes there may have had different results and have been more important than here; again, de Geer's methods have scarcely been utilised other than locally in Scotland, and in any case correlation with results from the Baltic is a very difficult problem.

It is noticeable that the first trees to immigrate are species with wind-carried seeds, which might be expected to travel much more quickly than the heavy seeds of hazel and oak. A later dominance of hazelwoods and oakwoods over the earlier birch and pinewoods might be partially explained along these lines. Again, the soils on which the later woodlands grew were not formed all in a day from the "raw" clays and sands left after the final retreat of the ice sheets. The earlier dominance of pine and birchwoods may perhaps be partly related to the fact that these trees flourish on poorer soils than the oakwoods, and may have had a better chance of spreading under the soil conditions of the time. With regard to the later retreat of the woodlands after the period of colonisation, part of the explanation may again lie in soil evolution. The leaching of the sandy and gravelly soils and the formation of hard pan cannot have been sudden, so that a slow diminution of the woodlands might be looked for on these grounds.

Another factor may perhaps be found in the nature of peat formation: once a thin mantle has accumulated, the peat itself hinders drainage by acting as a sponge, while peaty acids which help the preservative process tend to form, and the colonisation of such wet peat by *Sphagnum*, which itself holds the water, becomes possible. Consequently, once a start has been made, the accumulation is up to a point an accelerating process. This factor, increasing in importance as time went on, tended first to stop further colonisation of the ground by trees and later to restrict the area already occupied. Even with regard to the occurrence of strata in which tree stumps have been found within the peat, explanations have been brought forward without invoking climatic changes. Woodhead has suggested that local changes in drainage may have led to temporary periods of dryness on the surface of the peat.¹²

It is not intended by any means to rule out climatic fluctuations since the close of the Ice Age in Scotland, but to point out that the succession must be studied as a complex phenomenon, independently of the periods observed in the Baltic region. The accompanying table has been constructed, from the material in an article by C. E. P. Brooks, to show the sequence of events as he conceives it, and the correlation with the periods established for the Baltic. The dating in years, it should be noted, is from this correlation with Scandinavia, not from Scottish data. With regard to the early periods, the dating must be considered with the greatest reserve, since there is no agreement as to when the ice left this country. De Geer himself has suggested that varve clays in the valley of the Earn near Dunning indicate that the lowlands were comparatively free from ice by about 13,000 B.C.¹³; but other

geologists maintain that the lowland ice-sheets continued in existence until the Finiglacial stage in Scandinavia (by de Geer's chronology, about 9000 B.C.), and that the glaciers in the mountains remained until an even later date.¹⁴

THE CORRELATION OF CLIMATE WITH VEGETATION

(Summarised from C. E. P. Brooks, *Jour. Roy. Met. Soc.*, 1934, pp. 384-90)

	Blytt-Sernander Periods (Scandinavia).	Climate in North- West Europe.	Vegetation in Scotland.
B.C. 10000			
9000		Ameliorating after Ice Age. Arctic and semi-Arctic.	Tundra.
8000	Early Pre-Boreal Late	Very cold winters, cool summers, dry.	Birch dominant.
7000			(Pine spreading in Britain)
6000	Boreal	Cold winters, hot summers, dry, es- pecially in summer.	Birch and pine dominant with hazel, and first appearance of mixed oakwoods.
5000			
4000	Atlantic	Mild rainy winters, hot and fairly moist summers, with fre- quent drought.	Birch and pine retreating. Mixed oakwoods very important. Rapid formation of peat.
3000			
2000	Sub-Boreal	Winters rather mild, summers hot, rain- fall probably fluc- tuating.	Peat formation irregular; some bogs in south colonised by pine.
1000			
A.D. 1000	Sub-Atlantic	Winters moderate, summers cool, wet.	Rapid peat formation and moorlands ex- tending. Pine restricted to the Grampians.

If the climatic conditions indicated for the later periods did actually obtain, several difficulties are removed. The pollen analyses appear to indicate a relatively rapid development of the mixed oakwoods, and then a very rapid increase in peat formation during the early "Atlantic"; with other factors at work, such as those already mentioned, a slight change in climate might be expected to produce quick results by disturbing what may have been a nice balance between soils, climate and vegetation. Similarly, the second maximum of pine pollen, the occurrence of tree stumps in the peat, and the indications of drier conditions at what is considered to be the same horizon in other peat deposits, are accounted for if there was a drier "Sub-Boreal" period long after the peat mosses came into existence. The importance of this phase must not be over-estimated, however; there is no evidence of a great increase of pinewoods in the Western Isles, for instance, and it is very doubtful whether there was anything more than a slight drying out—insufficient to allow of colonisation by pines—on the mosses of central, western and northern Scotland. Some writers in the past have grossly exaggerated the importance of these temporary changes; it has been suggested that "the forest growths ascended the mountains to an altitude of 3400 feet, or 1400 feet above their present range."¹⁶ A general movement such as this is not indicated, as most of the major plant associations would not have their range materially affected, and only on the peat deposits would there be any considerable extension of the woodlands. Even then it was not universal.

II. FROM NEOLITHIC TIMES ONWARD

So far as is known at present, the earliest human communities in Scotland had a culture of Mesolithic type and sometimes inhabited caves on what is generally alluded to as the "twenty-five feet raised beach." The evidence indicates that these caves were on the edge of the actual sea-beach at the time of occupation, when sea-level seems to have been higher in relation to the land than at present. Now the pollen analysis of peat deposits on this "twenty-five feet raised beach" shows them to be not earlier than the "Sub-Boreal" period, and presumably there was a marine transgression during "Atlantic" times. In the Carse of Stirling, for instance, deposits belonging to the alleged "Boreal" period are separated from Sub-Boreal and Sub-Atlantic peat, not by Atlantic peat, but by marine silts. There is no need or space to discuss these matters in detail, but the general conclusion is that this marine transgression coincided with the period of Mesolithic cultures. It is certain on other grounds that a number of communities with a culture older than the Neolithic lived in Scotland during "Atlantic" times; but they were few and poor, they had no flocks and herds so far as we know, nor do they seem to have

been agriculturalists. Consequently, the vegetation of this country can have been but little affected by human agency before about 2000 B.C. That wild animals had some effect on the vegetation, especially in open woodlands, by grazing and destroying young shoots, is doubtless true, but their efforts cannot have been very important until they were reinforced by the introduction of herds of domestic animals in the Neolithic and Early Bronze Ages. Incidentally, the rabbit, which gives the forester so much trouble to-day, was apparently absent, and was not introduced, or at least did not become common, before about the twelfth century A.D.¹⁶

But in the Neolithic period and Early Bronze Age, the economic basis of life became broader, as agriculture and stock raising, rather than hunting and food collecting, became the main source of food supply. Invasions from the Continent and from South Britain also took place in the second millennium B.C., and it seems reasonable to suppose, from the comparatively large number of relics dating from the Bronze Age which have been found in this country, that the population was sufficiently large to be considered as a factor of importance in connection with the history of the vegetation. Any estimate of the actual number is impossible, though certainly it must have been much less than in the Early Mediaeval period; even so, the influence of a population of just a few thousands with their flocks and herds, concentrated in the more favourable localities, could have a considerable local effect on the character of the vegetation. With this increase in population it may be said that there began in earnest the process which finally led to the destruction of most of the woodlands, and to a radical change in the nature of the vegetation generally.

This process of "developing" the natural vegetation must have gone on very slowly, even in Bronze Age times, since the population was still small and ill-equipped with cutting tools for clearing, felling and making burnt-over land fit for cultivation. But the effect in the long run of the grazing and the destruction of woodlands would be cumulative, and it seems reasonable to suppose that with the coming of more efficient tools during the Early Iron Age, and almost certainly with an increasing population, the restriction of the forest and the extension of the pastureland would be accelerated.

A map of native "forts,"¹⁷ most of which were in use during the centuries about the beginning of our era, shows that a considerable number of communities were scattered over the country, and would appear to indicate that the natural vegetation was being affected over wide areas. In this period, the settlement was not spread evenly over the whole of Scotland: the very rugged areas such as the Highlands, the peat mosses, the marshy lowlands and heavy clays with a covering of damp oakwood, were avoided. It was the better-drained land with lighter soils and with comparatively light woodland (such as dry oakwood), and oak-birch-

heath, which were colonised, together with the coastal districts, where tree growth was to some extent restricted by the wind, and the very sandy areas such as Tents Muir in Fife and Glenluce Sands in Galloway. The plant associations of such localities were undoubtedly the first to suffer change. Statements, however, that the pre-Medieval settlements were normally located in what was naturally forest-free land should be discounted. A study of the distribution of forts in various parts of Scotland, which it is hoped to publish shortly, has convinced the writer that the very areas which might conceivably be quite forest-free in early times were usually avoided by the settlers; for instance, in the Lothians, only a small percentage of the sites occur above the upper limit of tree growth, and in Galloway and Caithness, the vast majority occur below 600 feet. Again, for this purpose the deep peat deposits appear to have been almost universally avoided.

Although forest clearance and the development of the natural vegetation was an age-old process by the end of the prehistoric period in Scotland, it would be unwise to hazard a guess as to what stage had been reached in any one period. In their distribution maps, the archaeologists often encounter blank stretches of lowland for which their explanation, *faute de mieux*, is that these were tracts of uninhabited forest. But "forest" is merely a supposition, for the absence of relics might be due to other causes, and even pure chance would play a large part if the country were not closely settled. In any case, the interpretation of archaeological maps of Scotland in this way presents considerable difficulty, for soils, topography, drainage and degree of exposure often vary greatly within small districts, and dense forests must have been scattered and restricted in extent, with nothing comparable to the wide stretches of the Wealden Forest or that of the Midlands of England. The archaeological sites themselves are frequently sporadic in distribution and limited in number, giving only a general idea of the inhabited areas of early times, so that it is quite impossible to judge how far the scattering is due to the presence of forest. The writer made the experiment of plotting all the known prehistoric sites over a considerable area in the south-east of Scotland on a map on the scale of 1 : 126,720; there was no practical result, as the distribution was often too even to be of significance. Although a sparse scattering was noticeable in some areas, such as the Merse of Berwick, parts of the Lothians and Strathmore, it was always possible to "infer" woodlands in these places without having recourse to the "no settlement" argument.

There are references to the appearance of Scotland in classical writings. Pliny (A.D. 23-79) had heard of the Caledonian Forest, and Ptolemy (mid second century A.D.) seems to have placed it in what is now approximately Perthshire, though the reference is vague. In Xiphiline's abridgement of the history of Dio Cassius (A.D. 150-235) there is mention of the forests of Scotland, and

Tacitus (A.D. 55-120), too, implies that woodlands were common. These statements have been taken at their face value by generations of historians, who, in discussing the Roman invasions, have not hesitated to clothe Scotland to the peaks of the higher mountains with a dense impenetrable forest; curiously enough, these very writers make Agricola manoeuvre his troops at the battle of Mons Grampius "in Strathmore" with as much ease as though he were on a parade ground.

