The Stratigraphy and Archæology of the Late-Glacial and Post-Glacial Deposits at Brean Down, Somerset

By

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1. INTRODUCTION

The first writer to notice the deposits at Brean Down was the local historian, F. A. Knight, who wrote: "Against the southern side of the down . . . is a great heap of drifted sand, in which human bones are sometimes brought to light by rabbits . . . several complete skeletons have been found"; and "in the fissures on the south side there have been found many bones and antlers of Reindeer" (Knight, 1902, pp. 299, 308). Twenty years later Knight's daughter, Mrs. Dutton, published a pamphlet on the Down in which the deposits were again briefly mentioned, although they were referred to as "raised sea-beaches", a misleading term since no old beach material is present. She described how "just under the Old Man Rock, where a Peregrine will sometimes lose all patience and dash down screaming

towards an intruder during the nesting season, there is a face of hardened sand—part of the 'raised sea-beach'—bored by innumerable solitary wild bees . . ." (Dutton, 1921, p. 15). This sand is our layer 12.

Later work on the site has been carried out almost entirely by members of the Society. In a brief note in *Proceedings* in 1921 Dr. Cooper reported the finding of parts of five skeletons at an average depth of 4 ft., in what we now know to be the Dark Age cemetery, above a layer with "very coarse thick pottery" [i.e. Iron Age] (Cooper, 1921, p. 93). About ten years later a more detailed examination of the section was made by L. S. Palmer, who referred to it briefly in 1930 (p. 51) and 1931 (p. 351) and in 1934 (pp. 130–131) provided a fuller account in which many important features were noted for the first time. Palmer described the lower and upper breccias, separated by wind-blown sand, noted the bone bed (11)* in its correct stratigraphical position, and recorded that the upper breccia is succeeded by red sandy loam (8A) in which H. Taylor had found "Neolithic" pottery. Early Bronze Age and Iron Age pottery was recorded from successive levels in blown sand above the red sandy loam. Palmer suggested that the formation of the breccias was a result of "alternations of abnormal cold and excessive moisture", and that they were probably the equivalents of the Coombe Rock of Chalk districts in south-eastern England. The blown sands (on the basis of a detailed examination of the heavy minerals) were believed to have been transported for a considerable distance from the south. Palmer noted the similarity to breccias in similar situations in North Somerset, including the Portishead–Clevedon area and Worle Hill, Weston-super-Mare, and dated the group as a whole as middle to late Pleistocene, contemporary with Upper Palæolithic cultures.

The late H. E. Balch, in a table of the Pleistocene fauna of the Mendip area, listed Neolithic man, horse, red deer, reindeer, and (?) northern vole from "Brean Down Sands" (Balch, 1937, folding table). The horizon of the remains was not stated.

In September, 1936, a "B" Beaker burial in the surface of layer 8A was excavated by Dr. and Mrs. H. Taylor. Publication was delayed by the war and by the destruction of the Society's museum, but in due course the Taylors noted that the base of the Pleistocene deposits lies at an unknown depth below sea-level, and that upon them (i.e., upon the upper breccia) lies a red loam which "marks the damp climate of Neolithic times; whilst a yellow blown sand indicates the drier conditions of the Early Bronze Age. Above these are later sands. There was considerable occupation on many occasions, including the close of the Neolithic and the Beaker periods. The

* Numbers given thus (8A) in the text refer to the numbered layers of the Sand Cliff, site A.

foreshore is a nearly horizontal section of the deposits just as the sand-cliff is roughly a vertical one" (Taylor and Taylor, 1949, p. 88).

An intensive study of the section was begun in 1954. The paper also incorporates numerous finds and records made by members of the Society, especially H. Taylor, during the past thirty years.

ACKNOWLEDGEMENTS

Dr. A. P. A. Vink, of Wageningen, Holland, kindly undertook to have sedimentary analyses made. We are also indebted to Dr. Ian Cornwall, of the Institute of Archæology, and Mr. Derek Findlay, of the Soil Survey, for studying samples and for numerous discussions on the interpretation of the deposits. Dr. R. J. G. Savage has identified the animal bones, and Dr. M. P. Kerney and Sgt. P. Cambridge have provided identifications of molluscs. Mr. John Crickmay has carried out the greater part of the surveying and levelling. Numerous members of the Society have helped during the work and we wish to express our thanks to them. Finally, we are indebted to Mrs. E. M. Minter for drawing the pottery.

2. EROSION FEATURES ON THE DOWN

The headland of Brean Down lies immediately south of Weston-super-Mare, in Somerset. It is a ridge of Carboniferous Limestone, belonging geologically to the Mendip range but separated from it by the mouth of the river Axe, which, after following the southern flank of the Mendips, turns northward to cut through them at Uphill. The limestone of the Down dips towards the north, so that the ridge has an east–west elongation, being about 2,500 yards long but barely 500 yards across at the broadest point. On account of the dip of the rocks, the northern slopes are moderately even and vegetation-covered, while the southern side falls in a series of rocky bluffs, which are ancient sea-cliffs, separated by shelves partly covered by impenetrable brushwood (*Plate* 6). The erosion features traceable in the limestone are not the subject of this paper, but a brief reference to them is necessary. The lowest is a well-marked wave-cut platform, extending for 600 yards beyond the Fort at the west end of the Down, where it is known as Howe Rock, and traceable a short distance along the south side (*Fig.* 14). The inner limit of this platform lies at Ordnance Datum. The lower limit at Howe Rock has not been determined, but is probably below −20 ft. O.D. South of the Fort, however, the platform is preserved as a narrow remnant cut off to seaward by a steep bluff at only −5 ft. O.D. Followed eastward, the platform seems to disappear beneath a mass of boulders believed to belong to the lower breccia, and this interpretation is supported by a fine oblique air photograph (Steers, 1960, *Plate* 72). If this interpretation is right, the Howe Rock platform, although it lies partly