The allusions of these classical writers are of very doubtful value, and have often been misinterpreted. Most of the information, such as it was, appears to have been derived from hearsay. Dio was concerned with eulogising the Emperor Severus, and the destruction of trees over wide areas is surely to be considered in this case as pardonable exaggeration. Tacitus, in making the enemy fly to the woods after defeats by the Romans, was disposing of them in a way suited to his narrative and literary style, without paying careful attention to the true nature of the landscape. That the Caledonian Forest is placed approximately in Perthshire is possibly due to the fact that this was one of the few areas north of the Antonine Wall with which the Romans were tolerably familiar. This "Caledonian Forest" is best considered as a myth which has served its purpose well; descriptions of its boundaries which are sometimes to be found in local histories and the older text-books must be treated as fiction.

Local historians often give descriptions of "former forests," but the evidence—when any is given—is rarely reliable. Much confusion has arisen over the misinterpretation of the word *foresta*, which refers, not to woodland, but to waste or hunting ground, in much the same sense that "deer forest" is used at the present time. Again, the writings of classical authors, or "old tree stumps buried in the peat"—probably of Boreal or Sub-Boreal date—are often cited as evidence of woodlands in existence in Roman times. It is necessary to treat these descriptions with the greatest reserve.*

Place names, too, sometimes yield fragmentary evidence of a somewhat similar nature. Many difficulties are to be encountered, however, not only in the etymology of the names themselves, but also because a descriptive name, perhaps suggesting the presence of trees, may have been given to a particular locality by reason of the exceptional nature of the place; for example, a small area surrounded by a few trees in the midst of an open moor might be

* A particularly difficult position exists with regard to a forest in the Flanders Moss area above Stirling. Much was and still is covered with peat, and on a *priori* grounds we should expect the tree stumps continually found there to date to the Boreal or Sub-Boreal times. But references occur repeatedly to what are alleged to be axe-marks on the stumps, about three feet above root level, and many writers contend that Severus was responsible for the destruction of this forest. One explanation put forward is that the forest is of Boreal or Sub-Boreal date, and that as the trees were gradually enveloped in peat, the stumps were preserved to the same three-feet level, and that the "axe-marks" are merely the break when the dead trees finally fell.

given a name relating to the trees as the distinguishing feature, not to the moorland. In any case, there is no adequate survey of Scottish place names such as is being compiled for the counties of England, and until such a catalogue is made investigation will be at the very least extremely difficult.

With the evidence to be obtained from documents such as abbey records and old charters we are on safer ground. Many woodlands, which have now disappeared, survived until well on in the historic period, and their existence is well attested in these old records. But unfortunately it is rarely possible to estimate the exact areas and nature of these forests; references to woodlands lying to the west of Edinburgh, or on the slopes of the Pentlands, or on the northern slopes of the Ochils in the wood of Drumselch, are interesting, but are useful only in confirming impressions from other sources. At least within the writer's experience, the references seem far too fragmentary to allow anything in the nature of a map of the woodlands in Mediaeval times to be constructed.

By the end of the fifteenth century, forest clearance had gone so far that attempts were being made to preserve the existing timber resources, and in the succeeding centuries there are references by contemporary writers to the treeless nature of Scotland. Nevertheless, these must apply to the southern part of the country, for in the eighteenth century there was an iron industry in the glens of the Western Highlands, whither iron masters had migrated from various parts of Britain in search of fuel. An incomplete map of the "Bloomeries" exists,¹⁸ and shows that some of the glens of Argyll, parts of Perthshire and the northern Grampians, and some of the glens in the North-West Highlands, must still have had a considerable amount of woodland, though at the present time many of these areas are comparatively poor in trees. Apparently, therefore, it was not until the eve of the Industrial Revolution that Scotland finally assumed the treeless aspect which characterises much of the country now, though the process was completed earlier in the Central Lowlands.

The great age of forest clearance in many parts of central and north-western Europe is generally said to have been the Mediaeval period. In England, a very important step forward in the occupation of the areas of deeper and heavier soils was made in the period immediately after the Anglo-Saxon invasions; the new-comers were able to clear and deal successfully with those areas which had hitherto been avoided. In Scotland, however, the Angles colonised a restricted area (in the south-east), and the occupation of the heavier soils probably proceeded more gradually. Another factor is that cereal cultivation is not so attractive in many parts of Scotland as in South Britain, nor was there the same demand for "water meadow"; grazing was often an easier method of land utilisation, so that there was less incentive to clear and drain heavy soils. Again, continuous areas of heavy soil are not so

extensive on the lowland as in South Britain, and the dense forest was probably attacked piecemeal.

On the whole, considering the widespread nature of the settlement even in the Early Iron Age, and the absence of evidence to the contrary, it would seem advisable to look upon this process of forest clearance as taking place over a very long period, without any marked acceleration during the early Mediaeval period, and ending only in the eighteenth century. This is a tentative suggestion, and a sifting of all the available evidence relating to the distribution of woodlands in the Middle Ages more careful than has been undertaken by the writer might lead to a rather different conclusion. The history of the vegetation did not, of course, cease with the transformation of the old woodlands, but the later stages fall rather within the province of the economic geographer, and have been reviewed in some detail in a recent publication.¹⁹

ON MAPS

By way of conclusion, a word must be said with regard to maps. Their exclusion from this paper is intentional and upon principle. Our knowledge is deficient in general and in particular on a number of crucial points; maps of the soils and vegetation at the present day are incomplete to say the least, and even detailed geographical regional surveys are very few. From period to period, the vegetation has changed ever since the Ice Age, and not one but several maps are necessary to give even a synoptic view of this transition. Attempts which have been made to show the distribution of the primitive forest of England, after very careful study, have been severely criticised, and there is no point in repeating that experience with a more difficult terrain. No one can gain greater satisfaction than the geographer from the contemplation of a good map; and no one can appreciate better the absurdity of attempting to construct, from the intangible data at our disposal, a reliable or even useful map of the "primitive vegetation."

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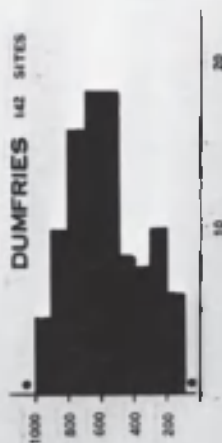
The Geographical Limits of the Iron Age

Settlement in Scotland.

CAITHNESS 145 SITES



DUMFRIES 142 SITES



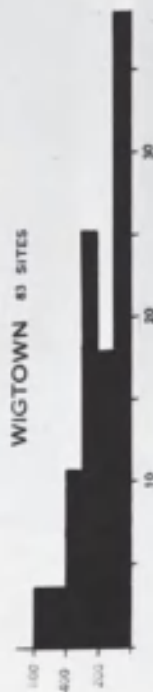
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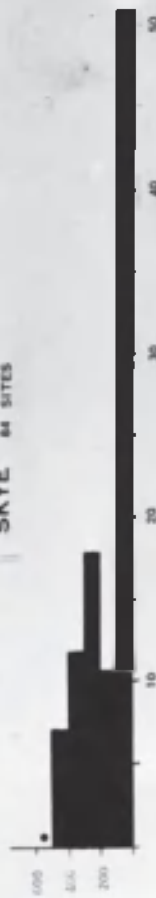
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WIGTOWN 83 SITES



SKYE 84 SITES



SUTHERLAND 78 SITES

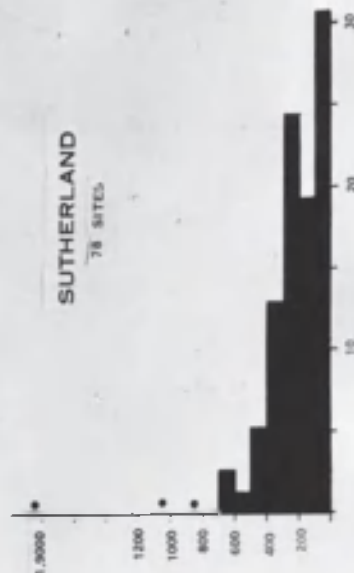




Figure 1



HIGHLANDS

WESTERN LOWLANDS AND EASTERN UPLANDS

EASTERN LOWLANDS



The Geographical Limits of the Iron Age Settlement in Scotland.

Archaeologists have come to realise that the interpretation of their distribution maps involves a study of the character of the physical environment. In that part of Britain which Sir Cyril Fox has called the Highland Zone (1), climate, relief soils and the natural vegetation change with disconcerting rapidity within quite small areas, and to take into account fully the "geographical factors" seems to imply a detailed knowledge of local topography that few of us possess. The following observations are in no sense intended to cover the whole field of the relationship between the Iron Age settlement and environment in Scotland, but to suggest one or two guiding principles, and to criticise several ideas which are rarely fully expressed in words, but form a noticeable undercurrent in writings concerning the Highland Zone. It is often assumed, for instance, that early settlers avoided the "extensive, densely forested lowlands" and "bleak mountain tops", and that a map showing the distribution of these types of country would go far to explain the archaeological maps. Many writers have yearned for a map of the "primitive vegetation", but so far quite in vain; the extraordinary

(1) C. Fox, "The Personality of Britain".

difficulties inherent in this problem have been discussed elsewhere. (2) Instead of awaiting the descent of this deus ex machina which may never come, the obvious course should be to see whether a deadlock has actually been reached.

The first necessity is an adequate distribution map; one has been produced for the Iron Age in Scotland by Professor Childe (3), showing a large number of actual settlement sites, but however admirable it may be from an archaeological point of view, the scale is far too small for present purposes. Furthermore, it is already to some extent out of date, although only five years old, as aerial photography has revealed the presence of a number of new sites, unknown at the time of publication.(4) The fullest information at present available is that to be found in the Inventories of the Royal Commission on the Ancient and Historic Monuments of Scotland, though as yet only a few of the counties have been covered. The obvious expedient in this study of environmental factors, seems to be to utilise the detailed regional data as much as possible and then to attempt generalisations after a study of Childe's map in the light of Crawford's emendations.

The method of approach which has been selected

- (2) Fairhurst, "The Natural Vegetation of Scotland", Scottish Geographical Magazine, July, 1939.
- (4) V. G. Childe, "The Prehistory of Scotland".
- (4) O.G.S. Crawford, "Air Reconnaissance in Roman Scotland", Antiquity, September, 1939.

may at first sight appear curious, and to ignore certain obvious difficulties, but perhaps its value will become apparent during the course of the investigation. Four widely separated areas have been selected to serve as what may be termed sample districts; the choice of the "Lothians", Caithness, Wigtown and Skye was to a considerable extent determined by the available Inventories of the Royal Commission, but each has its distinctive geographical character, and will serve admirably the purpose in hand. Using the Inventories and the one inch Ordnance Survey map, the height above sea level has been estimated to the nearest hundred feet for every fort, crannog, earth or wheel house, and for every hut circle and burial ground which has been proved by excavation to belong to the Iron Age. For each area chosen, it has thus been possible to count the number of sites occurring in each group of 100'; for purposes of comparison, these totals have been expressed as a percentage of the sum total for the area, and the results have been graphed (Fig. 1) (a). It should be noted that in estimating to the nearest 100', all sites between sea level and somewhere about 140' have been included within the lowest group, so that it has a greater chance of surpassing the percentage of the higher groups, and allowance must be made for this. Fine distinctions

- (a) Single sites have been marked with a dot in the appropriate group, not as a percentage.

such as this, however, will not concern us, as the graphs are intended to illustrate conditions more generally.

I "Lothians".

(Inventories for the counties of Berwick, Haddington,
Edinburgh and Linlithgow)

This area covers the lowlands of the Merse of Berwick and the Lothians proper (i.e., the coastal plains on the south of the Firth of Forth), and an upland area formed by part of the Lammermuirs, Pentlands and Moorfoots. The lowlands are not flat plains, and locally the relief is marked, but generally they may be described as being below 600', and with fairly continuous stretches of deep soil; parts of them now rank as some of the best cultivated land in Britain. The uplands, which rise to as much as 2,000', are part of a dissected plateau, but are not particularly rugged as compared with many districts in Scotland. The graph shows that there is a marked concentration of the sites upon the land between about 500' and 1,100'. Before accepting this as a significant feature, it is necessary to examine the proportion of the total area involved, for obviously if most of the land lies between these two contours, most of the sites might be expected to fall within these groups. Exact figures are not available, but at a rough calculation, less than half of the total area lies within this elevation zone, and more than a third seems to lie below 500', so that the distinction

is of significance. Its explanation, however, is another matter which must be discussed when evidence concerning new sites accumulated since the Royal Commission survey, has been considered; furthermore, a balanced judgment will be easier to attain when other sample areas have been examined. Bearing these points in mind, and remembering the possibility of further qualification, the "Lothians" may provisionally be divided into the following types of country:-

1. Sea level to about 400': sites few; about one eighth of the total.
2. About 500' to 1,100': sites frequent; over three quarters of the total.
3. Above about 1,200': sites rapidly becoming rare and ceasing before 1,400', although the land sometimes rises to 2,000'; less than one fifth of the total.

II Caithness.

(Inventory for the county of Caithness)

This county can be divided into two districts. The north eastern half consists of a lowland developed on rocks of Devonian age; it is far from level, but altitudes over 500' are not common. Extensive peat mosses occur and are apparently devoid of sites. The second division lies to the south and west, along the Sutherland border, where older rocks emerge and locally attain an elevation of over 2,000'; at a rough estimate, upwards of a third of

the county rises above 500'. This south western area is an inhospitable country of peat mosses and steep and sometimes rocky slopes; at present, much of it is a trackless wilderness. The graph shows a marked contrast with that for the "Lothians". Nearly all the sites (95%) occur below about 500'; the high percentage in the two lowest groups suggests that many sites lie near to the sea, and in fact somewhere about a quarter of the total are within a mile or so of the beach. Quite obviously, land above about 500' in Caithness was not attractive, but to avoid premature conclusions, it might be remarked that just over the Sutherland border, there is one isolated site at nearly 1,900'.

III Wigtown.

(Inventory for the county of Wigtown)

Much of this county lies below 500', but the lowlands consist of irregular ground rather than plains; along the Ayrshire border, there is a continuous stretch of higher ground which rises locally to over 800'. This latter area is almost completely devoid of sites, so that although allowance must be made for the great extent of land below 500', it is true to say that the graph gives a trustworthy indication of the unattractiveness of the uplands above 500'. Coastal sites are again common, as in Caithness. In view of the small extent of the upland country, it

would be unwise to make strict comparison with the preceding graphs, but there is no doubt that the distribution corresponds far more closely to that of Caithness than to that of the "Lothians".

IV Skye.

(Inventory for the Outer Hebrides and Skye)

The Misty Isle is world famous for its mountain scenery, but it is important to remember that although "plains" in the ordinary sense are absent, the area below 500' is by no means negligible. Almost all the sites occur below this level, and the higher parts appear to be absolutely devoid of settlement. A marked preference for coastal situations has been noted in both Caithness and Wigton, and in Skye a still greater proportion of the sites occurs in the lowest group (about one half); it must be remembered however, that as compared with the two mainland areas, the coastlands of Skye (which here includes Raasay) are exceptionally long.

Four diverse areas in widely separated parts of Scotland have now been considered. In Caithness, Wigton and Skye, the sites practically cease above about 500', and appear to be unusually common in coastal districts; in the "Lothians", the sites do not become rare until altitudes above about 1,200' are reached, there is an apparent diminution in lowland areas below about 500',

and few coastal settlements occur. For present purposes, these two contrasting types of distribution will be referred to as the "Lowland" and "Upland" respectively. The next step is to examine the country as a whole to see whether other forms can be found, or whether one grades into the other, and whether it is possible to make regional ~~differentiations~~ divisions in accordance with the type of distribution. For this purpose, the help of the Inventories is not forthcoming except for a few areas, and reliance has to be placed upon data from the one inch Ordnance Survey map, supplemented whenever possible from other sources and from personal knowledge.

The results of the examination are as follows. Two distinct "provinces" can be differentiated by a line drawn roughly along the western border of Dumfries, then along the eastern border of the counties of Ayr, Renfrew, Stirling (excluding the outlying eastern portion), and Argyll to the Moor of Rannoch, and thence northwards to about the town of Inverness. To avoid misapprehension, it should be stated that the exact position of this line is not critical except for short stretches which will be discussed in a moment; it is as though the position of a mountain range were being shown by indicating the line of the water parting. To the west of the line, the vast majority of the sites lie below about 500', and probably less than 10% at the most occur above this elevation; in

so far as the writer is aware, no site surpasses 1,000'. To the east of the line, well over 90% of the sites lie below about 1,100', and there is a marked diminution below 300' in the area between the Firths of Forth and Moray, below 400' in the Lothians, and below 150' in Dumfries. All these contours and the main division suggested above have been indicated on a map (fig. 2).

Generalisation has been necessary on this small scale map, and in fact is desirable to avoid a misleading appearance of meticulous accuracy; furthermore, no attempt has been made to follow the windings of the contours up deep and narrow glens, as anyone at all familiar with the distribution of the Iron Age sites knows that these narrow strips of land are almost invariably devoid of sites. Four types of country appear :-

1. "Western Lowlands", below 500': sites relatively frequent as compared with the adjacent highlands.
2. "Eastern Uplands", below 1,100' and above 400', 300' or 150' according to the district: sites relatively frequent as compared with the adjacent land above and below this zone.

(To avoid complication in the map, these two have been shaded in the same way)

3. "Eastern Lowlands", below the Eastern Uplands: sites markedly less frequent than in the adjacent parts of the zone above.

4. "Highlands" above 500' on the west and north, and above about 1,100' on the east: sites scarce.

It will be noticed that the main division between the east and west provinces runs through the "Highlands" for the greater part of its course, so that the exact position of the boundary does not seriously matter except in three areas, the Solway, at the head of the Moray Firth, and in the Central Lowlands. With regard to the first, the graphs for Dumfries and Kirkcudbright, constructed on the same lines as those of figure 1 from the Inventories of the Royal Commission, show that the transition is quite rapid, and the line can be drawn with a fair degree of confidence. On the Moray Firth, lowland sites are relatively rare on the south side, but common on the north, where there is also a marked decrease in the frequencies above 500', though a few persist to very high elevations - one site lies at about 1,900' which is the highest ~~site~~ in Scotland apparently. In the area around Glasgow, the scarcity of sites in the lowlands ~~makes it~~ of the Clyde basin above the estuary, and on either side of the Kilpatrick Hills, seems to suggest inclusion within the eastern province; the demarcation in this short stretch is admittedly guesswork.

Our investigation has indicated that it is possible to delimit extensive and continuous zones of

country where the recorded sites are relatively frequent or scarce as compared with adjacent areas above and below. In this argument, we are not yet in a position to study these variations in relation to the geographical conditions, although we may suspect environmental factors to be important. The regions which have been delimited must first be examined to see whether the zonal distinctions are accidental or cultural, rather than geographical. Two somewhat lengthy digressions from the main line of the discussion are necessary to clarify the position.

(1) The first difficulty is with regard to the reliability of the archaeological data.

A large number of Bronze Age burial sites have been discovered in Scotland, but the number of associated settlement sites is exceedingly small. A population by no means negligible in size, has apparently left behind no evidence of its existence of the type we have been considering. It must be assumed that the vast majority of the settlements of these Bronze Age folk were of such a flimsy nature that no vestiges have remained, or that these structures have been purposely demolished by later agriculturalists. Now a somewhat similar state of affairs may exist with regard to the Iron Age settlements, and may provide a possible explanation for the absence of sites in the "Highlands" and the infrequency in the "Eastern Lowlands". With regard to the former zone, no traces of a pre-existing Bronze Age population have been ~~found~~ recorded, there are

few unexcavated sites which might suggest Iron Age settlement, very few stray Iron Age objects have been recorded, and finally, cultivation is not intensive and is often non-existent. As far as can be seen, the negative evidence for the absence of settlement must be taken at its face value, and the limits of the "Highlands" are in fact a rough indication of the upper limit of the occupation sites.

The "Eastern Lowlands" present a very different problem in this respect. Opinions have varied considerably on the question as to how far the distribution of proven occupation sites in a relatively well explored country is an indication of the extent of the prehistoric settlement, when intensive cultivation over a long period of time has to be taken into account. No one of course, doubts that the destruction of the sites has been greater on arable lowlands than on upland pastures, but the problem at the moment is to decide whether it is justifiable to separate a less attractive "Eastern Lowlands" from the obviously attractive "Eastern Uplands".

In the first place, there is no doubt that cultivation has been much more intensive along these eastern coastal districts of Scotland, taken as a whole, than in the zone above; the chances of survival are therefore smaller. Secondly, there is some evidence of a pre-existing Bronze Age population in such areas as the Lothians proper, in lowland Aberdeenshire, and in the Clyde basin

near Glasgow, and if they could succeed in colonisation, there seems no reason to doubt the powers of the Iron Age peoples. Thirdly, the attention which the Romans paid to eastern Scotland and to the Central Lowlands scarcely suggests a relatively sparse occupation. Finally, concrete evidence has recently come to light indicating that the Inventories of the Royal Commission have overlooked a considerable number of fort sites in the arable lowlands.(5) Crawford's aerial survey is not complete and only a very general account has been published, but one very important statement has been made. Speaking of Iron Age forts, the author says, "We got a good bunch in the Lothians, indicating that this fertile lowland was once thick with them". This would seem sweeping negation of the whole idea.

It ~~trw~~ would be unwise, however, to assume that the fate of "Eastern Lowlands" has been sealed. It should be pointed out that the discovery of even scores of new sites in the arable areas of Eastern Scotland is not sufficient evidence upon which to pronounce a verdict. Not merely "a good bunch", but some fifty or more new sites would have to be added to the total for the zone below 500' in the four Lothian counties alone, before the graph in figure 1 would be seriously changed; any further discoveries in the higher areas would proportionately increase this number, and it is to be remembered that cultivation does

(5) Crawford, op. cit.

not cease at 500'. To prove that the lowlands were more attractive than the zone above, as in the west, several hundred new sites in the Lothians would probably be involved. Crawford's provisional account does not suggest anything so extraordinary as this. Two other points must also be made. The diminution in the frequency of the sites at low altitudes does not occur in the west, and in fact, large numbers are to be found in the arable zone. It is not easy to explain why survivals in lowland areas are extremely common in ~~one~~ the one, and rare in the other. Secondly, the upper limit of cultivation in the east has often risen above 500', and a sudden decrease in the frequency groups below that contour is unexpected if the efforts of the agriculturalist are entirely to blame.