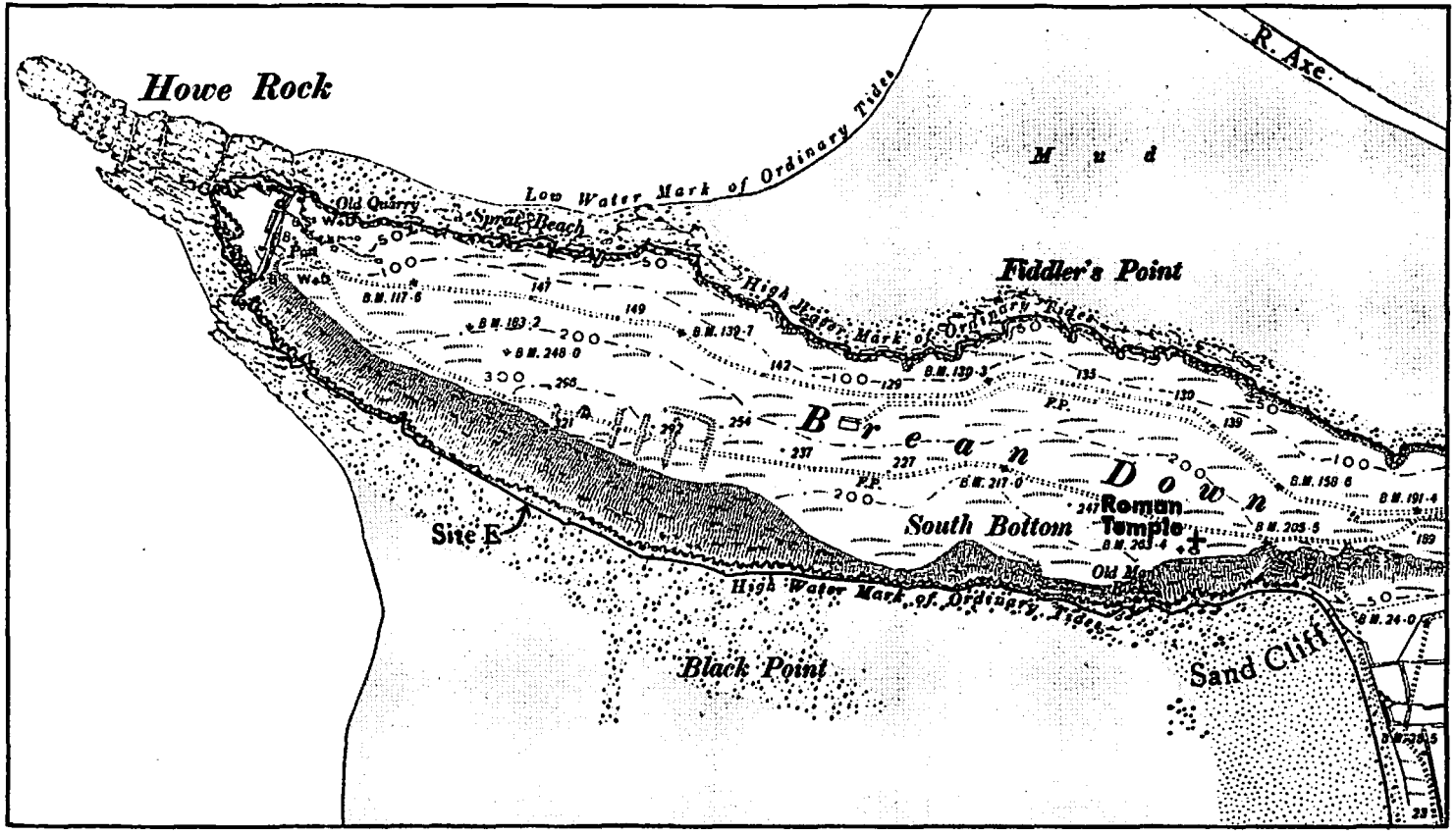


Fig. 14.—Plan of Brean Down. Scale 6 in. to 1 mile. Reproduced from the Ordnance Survey Six-Inch map, Somerset sheet XVI N.W., with the sanction of the Controller of H.M. Stationery Office. Crown Copyright reserved.

within the present tidal range, does not owe its existence to marine erosion at the present time. The hypothesis that it is an ancient feature is supported by the low level of its landward limit, for the present high tides range from +10½ ft. (Neaps) to +20 ft. (Springs), and authorities seem to agree that the landward sides of wave-cut platforms lie close to high-tide level.

The next well-marked level is seen as a rock platform between +40 and +47 ft. O.D., immediately west of the Fort, and can be traced much of the way along the north side of the Down, marking the boundary between the low limestone cliffs and the vegetation-covered slopes above (cf. Mackintosh, 1868).

On the south side of the Down the most prominent ancient cliff line has its base at about +70 ft. O.D., the steep slope below having probable traces of the 40–47 ft. level. Above this cliff a broad sloping shelf at about +120 to +140 ft. O.D. can be traced round the greater part of the Down. Still higher cliff lines are assumed to be related to erosion platforms found at various places on the Down. All these features are supposed, judging from their more degraded state, to be older than the low or Howe Rock platform and thus older than any of the deposits described in this paper.