This conflicting evidence cannot be reconciled by argument, and much more detailed field work is called for before a final decision can be made. In the meanwhile, the "Eastern Lowlands" have been retained on the map, though the distinction must be considered with some reserve.

(2) The second difficulty relates to the possibility that the regional divisions indicated in figure 2 are the reflection of cultural differences of paramount importance.

Archaeologists are familiar enough with the fact that the Iron Age culture in Scotland was not homogeneous. In the west and north, many of the sites consist of small stone forts with a single rampart, and include "castles",

brochs, galleried duns and stack forts. In the east, a much larger fort, often with more than one rampart, is the dominant form. Professor Childe has indicated a cultural difference existing between the builders of the brochs and castles, and of the large eastern forts. (6) Very broadly speaking, the areas where the small forts are common correspond to our western province, and in the eastern province, the large fort is characteristic; it is impossible to be more precise, as the distribution of the two generalised classes has not been worked out in detail. These facts seem to indicate that our settlement regions may have had a cultural basis. Furthermore, it is to be noted that the settlers in the west made full use of the possibilities offered by a coastal station for fishing, food collecting on the beach, and perhaps trade and piracy; taking the evidence at its face value, the eastern folk neglected this mode of subsistence. It is at least tempting to suggest that the various cultural groups utilised the possibilities of the environment in somewhat different ways.

On the other hand, this cultural distinction is not clear cut. Large forts of the eastern type are to be found in the Western Lowlands, and small forts, dominant in the west, also occur in the Eastern Uplands; the site on Bennachie at over 1,600' for instance, is a

(6) Childe, "Prehistory of Scotland".

"castle", and the group of forts in upper Glen Lyon at over 1,000' are typically western in form. In other words, when the sites of one branch of the Iron Age culture overflow into the area dominated by the other, no peculiar choice of locality is to be distinguished. Furthermore, in the west, it has been proved that some of the sites were occupied until a very late period, for instance at Dunadd, Kildonan and Ugaedale, and it is quite possible that the Iron Age continued along the West Coast until a very late ~~period~~ date. Yet all the sites of whatever period or branch of the Iron Age culture, are limited to the same zone.

Our settlement regions, therefore, are not to be explained simply in terms of cultural differences.

This method of approach to the study of Iron Age settlements enables certain conclusions to be drawn, since we can now speak with some degree of certainty concerning both the average and the extreme upper limit of occupation. In the west, the normal upper limit was about 500', and the extreme was less than 1,000'; in the east, the corresponding figures are about 1,100 and 2,000'. It is interesting to note that the upper limit of tree growth, where it has been carefully traced, often lies well above the settlement limit.

Elevation above sea level is in itself no serious obstacle to settlement, as is shown by the extremes in

the east, but the reasons for the general avoidance of high altitudes are not far to seek. The country is often rugged and rocky, the soils are often thin and poor, the pasture has a low carrying capacity, and cereal crops will not ripen in the damp cool climate. The regional variations of the upper limit are not so simply explained. It is interesting and perhaps relevant to note that during the summer months of July and August when the cereal crop is maturing, the mean temperature would seem to be about the same (54 degrees) at 1,200' in the Lothians and 500' in Caithness. An explanation for the low limit in Wigtown is not to be found along these lines, as there is not a corresponding fall in temperature towards the west. There is, of course, a very marked increase in the rainfall totals.

Anyone at all familiar with conditions on the West Coast knows that one of the great difficulties facing the farmer is the high rainfall and the high relative humidity. The climate is such that cereals ripen late, and the summer and autumn are frequently both wet and sunless, so that harvesting is difficult. The cloud ceiling is often low, and Scotch mists are only too common on the hills. In this cool humid climate, peat accumulation is very rapid * (especially ombrogenous peat), particularly in the uplands. In view of these conditions, the reclamation of fields from the moor is not worth while except on the lowlands. Grazing too, is often wet and

unhealthy on the hills, and poor on the deep soggy peat; sheep, for instance, are liable to become infested with maggot if the late spring is very wet, and the losses in the lambing season are often extremely high. It is hardly surprising that the Iron Age settlers were content to colonise the lowlands. The winter incidentally is very mild, and this open weather may not be without significance in considering the large number of sites which are to be found along parts of the West Coast. In the east, rainfall is much lower, and almost the whole of our Eastern Uplands have as dry or drier conditions than those prevailing in the Western Lowlands. It is nearly true to say that the unattractive region which has been referred to as "Highlands" may be defined as that part of Scotland with over forty inches of rainfall on the average each year. Certain exceptions would have to be made, but the problem is complex, and we must be content with remarking that the coast north of Loch Linnhe, which has few sites as compared with southern Argyll, is excessively wet, and that the high levels in south east Sutherland are apparently unusually dry.

To turn now to the Eastern Lowlands. Without definitely committing ourselves to the view that these areas as a whole were unattractive, we should at least examine the milieu to see whether there are any obvious geographical ~~advantages~~ disadvantages. Speaking generally, climate, topography and soils seem to combine to provide

a much more attractive environment than the "Uplands", but further consideration leads to the view that early settlers might have met with considerable difficulties locally. There are several badly drained lowlands of considerable size, of which the peaty areas along the ~~Firth~~ Forth above Stirling and Solway Moss may be mentioned; scarcely any sites occur in such localities, and peat may have been more widespread than is generally suspected, before the land was transformed into the well cultivated fields of to-day. Many areas too, had a deep soil covering, and there is some reason to suppose that they were densely wooded, more so than in the zone above; the plains of the Lothians, the Merse of Berwick, the lowlands of Dumfries, the Glasgow Basin and Strathmore might be mentioned as being locally of this nature. Apparently therefore, broad districts in the "Eastern Lowlands" were locally unattractive or initially difficult, but there is nothing to suggest that the whole region was unfavourable to early colonists. In the Western Lowlands, it must be borne in mind that the land is much more irregular in detail, and patches of well drained ~~land~~ country occur almost everywhere; peat mosses such as that of Crinan, are much smaller than their counterparts in the east. In the aggregate, the broader areas of mossland and deep soils to be found in the smoother terrain of the Eastern Lowlands, seem to have exerted a more potent influence on the zonal

than the more scattered and broken areas of the west.

This view of the nature of the lowlands is at complete variance with the statements of the older historians, whose usual contribution to a study of the character of the physical environment was to remark that dense forests covered the lower ground and that it was therefore thinly peopled. This view has survived in a somewhat different form, down to the present time, for many writers have implied that a map of "primitive woodlands" would go far to explain the frequent lack of pre-Saxon settlements in lowland country. Whatever may be the case in England, the lowlands in Scotland were only avoided locally, and in the west comprised the densely settled area.

It is hoped that the map which has been drawn by way of an illustration of the preceding argument, is not without value in the interpretation of archaeological distribution maps, since at least the upper limit of the Iron Age settlement has been fairly clearly defined. This limit may also be of interest in relation to earlier periods, since conditions cannot have been very different for the Bronze Age inhabitants, especially as it is so difficult to obtain evidence concerning the exact position of the settlements of these earlier folk. The choice of the Iron Age for this study was largely determined by the fact that it is the first period for which sufficient evidence is available. No great claims are made for the

map as it stands, as detailed regional studies of the archaeological evidence will in the future, make revision necessary. Furthermore, it is clear that the upper limit of settlement was not the only factor of importance in a consideration of the distribution of the Iron Age settlements, and that the map could be further amplified. The colonists seem to have avoided almost always, the areas of deep peat, and probably also, the districts of heavy clay soils. Both types of country could be differentiated if a large number of detailed geographical studies were available. Certainly the evidence is there for the seeking, and this ~~new~~ method of approach, by discovering "attractive" and "unattractive" types of country, does seem to be much more practicable than that of attempting to reconstruct the "primitive vegetation", which is a problem beset with what would appear to be insuperable difficulties. The great obstacle is the lack of detailed regional studies of the geographical facts and the archaeological evidence.

See p. 374

University of Glasgow.

HIGHER DEGREES & SPECIAL STUDY & RESEARCH

Session 1939-40

HIGHER DEGREES AND SPECIAL STUDY AND RESEARCH

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GENERAL INFORMATION

Higher Degrees

The University awards the higher degrees of Doctor of Letters (D.Litt.) and Doctor of Music (D.Mus.) in the Faculty of Arts, Doctor of Medicine (M.D.) and Master of Surgery (Ch.M.) in the Faculty of Medicine, Doctor of Science (D.Sc.) in the Faculties of Science and Engineering, and Doctor of Philosophy (Ph.D.) in all Faculties.

The regulations governing these degrees are printed below. Candidates for any higher degree are required to submit a thesis embodying original work; candidates for the degrees of Doctor of Medicine, Master of Surgery and Doctor of Music are also required to submit to examination and candidates for any other higher degree may be required to do so. For the degrees of Doctor of Medicine and Master of Surgery only Bachelors of Medicine of this University, and for the degree of Doctor of Science in Public Health only Bachelors of Science in Public Health of this University, may be candidates, and no residence is required for these degrees. The degrees of Doctor of Letters and Doctor of Science are open both to graduates in Arts or Pure Science or Engineering with Honours of this University, of whom no further residence is required, and to other graduates of this University, or graduates of other Universities, who have spent a prescribed period as Research Students in this University. The degree of Doctor of Music is open both to Bachelors of Music with Honours of this University, of whom no further residence is required, and to Bachelors of Music of other Universities who have spent a prescribed period as Research Students in this University. The degree of Doctor of Philosophy is open to graduates of this University or of other Universities; all candidates are required to spend a prescribed period as Research Students in this University.

The conditions under which candidates are admitted to the status of Research Student are printed below, p. 375. The fees payable by Research Students, in addition to the normal matriculation fee of £2 12s. 6d. a year, are £5 5s. a year in the Faculties of Arts, Divinity and Law and £10 10s. a year in the Faculties of Medicine, Science and Engineering.

Enquiries regarding admission to the status of Research Student should be addressed to the Clerk of Senate.

Diplomas and Certificates for Post-graduate Study in Arts

Graduates and other advanced students may be candidates for the Diploma and the Certificate of Proficiency awarded for special study in the Faculty of Arts. The Diploma is intended for Honours graduates who have pursued advanced study of a special subject under the direction of a Professor or Lecturer, the Certificate for others who have attended one of the regular advanced courses provided in the Faculty. The minimum period of study required either for the Diploma or for the Certificate is one year; in addition to the normal matriculation fee, candidates are required to pay a tuition fee of five guineas a year and an examination fee of two guineas. The regulations are printed in the syllabus of the Faculty of Arts (see p. 161).

I. DEGREE OF DOCTOR OF LETTERS

The Degree of Doctor of Letters is awarded under Ordinance XXVI (Glasgow No. 7), which came into force on 28th September, 1908. The following are the relevant provisions of the Ordinance :

VII. Graduates who have obtained any degree in the University of Glasgow, and who have either before or after graduation passed the Examination in an Honours Group for the Degree in Arts, or the Final Science Examination for the degree in Pure Science or in Engineering with Honours may offer themselves for the degree of Doctor of Letters (D.Litt.) after the expiry of five years from the date of their graduation.

VIII. Research Students as aforesaid, who have prosecuted in the University of Glasgow some special study under Ordinance No. 61 (General, No. 23—Regulations for the Encouragement of Special Study and Research, and for the appointment of Research Fellows), may offer themselves for the degree of Doctor of Letters ; provided—

(1) That they have obtained a degree in any Scottish University, or a degree in another University specially recognised by the University Court for the purpose of this section, which the Senatus shall deem to be equivalent to the corresponding degree in the University of Glasgow ; and provided that candidates who have obtained any such degree in a University outside the United Kingdom so recognised may be required if the Senatus think fit, before beginning their course as Research Students with a view to the degree of Doctor of Letters, to pass an examination equivalent to an Honours Examination in a group of subjects cognate to their line of work as Research Students.

(2) That they have spent not less than two terms in each of two academical years, or an equivalent period, as Research Students in the University of Glasgow, and produce to the Senatus evidence of satisfactory progress in the special study undertaken by them during that period.

(3) That a period of not less than five years shall have elapsed from the date of the graduation required in sub-section (1) of this section.

IX. All candidates for the degree of Doctor of Letters shall present a thesis or a published memoir or work, which shall be an original contribution to learning in relation to literature or to philosophy, to be approved by the Senatus on the recommendation of a Special Committee appointed by the Senatus ; provided that, if required by the Senatus, a candidate shall also be bound to pass such an examination, conducted orally or otherwise, on the subjects of his special study, or his thesis, or memoir or work, as may from time to time be determined. The thesis or memoir or work shall be accompanied by a declaration signed by the candidate that it has been composed by himself. If the thesis has not already been published, it shall be published by the candidate in such a manner as the Senatus shall approve, and a copy thereof shall be deposited by the candidate in the University Library.

X. Notwithstanding, and in supplement of the provisions of Ordinance No. 13 (General, No. 8—Regulations as to Examinations), Sections XIV and XV, the Senatus shall appoint such Professors or Lecturers in the University as it may think suitable to examine the theses and to conduct the examination of candidates who may offer themselves under

the provisions of Ordinance No. 12 (General, No. 7, Regulations for Degrees in Science) or of Ordinance No. 23, Glasgow No. 2—Regulations for Degrees in Engineering, Science or of this Ordinance, for the degree of Doctor of Letters...; and the University Court shall, after consultation with the Senatus, appoint one or more additional Examiners to act along with them in adjudicating on the merits of the candidates. Every such additional Examiner shall be a person of recognised eminence in the subject of the thesis or memoir or work which is to be submitted for approval, and may be a Professor or Lecturer in any Scottish University other than the University of Glasgow. The result of the examination and adjudication shall be reported to the appropriate Faculty or Special Committee of Senatus, who shall if they think fit make a recommendation thereon to the Senatus; and no candidate shall be approved for the degree unless the Senatus is satisfied that his work is of distinction as a record of original research undertaken by himself, or of important engineering work designed by himself and actually carried out, or as an original contribution to learning.

SUPPLEMENTARY REGULATIONS

1. The thesis should be presented in the form of a single memoir or writing containing a connected account of the candidate's research or work. Detached papers under various headings will not be regarded as a sufficient substitute, unless they are accompanied by a separate statement, composed by the candidate, giving a full account of the methods, results and conclusions of the research or work on which his candidature is based.

Along with this thesis each candidate must submit a résumé of it, stating what is claimed as original in it, and a bibliography.

2. Only in exceptional circumstances and with the express permission of the Senatus may a thesis not already printed and published be submitted for the degree.

3. Candidates who have been awarded a Certificate of Proficiency in the subjects of an Honours Group will be regarded as having "passed the Examination in an Honours Group" for the purpose of proceeding to the degree of D.Litt.

4. The copies of theses submitted by candidates, whether the theses are approved for the degree or not, shall become the property of the University.

2. DEGREE OF DOCTOR OF MUSIC

The Degree of Doctor of Music was instituted by Ordinance CLXXIII (Glasgow No. 42); the following are the sections of that Ordinance which govern the award of the Degree.

XL (1) Bachelors of Music of the University of Glasgow, who have taken Honours either before or after graduation, may offer themselves for the degree of Doctor of Music (D.Mus.), after the expiry of five years from the date of their graduation.

(2) Bachelors of Music of other Universities recognised for the purpose by the University Court after consultation with the Senatus may offer themselves for the degree of Doctor of Music, after the expiry of

five years from the date of their graduation, provided they have spent not less than three years as Research Students in the University of Glasgow, under Ordinance No. 61 (General, No. 23), and produce to the Senatus evidence of satisfactory progress in the special study undertaken by them during that period.

XII. The Degree shall be given in three Departments, and candidates may present themselves in one or more of these Departments.

• The Departments shall be those of :

- (a) Composers ;
- (b) Executants ;
- (c) Theorists or Historians.

Composers

XIII. (1) Candidates for the Degree of Doctor of Music as Composers shall submit a prescribed number of original works in accordance with regulations to be prescribed by the Senatus.

Compositions must be accompanied by a declaration signed by the candidate that they are his own unaided work, and that no portion has been submitted previously to any University.

(2) Candidates in this department shall also be examined in the following subjects :

- (a) Eight-part Harmony and Counterpoint ;
- (b) Canon and Double Counterpoint in four parts, and Fugue in five parts ;
- (c) Scoring for full Orchestra ;
- (d) Historical Knowledge.

Executants

XIV. (1) Candidates for the Degree of Doctor of Music as Executants shall be required to pass a test of a wide repertoire of concert works in accordance with regulations to be prescribed by the Senatus.

(2) Candidates in this department must also qualify for the optional subject set forth in VI (8), and may also be required to pass an examination in any or all of the subjects prescribed for candidates for the Degree of Doctor of Music as Composers in accordance with regulations to be prescribed by the Senatus.

Theorists or Historians

XV. (1) Candidates for the Degree of Doctor of Music as Theorists or Historians shall present, in accordance with regulations to be prescribed by the Senatus, one or more treatise on Theoretical or Historical subjects. Such treatises must be the result of original thought and research, not merely abstracts or compilations of existing works.

Each treatise must be accompanied by a declaration signed by the candidate that it is his own unaided work and that it has not been submitted to any other University.

(2) Candidates in this department may also be required to pass an examination in any or all of the subjects prescribed for candidates for the Degree of Doctor of Music as Composers, in accordance with regulations to be prescribed by the Senatus.

SUPPLEMENTARY REGULATIONS

1. **Executants.** Each candidate must submit, not later than six weeks before the examination, an extensive list of works which he professes ; if the list is approved, he will be informed, a month before the examination, of not more than four works which he will be required to perform. Violinists and violoncellists must include one or more of the unaccompanied sonatas or suites of J. S. Bach ; candidates who profess instruments other than pianoforte, violin, violoncello or organ must include concertos and chamber works ; vocalists must include rôles in opera and oratorio.

2. **Theorists and Historians.** Before submitting a treatise, candidates must submit a précis indicating its scope and general character ; a treatise may not be submitted until the précis has been approved.

3. DEGREE OF DOCTOR OF MEDICINE

The following regulations for the award of the degree of Doctor of Medicine are contained in Ordinance XXXI (Glasgow No. 9).

XXII. (1) Subject to the conditions hereinafter specified, the Degree of Doctor of Medicine may be conferred on any candidate who has obtained the Degrees of Bachelor of Medicine and Bachelor of Surgery of the University of Glasgow, and is of the age of twenty-four years or upwards, and has produced a certificate showing that, after having received the degrees of Bachelor of Medicine and Bachelor of Surgery, he has been engaged for at least one year in attending the Medical Wards of a Hospital or in scientific work bearing directly on his profession, such as is conducted in the Research Laboratories of the University, or in the Naval, Military, Colonial, or Public Health Medical Services, or has been engaged for at least two years in Practice other than Practice restricted to Surgery.

(2) Each candidate for the degree of Doctor of Medicine shall be required to pass an examination in Clinical Medicine or in such special department of Medical Science or Practice professed by the candidate as the Senatus, on the recommendation of the Faculty of Medicine, may approve ; and he may be admitted to the examination at such time, not sooner than one year after he has received the degrees of Bachelor of Medicine and Bachelor of Surgery, as the Senatus may appoint for the purpose.

(3) Each candidate for the degree of Doctor of Medicine shall submit for the approval of the Faculty of Medicine a thesis on any branch of knowledge, comprised in the several divisions of the Examination for the degrees of Bachelor of Medicine and Bachelor of Surgery, which he may have made a subject of special study, excepting a subject that is exclusively surgical ; and the thesis, accompanied by a declaration signed by the candidate that the work has been done and the thesis composed by himself, shall be lodged with the Dean of the Faculty of Medicine on or before a date to be fixed by the Senatus. The faculty may, if it sees fit, before approving the thesis, require the candidate to present himself for oral or other examination on the subject-matter thereof. If the thesis is, in the judgment of the Faculty, of special merit, the Senatus may, on the recommendation of the Faculty, exempt the

candidate from the whole or part of the examination prescribed in sub-section 2 of this Section.

(4) A Bachelor of Medicine and Bachelor of Surgery, who produces to the Senatus satisfactory evidence of his intention of entering within twelve months after obtaining such degrees on the practice of his profession in a British Possession or Colony, or in a Foreign Country, may, under such conditions as the Senatus may from time to time prescribe, be admitted to the examination in Clinical Medicine or in a special department of Medical Science or Practice prescribed in sub-section 2 of this Section at such time after he has received such degrees as the Senatus may appoint for the purpose: provided always that in special circumstances the Senatus may, if it sees fit, on the recommendation of the Faculty of Medicine, exempt him from the whole or part of the Examination; but the degree of Doctor of Medicine shall not be conferred on him unless he shall produce a certificate showing that, after having received the degrees of Bachelor of Medicine and Bachelor of Surgery, he has been engaged for at least one year in attending the Medical Wards of a Hospital or in scientific work bearing directly on his profession, such as is conducted in the Research Laboratories of the University, or in the Naval, Military, Colonial or Public Health Medical Services, or for at least two years in Practice other than Practice restricted to Surgery, and unless his thesis, in the judgment of the Faculty of Medicine, is of special merit.