The main series of Pleistocene deposits is preserved along the eastern third of the south face of the Down. Here the limestone cliff against which the deposits are banked reaches a height of about 120 ft. O.D. This cliff must clearly be older than any of the deposits and its formation is tentatively associated with the sea-level stage represented by the Howe Rock platform. Possible traces of an intermediate stage in this erosion are to be found between sites B and C (*see* p. 88, *below*), where the beds forming the foot of the visible cliff project in places to form a narrow shelf never more than 10 ft. wide. The surface of this discontinuous shelf coincides with the bedding of the limestone but is never more than 8–10 ft. above the back of the beach. In the same area some very worn spurs of limestone project a few feet in front of the cliff, rising up to 5 ft. above the beach and showing slight notching or rounding at present high-tide level. The appearance of these features suggests that they are the very degraded relics of a platform of marine abrasion whose landward limit was not less than 8–10 ft. above present high-tide mark.

Above and behind the top of the cliff lies a second very much degraded cliff line attributed to one or more of the high-sea-level phases mentioned above.

3. DESCRIPTION OF THE DEPOSITS

The deposits to be described were accumulated by three principal agencies, namely wind transport, physical weathering of the limestone, and colluvial action. There are no raised beaches, in spite of statements in earlier

accounts. The deposits may originally have extended the whole length of the cliff, but recent marine erosion has removed them from the greater part of its length. This erosion has produced a sand cliff, which is still receding, providing the principal section parallel to the direction of dip of the deposits and approximately at right angles to the line of the limestone cliff (site A). The principal section is complemented by a horizontal section formed by a wave-cut platform only partly covered by a thin veneer of recent beach material. It is supplemented by relics, which have escaped erosion, along the limestone cliff west of the sand cliff (sites B–E).

Site A. The Sand Cliff

(*Plate* 11 and *Fig.* 15)

Section on Sept. 15th, 1958

1. Turf and humus
2. Modern pebble bed and blown sand
3. Grey stony sand with cemetery
4. Iron Age sand
5. Blown sand
6. Bronze Age sand
7. Beaker sand
8. A. Red loam
   B–C. Upper breccia
9. Main sand
10. Silty sand
11. Middle breccia and bone bed
12. Stony silt
13. Lower breccia

The deposits banked up against the limestone cliff will be described from below upwards. Beds 13 to 8 have a depositional dip of about 25° to the south so that the lowest beds are exposed at the northern end of the section. Beds 7 to 1 show a lower dip at the southern end of the section, and level out southwards. At the northern end of the section the lowest point (reached by excavation) was +17 ft. O.D. and the highest point +120 ft. O.D.

The general section reproduced in *Plate* 11 was constructed from data obtained by plane tabling and levelling, projected on to a plane approximately at right angles to the line of the limestone cliff, and parallel to the calculated direction of dip of the deposits. The detailed sections (*Figs.* 16–21) are reduced from measured drawings made to a scale of 1 in. to 4 ft.

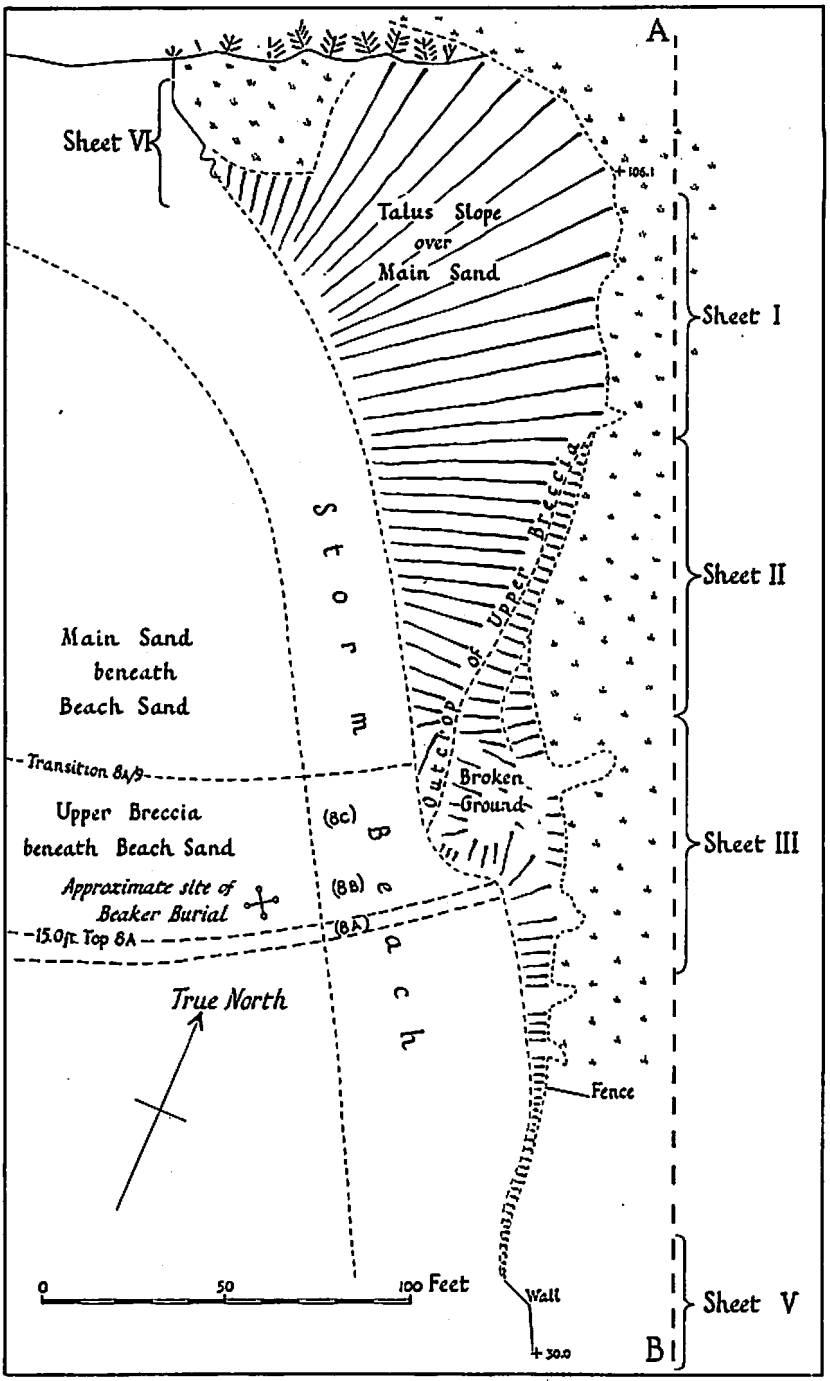


Fig. 15.—Plan of the Sand Cliff (site A), Brean Down. Line A - - - B represents the plane of projection of the sections.

Layer 13. *The Lower Breccia.* The layer is sometimes exposed in the beach to the west of the Sand Cliff, but is not at present seen in section. A pit was dug to expose it as shown in *Fig.* 16. The lowest layer reached (13D) consisted of limestone blocks up to 3×2 ft., with sharp angles and unweathered faces, and air spaces between them. There was no cementation. Above this was limestone breccia (13C) stained red, the majority of fragments being less than 2 in. across. It was loosely compacted, the interstitial material being mainly rock flour, as shown by thin sections which contained comparatively few, small quartz grains. The red staining was seen to be due to the presence of chocolate-brown coloured limonite in rounded concretions and as a coating to the mineral grains. The following fauna has been identified: Vole (*Microtus anglicus*), Arctic Fox (*Alopex lagopus*), Reindeer (*Rangifer tarandus*) and Aurochs or Bison.

The red-stained layer is capped by a thin grey horizon (13B), 6 to 9 in. thick, essentially similar to the material below except for the absence of iron staining. Layer 13A consisted of a strongly red-stained horizon 6 in. to 1 ft. thick. The possibility that this might be a fossil soil was discounted by microscopical examination which showed derived masses of yellow peptized iron hydroxide, as well as limonite concretions, and absence of any characteristic soil structure.

Layer 13 as exposed in our excavation is interpreted as the frost-weathered top of a boulder pile, here buried below the beach, but rising above it along the foot of the cliff to the west. Its occurrence there is described under sites C and D.

Layer 12. *Stony Silt* (*Plate* 8). The layer consists essentially of clayey silt with scattered sharp limestone fragments (12A and C) with an intercalation of stiff, silty clay (12B). The layer is comparatively hard and forms a vertical and, in places, overhanging face. The total thickness is approximately 12 ft.

Layer 12C commences with yellowish-brown (Munsell 7·5 YR 5/4)* clayey silt with about 25 per cent of particles over 2 mm. in size, but no large stones. The mechanical analysis is given in *Fig.* 34, p. 134. Several pieces of reindeer antler were found at the base of this horizon. Above this level the deposit close to the limestone cliff is red-stained and contains blocks up to 1 ft. long, and numerous smaller angular fragments of limestone. A mechanical analysis of the matrix of this material is given on p. 134. Above the red-stained brecciated zone the amount of limestone is reduced, and clayey bands appear, of the same character as 12B. Rodent remains, identified by Mr. M. A. C. Hinton as *Microtus nivalis* or an allied species, are frequent in the upper part of 12C, and fragments of larger bones are scattered through the deposit.

* All subsequent layer colour references are to Munsell.

Layer 12B is an intercalation of very tenacious, red-speckled, greenish (composite of reddish-brown 5 YR 4/3 and yellow-brown 10 YR 5/4) clay. The mechanical analysis (p. 134, No. 2) shows 45 per cent of clay grade material. Limestone fragments are absent, and so are animal bones.