SUPPLEMENTARY REGULATIONS

1. The Examination in Clinical Medicine shall for each candidate consist of a written Report and Commentary, with any oral questions that may be considered desirable, upon at least three medical cases. In the selection of the cases, special regard shall be given to the opportunities they afford for testing the candidate, not only in the ordinary methods of clinical investigation, but also in the more advanced methods requiring practical knowledge in the applications of the ophthalmoscope and laryngoscope, the chemical and microscopical examinations of excreta, the quantitative determination and microscopic characters of the chief constituents of blood possessing clinical importance, the recording by instruments of the condition of the circulation, and the applications of electricity.

A candidate who elects to be examined in a special department of Medical Science or Practice will be expected to show high proficiency in it. The special departments from which the subject of examination may be selected are the following:

- Diseases of Women;
- Diseases of Children;
- Mental Diseases;
- Zymotic Diseases;
- Diseases of the Eye;
- Diseases of the Throat;
- Diseases of the Ear;
- Diseases of the Skin;
- Midwifery;
- Tropical Diseases.

The Clinical Examinations will be held twice in each year, about the

middle of September and about the middle of March. Candidates are required to enter their names not later than 15th August for the September, and not later than 15th February, for the March Examinations. Entry forms may be obtained from the Registrar.

2. No thesis will be approved unless it gives evidence of original observation, or, if it deals with the researches of others, gives a full statement of the literature of its subject with accurate references and critical investigation of the views or facts cited : mere compilations will in no case be accepted.

A thesis submitted for the degree must be a dissertation written for the purpose, provided that the results of original observations already published in medical or scientific journals or in the transactions of learned societies or otherwise may be accepted in place of such a dissertation.

3. The subject-matter of the thesis submitted by a candidate who elects to be examined in a special department of Medical Science or Practice must be cognate to that special department.

4. Three grades of distinction are awarded for the excellence of theses submitted for the degree—Commendation, High Commendation and Honours. A candidate who has been awarded Honours for his thesis will be exempted from the clinical examination prescribed in sub-section 2 above.

5. The copies of theses submitted by candidates, whether the theses are approved for the degree or not, shall become the property of the University.

4. DEGREE OF MASTER OF SURGERY

The following regulations for the award of the degree of Master of Surgery are contained in Ordinance XXXI (Glasgow No. 9).

XXIII. (1) Subject to the conditions hereinafter specified the degree of Master of Surgery may be conferred on any candidate who has obtained the degrees of Bachelor of Medicine and Bachelor of Surgery of the University of Glasgow, and is of the age of twenty-four years or upwards, and has produced a certificate showing that, after having received the degrees of a Bachelor of Medicine and Bachelor of Surgery, he has been engaged for at least one year in attending the Surgical Wards of a Hospital or in scientific work bearing directly on his profession, such as is conducted in the Research Laboratories of the University, or in the Naval, Military, or Colonial Medical Services, or has been engaged for at least two years in Practice other than Practice restricted to Medicine.

(2) Each candidate for the degree of Master of Surgery shall be required to pass an examination in the following subjects: Surgical Anatomy, Operations upon the dead body, and Clinical Surgery or such special department of Surgery professed by the candidate as the Senatus, on the recommendation of the Faculty of Medicine, may approve ; and he may be admitted to the examination at such time, not sooner than one year after he has received the degrees of Bachelor of Medicine and Bachelor of Surgery, as the Senatus may appoint for the purpose.

(3) Each candidate for the degree of Master of Surgery shall submit for the approval of the Faculty of Medicine a thesis on any branch of knowledge, comprised in the several divisions of the Examination for

the degrees of Bachelor of Medicine and Bachelor of Surgery, which he may have made a subject of special study, excepting a subject that is exclusively medical; and the thesis, accompanied by a declaration signed by the candidate that the work has been done and the thesis composed by himself, shall be lodged with the Dean of the Faculty of Medicine on or before a date to be fixed by the Senatus. The Faculty may, if it sees fit, before approving the thesis, require the candidate to present himself for oral or other examination on the subject-matter thereof. If the thesis is, in the judgment of the Faculty, of special merit, the Senatus may, on the recommendation of the Faculty, exempt the candidate from the whole or part of the examination prescribed in sub-section 2 of this Section.

(4) A Bachelor of Medicine and Bachelor of Surgery who produces to the Senatus satisfactory evidence of his intention of entering within twelve months after obtaining such degrees on the practice of his profession in a British Possession or Colony, or in a Foreign Country, may, under such conditions as the Senatus may from time to time prescribe, be admitted to the examination in the subjects specified in sub-section 2 of this Section, at such time after he has received such degrees as the Senatus may appoint for the purpose: provided always that in special circumstances the Senatus may, if it sees fit, on the recommendation of the Faculty of Medicine, exempt him from the whole or part of the examination; but the degree of Master of Surgery shall not be conferred on him unless he shall produce a certificate showing that, after having received the degrees of Bachelor of Medicine and Bachelor of Surgery, he has been engaged for at least one year in attending the Surgical Wards of a Hospital or in scientific work bearing directly on his profession, such as is conducted in the Research Laboratories of the University, or in the Naval, Military, or Colonial Medical Services, or for at least two years in Practice other than Practice restricted to Medicine, and unless his thesis in the judgment of the Faculty of Medicine is of special merit.

SUPPLEMENTARY REGULATIONS

1. The Examination in Clinical Surgery shall for each candidate consist of a written Report and Commentary, with any oral questions that may be considered desirable on at least three surgical cases.

One of the three surgical cases on which a candidate is examined shall, if the candidate on entering his name for the Examination declares a wish to that effect, be from one of the following departments, namely, Surgical Diseases of Women, Diseases of the Throat, Diseases of the Eye, Diseases of the Ear. Should the candidate specialise in one of these departments he will be expected to show high proficiency in it.

The Clinical Examination will be held twice in each year, about the middle of September and about the middle of March. Candidates must enter their names not later than 16th August for the September, and not later than 15th February for the March Examination. Entry forms may be obtained from the Registrar.

2. Three grades of distinction are awarded for the excellence of theses submitted for the degree—Commendation, High Commendation and Honours. A candidate who has been awarded Honours for his thesis will be exempted from the clinical examination prescribed in sub-section 2 above.

5. DEGREE OF DOCTOR OF SCIENCE

The degree of Doctor of Science is awarded under Ordinance XXVI (Glasgow No. 7), which came into force in September, 1908. The following are the relevant provisions of that Ordinance, with the amendments made in subsequent Ordinances.

I. Graduates who have obtained any degree in the University of Glasgow, and who have either before or after graduation passed the Examination in an Honours Group for the degree in Arts, or the Final Science Examination for the degree in Pure Science or in Engineering with Honours, may offer themselves for the degree of Doctor of Science (D.Sc.) after the expiry of five years from the date of their graduation.

II. Research Students within the meaning of Ordinance No. 61 (General No. 23—Regulations for the Encouragement of Special Study and Research and for the Appointment of Research Fellows), who have prosecuted in the University of Glasgow (or in a College affiliated thereto) some special study or research under that Ordinance, may offer themselves for the degree of Doctor of Science: provided:

(1) That they have obtained a degree in any Scottish University, or a degree in another University specially recognised by the University Court for the purpose of this section which the Senatus shall deem to be equivalent to the corresponding degree in the University of Glasgow; and provided that candidates who have obtained any such degree in a University outside the United Kingdom so recognised may be required, if the Senatus think fit, before beginning their course as Research Students with a view to the degree of Doctor of Science, to pass an examination equivalent to an Honours or to a Final Science Examination in a group of subjects cognate to their line of work as Research Students.

(2) That they have spent not less than two terms in each of two academic years, or an equivalent period, as Research Students in the University of Glasgow (or in a College affiliated thereto), and that they produce to the Senatus evidence of satisfactory progress in the special study or research undertaken by them during that period.

(3) That a period of not less than five years shall have elapsed from the date of the graduation required in subsection (1) of this section.

III. All candidates for the degree of Doctor of Science shall present a thesis or a published memoir or work, to be approved by the Senatus on the recommendation of the Faculty of Science; provided that, if required by the Senatus, the candidate shall also be bound to pass such an examination conducted orally or practically, or by written papers, or by all of these methods, on the subjects of his special study or of his thesis, memoir, or work, as may from time to time be determined. The thesis shall be a record of original research in relation to science undertaken by the candidate, or of some important engineering work designed by the candidate and actually carried out, and shall be accompanied by a declaration signed by him that the work has been done and the thesis composed by himself. If the thesis has not already been published, it shall be published by the candidate in such manner as the Senatus shall approve, and a copy thereof shall be deposited by the candidate in the University Library.

X. Notwithstanding, and in supplement of the provisions of Ordinance No. 13 (General, No. 8—Regulations as to Examinations), Sections XIV and XV, the Senatus shall appoint such Professors or Lecturers in the University as it may think suitable to examine the theses and to conduct the examination of candidates who may offer themselves under the provisions of Ordinance No. 12 (General, No. 7—Regulations for Degrees in Science) or of Ordinance No. 23 Glasgow, No. 2—Regulations for Degrees in Engineering Science, or of this Ordinance, for the degree of Doctor of Science . . . ; and the University Court shall, after consultation with the Senatus, appoint one or more additional Examiners to act along with them in adjudicating on the merits of the candidates. Every such additional Examiner shall be a person of recognized eminence in the subject of the thesis or memoir or work which is to be submitted for approval, and may be a Professor or Lecturer in any Scottish University other than the University of Glasgow. The result of the examination and adjudication shall be reported to the appropriate Faculty or Special Committee of Senatus, who shall if they think fit make a recommendation thereon to the Senatus; and no candidate shall be approved for the degree unless the Senatus is satisfied that his work is of distinction as a record of original research undertaken by himself, or of important engineering work designed by himself and actually carried out, or as an original contribution to learning.

SUPPLEMENTARY REGULATIONS

1. The thesis should be presented in the form of a single memoir or writing containing a connected account of the candidate's research or work. Detached papers under various headings will not be regarded as a sufficient substitute, unless they are accompanied by a separate statement, composed by the candidate, giving a full account of the methods, results, and conclusions of the research or work on which his candidature is based.

2. A thesis presented for the degree of Doctor of Science in Engineering must be a record of original research undertaken by the candidate, or of important engineering work designed by himself and actually carried out, and must be accompanied by a declaration signed by him that these conditions have been satisfied. "Important engineering work" has been defined by the Senatus as work involving the application of some new scientific principle, or a new application of known scientific principles, to engineering design and/or construction; work carried out on more or less standard lines, however large, useful or successful it may be, will not be regarded as falling within this category.

3. Each candidate must submit two copies of his thesis: both copies, whether the thesis is approved for the degree or not, shall become the property of the University.

4. Every candidate whose thesis has been approved for the degree must, before the degree is conferred upon him, furnish the University with a number of copies of his thesis, to be fixed in each case by the Senatus. These copies must be either printed or satisfactorily multiplied from a typewritten copy.

5. It is advisable that a candidate should have published the main original features of his thesis before submitting it for the degree.

6. Candidates who have been awarded a Certificate of Proficiency in the subjects of an Honours Group will be regarded as having "passed the Examination in an Honours Group" for the purpose of preceding to the degree of D.Sc.