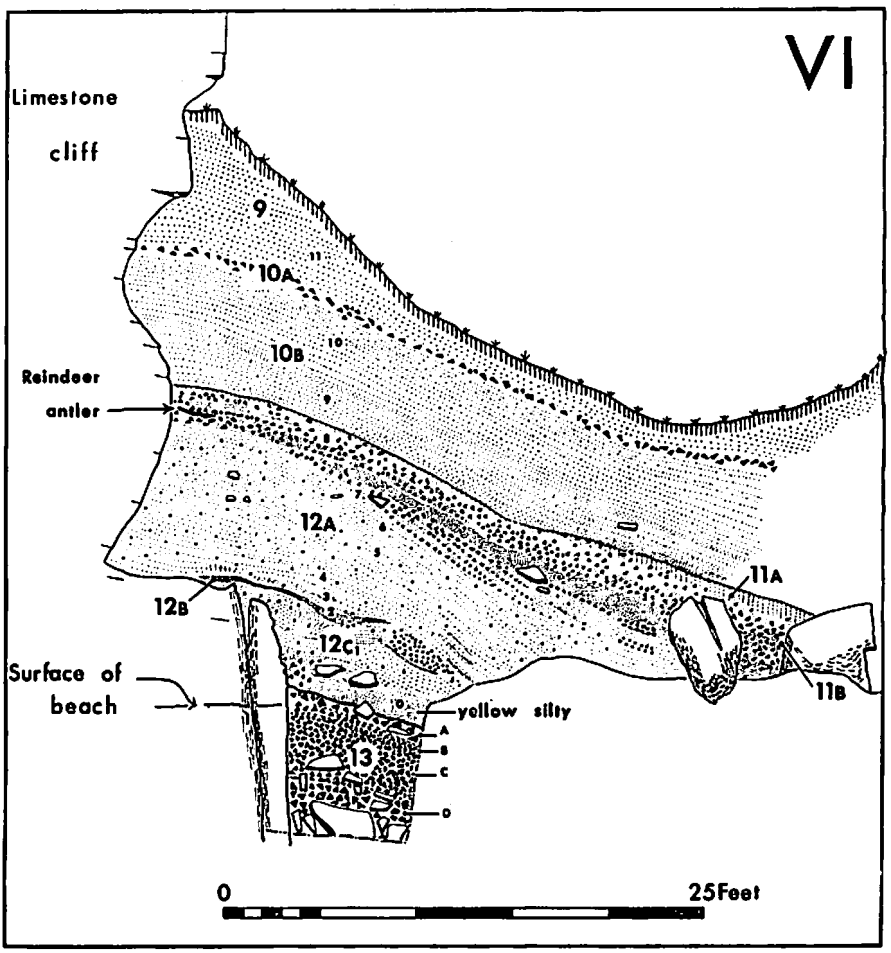


Fig. 16.—Brean Down Sand Cliff (site A): sheet VI. The small figures show the locations of samples referred to in *Figs.* 24, 34 and 35.

Layer 12A is fairly uniform in character, finely laminated with scattered sharp limestone fragments; these are seldom more than an inch or two in size, except in the uppermost 18 in. of the layer where larger fragments are conspicuous, arranged to some extent in layers parallel to the stratification. In the lowest part of the layer there are thin laminæ of material similar to

that composing 12B. Mechanical analyses at several levels (p. 134, Nos. 3–7) show sand, silt and clay grades in roughly equal amounts, the proportion varying somewhat, with an increase in the sand grade towards the top. The layer has yielded reindeer antler, bird bones and other bone fragments. In this layer and the succeeding one (11B) there is some cementation of limestone and bone fragments close to the cliff.

Layer 11. *The Middle Breccia and Bone Bed.* The layer is divided into two, 11B a sandy breccia, succeeded by 11A, the bone bed.

Layer 11B is a limestone breccia in loamy matrix, more sandy than the beds above or below. The rock fragments are generally less than 3 in. long. The junction with 12A is well defined close to the limestone cliff, but a few feet away the lower part of the breccia, which contains blocks up to 18 in. long, divides up into thin layers interleaved with very hard, compact 12A.

Layer 11A comprises the topmost few inches of the sandy breccia of 11B, coloured reddish and crowded with bones and bone fragments. Beyond a point 20 ft. south of the cliff, the following succession can be observed:—

10B. Silty sand as described below (p. 77).
10C. Pale yellow-brown silty sand as described below - - 2½–3 in.
11A. Bone bed, limestone breccia with reddish-grey matrix. The surface of this bed appears to have been slightly eroded and some stones of the breccia project slightly into 10C above, but no differential weathering of the surfaces of the topmost stones can be detected - - - - - to about 5 in.
11B. Limestone breccia as described above.

At about 30 ft. from the cliff the following subdivisions were noted in 1959 (the point lies between the two large boulders shown on *Fig.* 16):—

11A. Bone bed, chocolate-brown impure earthy sand with dark specks (of MnO_2 ?), very little limestone but contains angular bone fragments - - - - - - - - - 8 in.
11B. (i) Breccia, abundant angular limestone fragments about 2–3 in. with very hard, reddish-brown silty-sandy matrix, contains bone fragments - - - - - - - 1 ft. 4 in.
(ii) Breccia, mainly small closely packed fragments, fewer large pieces, matrix is paler, yellower than the layer above. No bone fragments were seen. There is a gradual transition to a less stony, silty-sandy layer below, perhaps really the top of layer 12A - - - - - - 1 ft. 5 in. or more

The limestone fragments in the bone bed are sharp as in the layers below. Much of the bone is fragmented but at the top of the layer, at some distance from the cliff, complete bones are found. Chemical and mechanical

analysis, and the microscopical examination of thin sections, suggest that this is an immature soil (*see* Appendix II, p. 133). The gross appearance of the layer supports this conclusion, as does the abundance of bones, suggesting that deposition ceased for some time.

Layer 11A has yielded the following vertebrate fauna: Lemmings (*Dicrostonyx gulielmi, D. henseli*), Varying Hare (*Lepus variabilis*), Arctic Fox (*Alopex lagopus*), Elephant (*Elephas* sp. ind.), Horse (*Equus caballus*), Reindeer (*Rangifer tarandus*) and indeterminate bird bones. There is a great predominance of horse and reindeer. Many of the limb bones have been split longitudinally, but observations at other Pleistocene sites suggest that this may occur naturally. Several bones show traces of human workmanship (*see* p. 131), but no recognizable artefacts are present.

A sample of layer 11 was washed by Dr. M. P. Kerney, who identified the following non-marine mollusca: *Pupilla muscorum* (L.) (185 examples), *Hygromia hispida* (L.) (8), *Agriolimax* cf. *agrestis* (L.) (5), *Limnæa truncatula* (Müller) (1), and *Succinea* (?) *oblonga* Draparnand (1 juvenile).

Another sample was washed by Sgt. P. Cambridge, who reports the following marine molluscs: *Macoma balthica* (L.) (fragments common), *Modiolus* or *Mytilus* sp. (few fragments), *Cardium* sp. (few fragments), *Lacuna crassior* Mont. (1), *Lora* sp. juv. (1), (?) *Phacoides* sp. (1); also one valve of the barnacle *Balanus* sp.

Layer 10. *Silty Sand.* The main mass of this bed is referred to as 10B, the upper limit being taken at a horizon of angular limestone debris numbered 10A.

The lowest part of the bed has been called 10C. This is a pale yellow-brown silt, in which the sand grade is finer and the bed as a result harder than 10B. The boundary between this layer and 11A below is sharp and 10C appears to have been deposited around and above stones projecting from the slightly eroded surface of the bone bed. The boundary between 10C and 10B is less sharp. The maximum thickness is 3 in.

Layer 10B is reddish brown in colour (5 YR 5/4) and similar in texture to layer 12A, but limestone fragments are rare. There is lamination, with bands of coarser and finer material. The mechanical analyses (p. 135) confirm that there is greater resemblance to layer 12A than to the succeeding sands of layer 9, which are very low in silt grade material. There is, however, an increase in the proportion of sand in the higher sample (No. 10) as against the lower (No. 9).

Layer 10A is a thin but persistent band of angular fragments, which do not, however, form a continuous layer of breccia. This band marks a textural change from silty and clayey sand below to dune sand above.

Layer 9. *Main Sand.* Orange-brown sand (7·5 YR 5/4) with very little fine material, containing white specks which are sometimes recognizable as

shell fragments. The thickness is between 50 and 60 ft. measured vertically on the projected section (*Plate* 11). Stratification is prominent and beautifully displayed by recent wind erosion and presumably is due to minor variations in composition, and locally shows dips greater than the average depositional dip of about 25°. Examination with a low-power microscope shows that occasional quartz grains are colourless, but the majority range from pink to orange. The grains are not well rounded. The analysis of a sample from near the bottom (No. 11, p. 135) shows an almost complete absence of silt, in contrast to 10B; another sample was taken about half-way up (No. 12). A few blocks of limestone are found in the layer near the cliff, but the main mass of it is stone-free.

In the upper part of the main sand are conspicuous seams of white calcareous matter. Most of these show a southerly dip of about 60°, while a smaller proportion lie along the bedding. In some places they form sheets, but they are often cylindrical, up to 1 in. or more in diameter, with smaller fibres branching off them. At the top of the Sand Cliff, one series descends vertically about 10 ft. from the top of the layer. Most of the seams lie in the uppermost 8 ft. of the sand, but a few descend much lower. The cylindrical structures appear to have been formed by the deposition of calcium carbonate along root systems of plants. The level from which the roots descended has not been recognized. They do not occur in the overlying breccia.

Layer 8B–C. *The Upper Breccia.* This layer is divided into two, the lower, 8C, is sandy breccia, succeeded by 8B, earthy breccia. Layer 8C is composed of sharp, angular limestone fragments in a reddish-yellow sandy matrix identical with 9. It is first visible about 25 ft. south of the limestone cliff where blocks of limestone from 8 in. to 1 ft. long appear in the top of the main sand (9). The layer thickens southward and in that part of the section represented by the right-hand half of sheet I there is a twofold division, the upper part being much less stony than the lower. Southwards this division is not maintained and in places the stone content is very small. Towards the right-hand side of sheet II the breccia increases in thickness. The southerly thickening in the area covered by sheet III is largely due to the appearance of bands of breccia in the uppermost part of the main sand. These bands thicken and coalesce southwards, merging into the base of the breccia. One sandy layer persists in the breccia for some distance. Limestone fragments are small and closely packed, with a few larger pieces up to about 15 in. long.

Layer 8B, the upper division of the breccia, consists of angular limestone fragments in a matrix of tough, fine, reddish, clayey, sandy earth. It is exposed on the slope above the limestone cliff where a footpath has been worn down to show up to 3 ft. of breccia resting on limestone. This deposit