6. DEGREE OF DOCTOR OF SCIENCE IN PUBLIC HEALTH

The regulations for the award of the degree of Doctor of Science in Public Health are contained in Ordinance VI (Glasgow No. 2), which came into force in May, 1903. The relevant provisions of the Ordinance are :

X. Graduates who have held the degree of Bachelor of Science in Public Health from the University of Glasgow for a term of five years, may offer themselves for the degree of Doctor of Science in Public Health in the said University.

XI. Each candidate for the degree of Doctor of Science in Public Health shall present a thesis or a published memoir or work to be approved by the Senatus, on the recommendation of the Faculty of Science, and shall also be required to pass an examination in Public Health, and in such of its special departments as the Senatus, with the approval of the University Court, by regulations framed from time to time, shall determine.

The thesis, or published memoir or work, shall be a record of original research undertaken by the candidate, and shall be accompanied by a declaration, signed by him, that the work has been done, and the thesis or memoir composed, by himself.

XII. The Senatus Academicus shall appoint such Professors or Lecturers as it may think suitable to conduct the examination of candidates who may offer themselves under the provisions of this Ordinance for the degree of Doctor of Science, and the University Court shall, after consultation with the Senatus Academicus, appoint such additional Examiners as they deem necessary to act along with them. Such additional Examiners shall be persons of recognised eminence in the subject of the thesis, or memoir, or work which is to be submitted for approval, and may be Professors or Lecturers in any Scottish University other than the University of Glasgow.

XIII. The thesis, memoir, or work submitted by a candidate for the degrees of Doctor of Science shall in each case be examined by the additional Examiner to be appointed by the University Court, as well as by the Examiners to be appointed by the Senatus under the provisions of Section XII of this Ordinance.

XIV. The result of the examination of the thesis, memoir, or work submitted by a candidate, as well as the result of the Examination prescribed under Section XI of this Ordinance, shall be reported to the Faculty of Science.

7. DEGREE OF DOCTOR OF PHILOSOPHY

The degree of Doctor of Philosophy was instituted by Ordinance LXXIV (Glasgow No. 21), which came into force in October, 1919. The relevant provisions of the Ordinance are as follows :

II. Research Students within the meaning of Ordinance No. 61 (General No. 23), who have prosecuted in the University of Glasgow, or in a College affiliated thereto, a course of special study or research in accordance with the provisions of that Ordinance, may offer themselves for the degree of Doctor of Philosophy, under the following conditions, namely—

(1) That they have obtained a degree in any Scottish University, or in another University or College specially recognised for the purpose of this Section by the University Court on the recommendation of the Senatus : provided always that a diploma or certificate recognised in like manner as equivalent to a degree may be accepted in place of a degree.

(2) That they have prosecuted a course of special study or research during a period of three academical years as Research Students in the University of Glasgow, or in a College affiliated thereto, and that they produce to the Senatus evidence of satisfactory progress in the special study or research undertaken by them during that period : provided always that the Senatus shall have power, in exceptional cases, to reduce the period to two academical years, and to permit a Research Student during part of the period to prosecute elsewhere his special study or research.

III. All candidates for the degree of Doctor of Philosophy shall present a thesis to be approved by the Senatus on the recommendation of a Special Committee appointed by the Senatus. The thesis shall embody the results of the candidate's special study or research, and shall be accompanied by a declaration signed by the candidate that it has been composed by himself. The Special Committee shall always include the Professor or other Head of a Department who has been appointed by the Senatus to supervise the candidate's work as a Research Student.

The University Court may, on the recommendation of the Senatus, appoint one or more additional Examiners to act along with the Special Committee in adjudicating on the merits of the thesis. The Senatus may, on the recommendation of the Special Committee, require the candidate to present himself for oral or other examination on the subject-matter of his thesis. A copy of the thesis, if approved, shall be deposited by the candidate in the University Library.

SUPPLEMENTARY REGULATIONS

1. The Senatus does not recognise as a Research Student for the purposes of the degree of Ph.D. in the Faculty of Arts any applicant who is prevented by professional or other duties from devoting the major part of his day during term-time to the object of his research.

2. All copies of theses submitted by candidates, whether the theses are approved for the degree or not, shall become the property of the University. Candidates in Science and in Engineering are required to

submit two copies of the thesis : both copies become the property of the University.

3. In submitting a thesis a candidate must state, generally in the preface and specifically in the notes, the sources from which his information is derived, the extent to which he has availed himself of the work of others, and the portions of his thesis which he claims as original.

RESEARCH STUDENTS

The following are the provisions of Ordinance No. 61 (General No. 23), by which the admission of Research Students is controlled :

I. It shall be in the power of the Senatus Academicus in each University, with the approval of the University Court, to make regulations under which graduates of Scottish Universities or of other Universities recognised by the University Court for the purposes of this Ordinance, or other persons who have given satisfactory proof of general education and of fitness to engage in some special study or research, may be admitted to prosecute such study or research in the University [or in a College affiliated thereto].

II. It shall be the duty of the Senatus Academicus in each University :

- (1) To receive and decide upon all applications for admission to prosecute special study or research ;
- (2) To prepare a list of all persons so admitted (hereinafter referred to as Research Students) ;
- (3) To make regulations for the supervision of their work ;
- (4) To satisfy themselves from time to time that the Research Students are carrying on their work in the University in a satisfactory manner ;
- (5) To suspend or exclude from any course any student whose conduct or progress is unsatisfactory.

III. Every applicant for admission must send in to the Senatus Academicus a written application stating any degree or other distinction which he has already obtained, the line of study or research which he wishes to prosecute, and the probable period of its duration, together with evidence as to his character, capacity, and general qualifications.

IV. Any application for admission shall be in the first instance referred by the Senatus Academicus to the appropriate Faculty, or to a Committee appointed by the Senatus ; one member of the Committee shall always be a Professor or Lecturer within whose department the proposed line of study or research falls. No applicant shall be recommended by the Faculty or the Committee who has not satisfied them by examination or otherwise that he is qualified to prosecute the proposed line of study or research, and further :

- (a) That his proposed line of study or research is a fit and proper one ;
- (b) That he possesses a good general education ;
- (c) That he is of good character ;
- (d) That he proposes to prosecute his studies or research during a period to be approved by the Senatus Academicus.

The Faculty or the Committee shall make a report to the Senatus

¹ Added by Ordinance XXXIX (Glasgow No. 12).

Academicus upon each application. It shall also be their duty, subject to the regulations of the Senatus Academicus, to provide for the supervision of the Research Student's work, and to report at least once a year to the Senatus as to his progress and conduct. The Senatus shall then determine whether he shall remain a Research Student.

V. Every Research Student shall be required to matriculate each year, paying the ordinary fee.

VI. Research Students shall have access to and the use of the University Laboratories and Museums, under such conditions as to payment and otherwise as the University Court, after consultation with the Senatus Academicus, may determine.

VII. The title of Research Fellow may be conferred by the Senatus Academicus, with the approval of the University Court, on Research Students who have shown special distinction. Such title shall not of itself confer any right to stipend, but it shall be in the power of the University Court to provide a stipend of such amount and for such period as it may think fit to any Research Fellow, under the powers of Section XI, sub-section 8, of Ordinances numbered 25 and 27, Section X, sub-section 8, of Ordinance numbered 26, and Section IV, sub-section 2, of Ordinance numbered 46.

VIII. (1) The Research Fellows shall be appointed as aforesaid after consideration of the report or reports submitted in terms of Section IV hereof.

(2) The title of Research Fellow may be conferred either at the commencement of the Research Student's course of study or research, or at any time during its progress, as the Senatus Academicus may determine.

(3) Research Fellows shall retain their title and stipend, if any, for the period during which they are engaged in special study or research in the University, and no longer.

(4) Research Students who have been appointed Research Fellows shall continue to be subject to the conditions above prescribed as to the supervision of their work, and the reports to be made thereon.

IX. Nothing herein contained shall prejudice the right of Research Students to such Fellowships, Scholarships, or prizes as may be open to them by Ordinance or Deed of Foundation.

X. The University Court may, subject to the provisions of Section XI, sub-section 8, of Ordinances numbered 25 and 27, Section X, sub-section 8, of Ordinance numbered 26, and Section IV, sub-section 2, of Ordinance numbered 46, provide such sums as it may think fit in aid of the expenses of special study or Research.

SUPPLEMENTARY REGULATIONS

1. Application for admission to the status of Research Student must be made to the Clerk of Senate on the prescribed form.

2. A Research Student must in person report his attendance to the supervisor of his research, or to the Clerk of Senate, at least once a week in term-time, except during periods when, with the permission of the Senatus, he is prosecuting his special study or research elsewhere than in the University or in a College affiliated thereto.

3. A Research Student may, with the sanction of his supervisor, attend classes in the University as a Private Student (see p. 84) but he shall not

be eligible for prizes in classes so attended and his attendance shall not qualify for graduation.

4. Each Research Student who is carrying out his work in a laboratory shall make payment of a sum which is estimated by the Professor in charge of the laboratory as sufficient to cover the ordinary expenses incident to the Research Student's work. The cost of apparatus and material beyond what is included in the ordinary operations of the laboratory shall be charged to the Student, unless the Professor judges that such apparatus and material will be a useful addition to the laboratory. But it shall be in the power of each Professor to propose to the University Court in any particular case that these payments be remitted in whole or in part.

5. All papers arising out of work done in a laboratory shall be submitted before publication to the Professor in charge of the laboratory, and in all such papers, when they are published, a due recognition of the laboratory shall be inserted.

CARNEGIE TRUST FOR THE UNIVERSITIES OF SCOTLAND

ENDOWMENT OF POST-GRADUATE STUDY AND RESEARCH

The regulations governing the award by the Trust of Scholarships, Fellowships and Grants in aid of research, and the award by the University of Carnegie Teaching Fellowships to members of its teaching staff, are printed below. Nominations for Scholarships or Fellowships and applications for Grants must be lodged not later than 15th March with the Secretary of the Trust, Merchants' Hall, Hanover Street, Edinburgh, from whom forms may be obtained. All Scholarships, Fellowships and Grants awarded in any year will normally date from 1st October.

A student who has not graduated but expects to take a degree at the summer or autumn graduation may be nominated for a Scholarship or apply for a Research Grant in the preceding March, but will not be eligible to receive either until he has graduated.

I. SCHOLARSHIPS

(a) *In Science and Medicine ;*

(b) *In History, Economics and Modern Languages
and Literature*

I (a) A Scholar in Science or Medicine must be a graduate of a Scottish University who desires to devote himself to higher study and research in some department of science or medicine.

(b) A Scholar in History, Economics or Modern Languages and Literature must be a graduate of a Scottish University, preferably with Honours in at least one of the groups : History, Economic Science, English, Modern Languages and Literature, who desires, at home or abroad, to devote himself to higher study and investigation within the scope of these groups of study.

II. A Scholarship shall ordinarily be tenable for two years, the extension to a second year being dependent on the receipt of satisfactory reports by the Scholar and from his Supervisor on his work during the

first year ; but it may be renewed for a third year, if the Executive Committee deem this expedient, in which case the award is termed a Senior Scholarship.

III. A Scholarship shall be of the annual value of £150 for each of the two years for which it is ordinarily tenable. It may be extended to a third year, in which case the value will be £175 per annum. It shall be payable by quarterly instalments in advance, the second and subsequent instalments being payable on the receipt of a satisfactory report by the Scholar and a certificate from the authority under whose supervision the Scholar has been working. The Executive Committee reserve power to suspend or withhold payment, if not satisfied with the progress or conduct of the Scholar.

A Scholarship shall not be held along with any other scholarship or position of emolument, except with the sanction of the Executive Committee.

In the event of a candidate holding or obtaining any other scholarship or position of emolument, the Executive Committee may, in place of granting or continuing to grant a Carnegie Scholarship, supplement the amount of such scholarship or emolument so as to bring the income up to the value of the Carnegie Scholarship at least, the candidate thereby ranking, and coming under the same regulations, as a Carnegie Scholar.

IV. A Scholar shall ordinarily be expected to devote his whole time to the purpose for which the Scholarship is awarded. If he purposes to undertake other work during his tenure of the Scholarship, he must define such work precisely, and obtain the sanction of the Executive Committee.

V. A candidate must be nominated by a Professor or Lecturer in a Scottish University, or by a Teacher in Scotland recognised for the purpose of graduation by a Scottish University, under whose supervision, unless other supervision be approved by the Executive Committee, he shall work during his tenure of the Scholarship.

The Nomination Form, to be signed by the Nominator and the candidate, must contain information on the following points, all of which will be taken into consideration in estimating the relative claims of candidates :

(1) The age of the candidate, his career as a student, and his knowledge of modern languages.

(2) His special fitness for the work proposed.

(3) His programme of study and research during his tenure of the Scholarship ; and where and under whose supervision he proposes to work.

(4) Whether the candidate proposes to undertake other work during his tenure of the Scholarship ; and, if so, the character of the work proposed, and the demand on his time which it will involve.

(5) Whether the candidate holds, or expects to hold, any other scholarship or position of emolument ; and, if so, particulars of the amount and duration of such scholarship or emolument.

(6) The names of two or more authorities other than the Nominator, to whom the Executive Committee may refer as to the qualifications of the candidate.

The Nominator must, if required, satisfy the Executive Committee

that the candidate, if appointed to a Scholarship, will be provided with the facilities and supervision necessary for carrying out his programme of study and research, and that such information will be furnished on his progress and conduct as may seem expedient to the Executive Committee.

VI. By accepting a Scholarship a Scholar comes under an obligation to pursue the programme of research which has been approved by the Executive Committee, and to submit such reports on the progress of his work as the Executive Committee may require.

2. FELLOWSHIPS

(a) In Science and Medicine ;

(b) In History, Economics and Modern Languages and Literature

I (a) A Fellow in Science or Medicine must be a graduate of a Scottish University who has given evidence, preferably by work already published, of capability to advance science or medicine by original research, and who desires to devote himself further to this work.

(b) A Fellow in History, Economics or Modern Languages and Literature must be a graduate of a Scottish University, preferably with Honours in at least one of the groups : History, Economic Science, English, Modern Languages and Literature, who desires to investigate at first-hand, at home or abroad, some historical, social, economic, or educational problem or factor of modern civilisation, and who can give evidence by his previous career and general culture, and also preferably by work already published, of capability to advance knowledge by his proposed investigation.

II. A Fellowship shall ordinarily be tenable for two years, the extension to a second year being dependent on the receipt of a satisfactory report by the Fellow on his work during the first year ; but it may be renewed for a third year, if the Executive Committee deem this expedient.

III. A Fellowship shall be of the annual value of £250, exclusive of such special expenses in connection with his research as the Executive Committee may allow. Payment shall be made by half-yearly instalments in advance ; but the Executive Committee reserve power to suspend or withhold payment, if not satisfied with the progress or conduct of the Fellow.

A Fellowship shall not be held along with any other fellowship or position of emolument, except with the sanction of the Executive Committee.

In the event of a candidate holding or obtaining any other fellowship or position of emolument, the Executive Committee may, in place of granting or continuing to grant a Carnegie Fellowship, supplement the amount of such fellowship or emolument so as to bring the income up to £250 at least, the candidate thereby ranking, and coming under the same regulations, as a Carnegie Fellow.

IV. A Fellow shall ordinarily be expected to devote his whole time to the purpose for which the Fellowship is awarded. If he proposes to undertake other work during his tenure of the Fellowship, he must define such work precisely, and obtain the sanction of the Executive Committee.

V. A candidate must be nominated by a University Professor, or other Head of a University Department.

The Nomination Form, to be signed by the Nominator and the candidate, must contain information on the following points, all of which will be taken into consideration in estimating the relative claims of candidates :

(1) His age, his career as a student, and his knowledge of modern languages.

(2) His special fitness to conduct the research proposed, and his previous experience, along with any published accounts of work already done.

(3) His programme of research during his tenure of the Fellowship ; where he proposes to work ; and his prospective occupation after the Fellowship has expired.

(4) Whether he proposes to undertake other work during his tenure of the Fellowship ; and, if so, the character of the work proposed, and the demand on his time which it will involve.

(5) Whether he holds, or expects to hold, any other fellowship or position of emolument ; and, if so, particulars of the amount and duration of such fellowship or emolument.

(6) The names of two or more authorities, other than the Nominator, to whom the Executive Committee may refer as to his qualifications.

(7) An estimate, as detailed as is possible, of special expenses, if any, required in connection with the research he proposes to undertake.

VI. By accepting a Fellowship a Fellow comes under an obligation to submit such reports on the progress of his work as the Executive Committee may require.

The publication, in some form, of an account of the results of his research will be expected.

3. GRANTS IN AID OF RESEARCH

I. An applicant for a Research Grant must be a Scottish University Graduate resident in Scotland, or an actual member of the staff of one of the Universities or Colleges in Scotland receiving Grants from the Trust.

II. An applicant must furnish the Executive Committee with information on the following points, all of which will be taken into consideration in estimating the relative claims of applicants :

(1) His experience in research, with copies of or references to any published papers, or, if he has no papers to offer, with references to two or more authorities who are acquainted with his qualifications for research.

(2) The nature of the research in which he desires to engage, and the results expected to follow therefrom.

(3) The period over which the proposed research is likely to extend, and the approximate amount of time which he expects to be able to devote to it.

(4) A statement of special requirements for the proposed research, with a detailed estimate of the cost.

(5) Whether he has received, or is receiving, any grant from any other source for the same object; and if so, what results have already ensued from his investigations.

III. A Research Grant is not intended (1) to take the place of such provision as should be made by the University Courts out of the Grants for Permanent Equipment under the Scheme of "Grants for five years to the four Universities of Scotland," or (2) to provide minor apparatus or research materials or instruments which should form part of the equipment of a Laboratory appropriate to the investigation, or (3) to relieve periodicals of the normal charges involved in publishing the results of researches.

IV. Grants are not applicable to the payment of salaries, wages, or honoraria, except in so far as they may be assigned for a specific purpose, as, for example, the cost of preparing necessary illustrations as specified in the application and approved by the Executive Committee. Such illustrations may include drawings, photographs, or maps.

V. Grants in aid of illustration may be applied to defray the cost of the preparation of process blocks or other means of reproduction, and of the actual printing of the illustration, including any special paper necessary for the purpose, but they are not applicable to the cost of printing and publishing the letterpress of the publication unless, in exceptional cases, special tabular matter is required.

VI. Applications for Grants in aid of Laboratory research, or of the adequate publication of its results, must be made by the individual workers concerned, and Grants made for specific purposes to one worker cannot be utilised by another (whether in the same Laboratory or not), without the express consent of the Executive Committee.

VII. An application for a Grant to be used by two or more collaborators in the same research must be signed by each; but they shall appoint one of their number who shall be responsible for furnishing the report, for receiving and disbursing the money and in general for the conduct of the research.

VIII. By accepting a Grant an applicant comes under an obligation to pursue the programme of research which has been approved, and to send to the Executive Committee a report containing (a) a brief statement (not necessarily for publication) showing the results arrived at, or the stage which the inquiry has reached; (b) a statement of the expenditure incurred; and (c) copies of or references to any papers in which results of the research have been printed.

The Executive Committee expect that in every case the results of the research will be published in some form. Copies of the published records of all work carried out with the aid of a Grant must be forwarded to the Offices of the Trust without delay.

IX. Instruments of permanent value purchased by means of the Grant shall remain the property of the Trust, but at the conclusion of the research, or at such other time as the Executive Committee may determine, they shall be placed under the care and at the disposal of the institution in which the research has been conducted, provided that the Executive Committee may, if they see fit, request their return.

X. All Grants awarded in any year shall date from 1st October, unless expressly stated otherwise.

4. CARNEGIE TEACHING FELLOWSHIPS

The following are the conditions and regulations under which the Scottish Universities are authorised to award Carnegie Teaching Fellowships to persons appointed University Lecturers or Assistants and possessing certain qualifications as research workers, who undertake to devote not less than half their time to research.

I. The title shall be "Carnegie Teaching Fellowships".

II. The Fellowships shall be awarded only to Research workers whose qualifications are at least equivalent to those of Research Fellows, and who are to hold concurrently with their Fellowships University appointments as Lecturers or Assistants.

III. Appointments shall be annual, and shall not normally be renewed beyond a period of three years, and in any case not beyond five years.

IV. The names of those who hold these appointments in each University shall be entered officially in the University Calendar.

V. Each University shall intimate to the Trust, at as early a date as possible, (1) the name and qualifications of those whom they propose to hold appointments as Carnegie Teaching Fellows, (2) the programme of Research, and (3) the nature and extent of the teaching duties to be undertaken. The appointment of Carnegie Teaching Fellows shall be subject to confirmation by the Carnegie Trust, having due regard to these particulars.

VI. Persons holding these Fellowships shall devote not less than half their time to Research.

VII. Carnegie Teaching Fellows shall pursue the specified programme of Research, and shall submit such reports on the progress of their work as the Executive Committee of the Trust may require. It is expected that an account of the results of the Research will be published in some form.

VIII. The annual Grants to the Universities, out of which the proportion of salary borne by the Trust shall be paid, shall be continued for a period of five years, beginning with 1st October, 1937, and shall be as follows: To Glasgow, £1,500; to Edinburgh, £1,500; to St. Andrews, £1,200; to Aberdeen, £1,200. Any credit balance unexpended by a University, not exceeding £300, and any debit balance not exceeding £300, from one year shall be carried forward to the next until the period of five years has expired.

IX. Each University shall report annually in detail the manner in which the said Grants have been expended.

X. Awards shall not be utilised to make up a small salary for a young graduate entrusted with University teaching of minor importance. The salary for Carnegie Teaching Fellows shall be determined by the University concerned, and shall in no case be less than £350.

XI. The proportion of the salary to be borne by the Trust shall not exceed one-half.

XII. The advantages of the Scheme shall be available in all subjects admitted for Fellowships, Scholarships and Grants.

BURSARIES, SCHOLARSHIPS, FELLOWSHIPS AND PRIZES

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