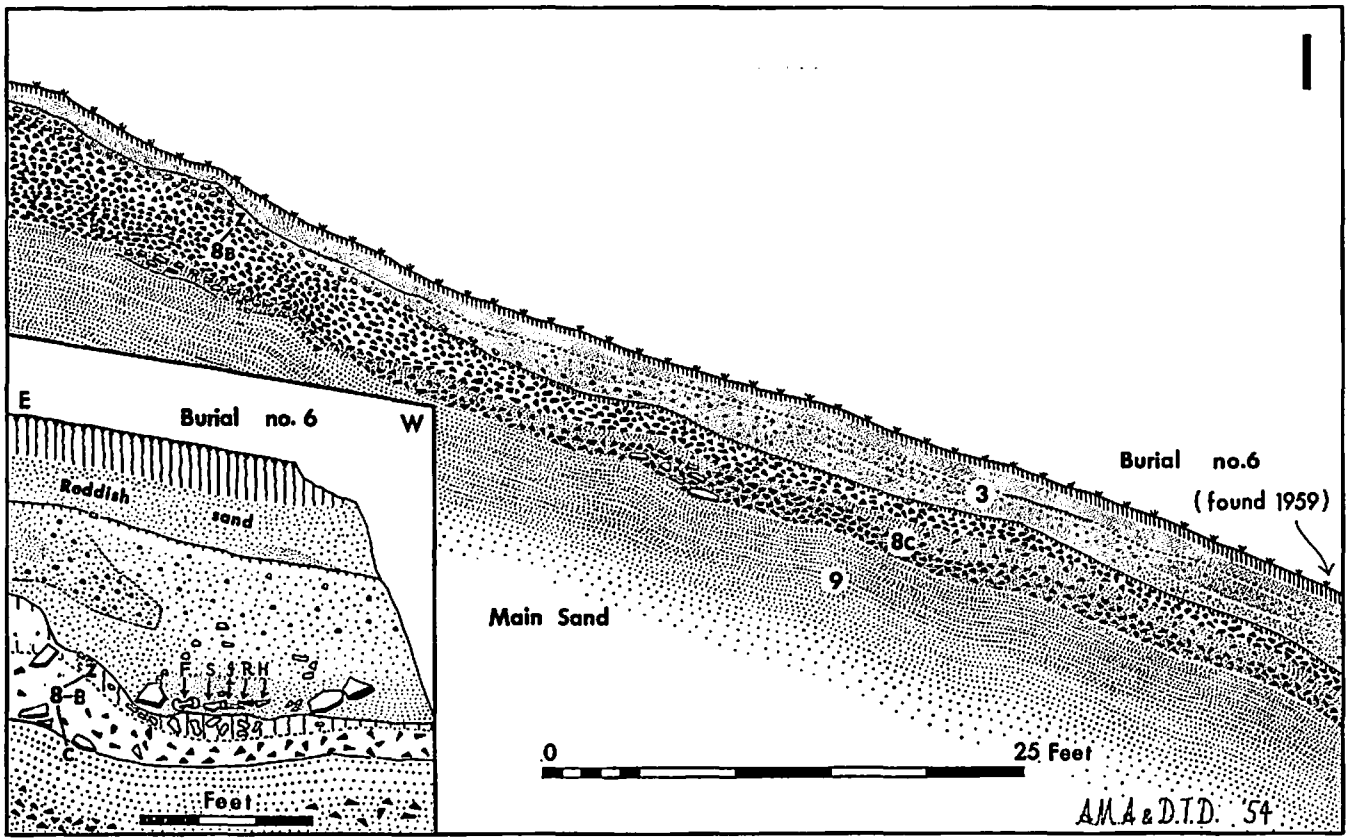


Fig. 17.—Brean Down Sand Cliff (site A): sheet I. Key to bones of burial No. 6: F = rt. femur, S = sacrum, I = innominate, R = rt. radius, H = rt. humerus.

presumably extends uphill to the base of the weathered upper cliffs. 8B is thickest immediately south of the cliff although the top has been eroded; it thins rapidly southward. The base of the breccia where it abuts against the cliff contains numerous boulders over a foot and a few up to 5 ft. long. The large boulders peter out about 40 ft. from the cliff. Undulating bands of finer and coarser breccia are visible and may be maintained for several feet, although the deposit is not stratified in the strict sense. Many fragments have their long axes horizontal, a few vertical. The limestone fragments are not generally in contact so that the matrix must have been deposited at the same time as the breccia. Some larger blocks are also visible in the upper part of the layer.

A short distance west of the main section the upper breccia outcrops on the modern beach, and usually shows up as an elongated stony area (*Fig.* 22). The maximum width of the outcrop is about 85 ft. and excavation showed that the lower boundary maintains its dip of 20°–25°, while the upper is flattening to 10° or less. It is probable that the thickness here is of the order of 20 ft.

No finds have ever been made in this layer.

Layer 8Z. This layer is restricted to the upper, northern end of the section where it consists of weathered, sub-rounded limestone blocks in a grey sandy matrix. Its maximum thickness is 18 in. near the cliff, where it rests on the eroded surface of 8B and is covered by 3. As it is traced southward across sheet I the layer becomes thinner, less easy to distinguish, the transition to 8B less sharp, while the overlying thickness of 3 increases. At the right-hand side of sheet I, 8Z is represented only by a thin layer of red-brown sandy material distinguished from 8B by the limestones in it being weathered. At this point the layer is covered by about 4 ft. of deposits which include layer 3 and probably layers 4 and 5. Layer 8Z has not been distinguished south of this point.

Layer 8A. *The Red Loam.* The layer is distinct at the southern end of the section only, and can be traced from the point where it disappears beneath the modern beach for about 60 ft. northwards, beyond which point it merges with layer 6B due to the wedging out of layer 7. It is dark, red-brown tough loam, up to 18 in. in thickness. At the base it passes down into the upper breccia, the lower boundary being taken at a zone of partly decalcified limestone at the top of the breccia. The upper boundary is sharply defined. The loam falls into two horizons, the upper paler in colour, and more earthy in texture, than the lower. The layer is stone-free except for some large weathered blocks of limestone embedded in the upper surface. Microscopic study indicates that this layer is a mature soil (Appendix II, p. 133). When exposed by excavation, the surface of 8A has the appearance of an old land surface, penetrated by burrows and depressions.

Locally, fragments of charcoal are common in the red loam, and animal bone, including ox, and limpet shells occur. Rarer are fragments of flint and potsherds; the shards are of Early Bronze Age "B" Beaker except for a single "A" Beaker shard found in the upper part. In 1936 Dr. and Mrs. Taylor discovered and excavated a pit which had been dug through the red loam into the upper breccia in Early Bronze Age times, and which contained parts of two "B" Beakers and is likely to have contained a burial, although no human bone was preserved. This burial must have been made at a time when little, if any, of the overlying Beaker sand (layer 7) had accumulated. For full details the reader is referred to Taylor and Taylor (1949).

Layer 7. *The Beaker Sand.* A clean yellow sand wedging out northward, as shown in *Fig.* 19. The upper part is penetrated by animal burrows from the layer above, which occasionally reach the red loam below. They are filled with darker material similar to layer 6B. Excavations made in 1955 to establish the archæological dating of the sand yielded "A" Beaker shards, from the upper part of the layer. Animal bones, including sheep, and molluscan shells were also found.

Layer 6. *The Bronze Age Sand.* The layer is only differentiated at the southern end of the section. It overlaps the Beaker sand northwards, but north of this point the lower part, 6B, rests directly on layer 8A and no certain distinction between it and layer 8A can be made. Subdivision 6B consists of reddish loamy sand with many weathered limestone blocks, up to 6 in. across. The texture becomes more sandy towards the base. Flecks of charcoal are abundant in the middle part. At the top of 6B hearth levels occur (6C). (*Fig.* 20, p. 87.)

The lowest 2 in. of layer 6B yielded shards of "A" Beaker pottery; the rest of the layer and the hearths at the top produced Middle Bronze Age pottery. The hearths are noteworthy for the abundance of limpet shells, and contain also bones of horse, sheep, pig and bovids, burnt and broken beach pebbles, and fragments of unpatinated flint.

Layer 6A consists of grey-green stony clay with bands of green sandier material. It becomes thicker and more clayey to the south; northward it becomes more sandy and merges with the base of layer 5. Stones are most common in the middle of the layer. The 1955 excavation produced later Middle Bronze Age pottery, bones and a horn-core of sheep from this layer. A small hearth was exposed in the top of the layer. Animal remains from this layer include those of Sheep, Goat and Wild Boar (?). From the middle of sheet III 6B thins out progressively southward whereas layer 6A at first increases in thickness showing internal stratification and locally containing numbers of large blocks of weathered limestone up to 4 ft. long. These are presumably the remains of houses or other structures. Layer 6A then thins to 6 in. and where last seen is separated from 6B by only 4 in. of fine yellow

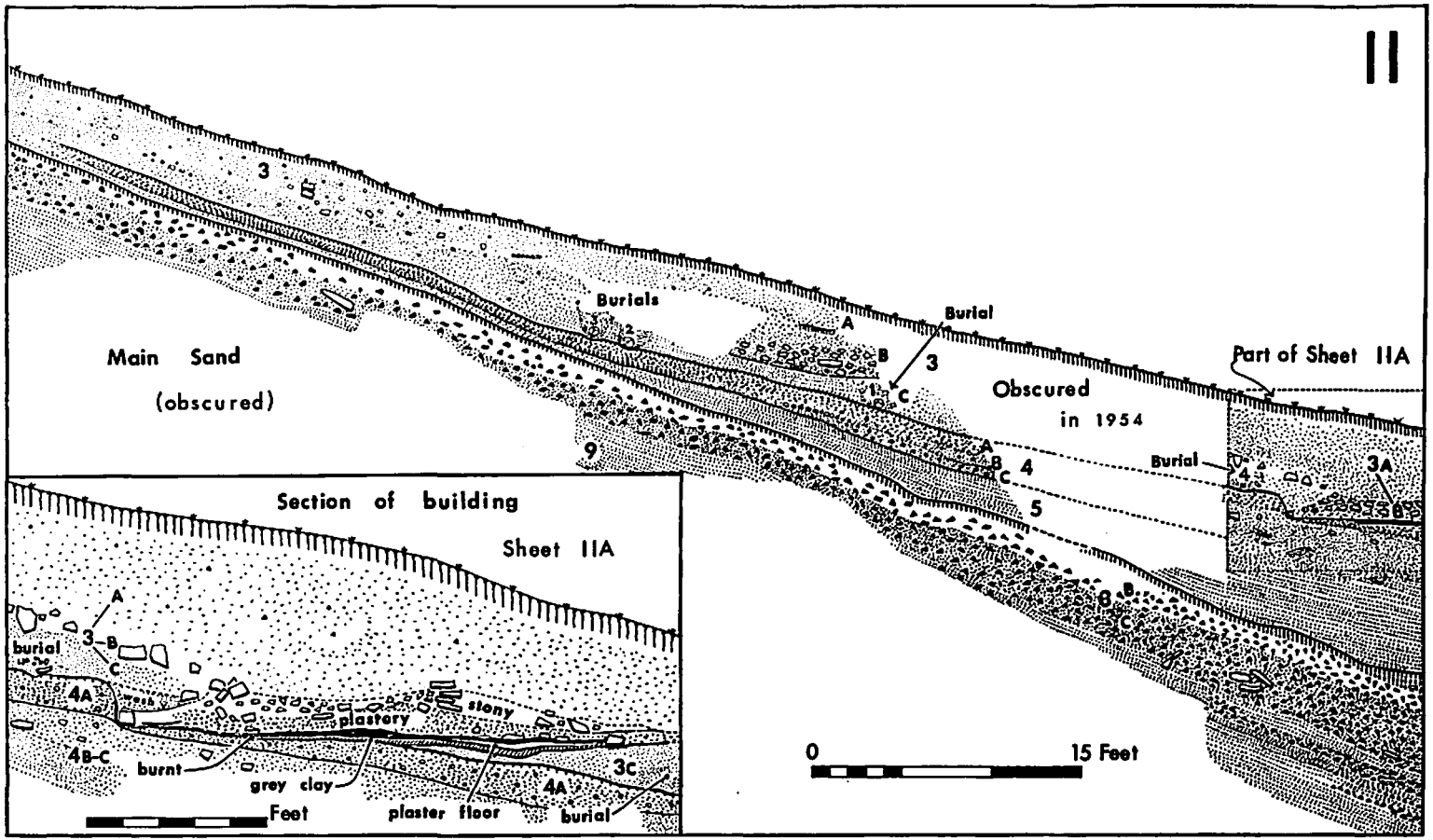


Fig. 18.—Brean Down Sand Cliff (site A): sheet II.

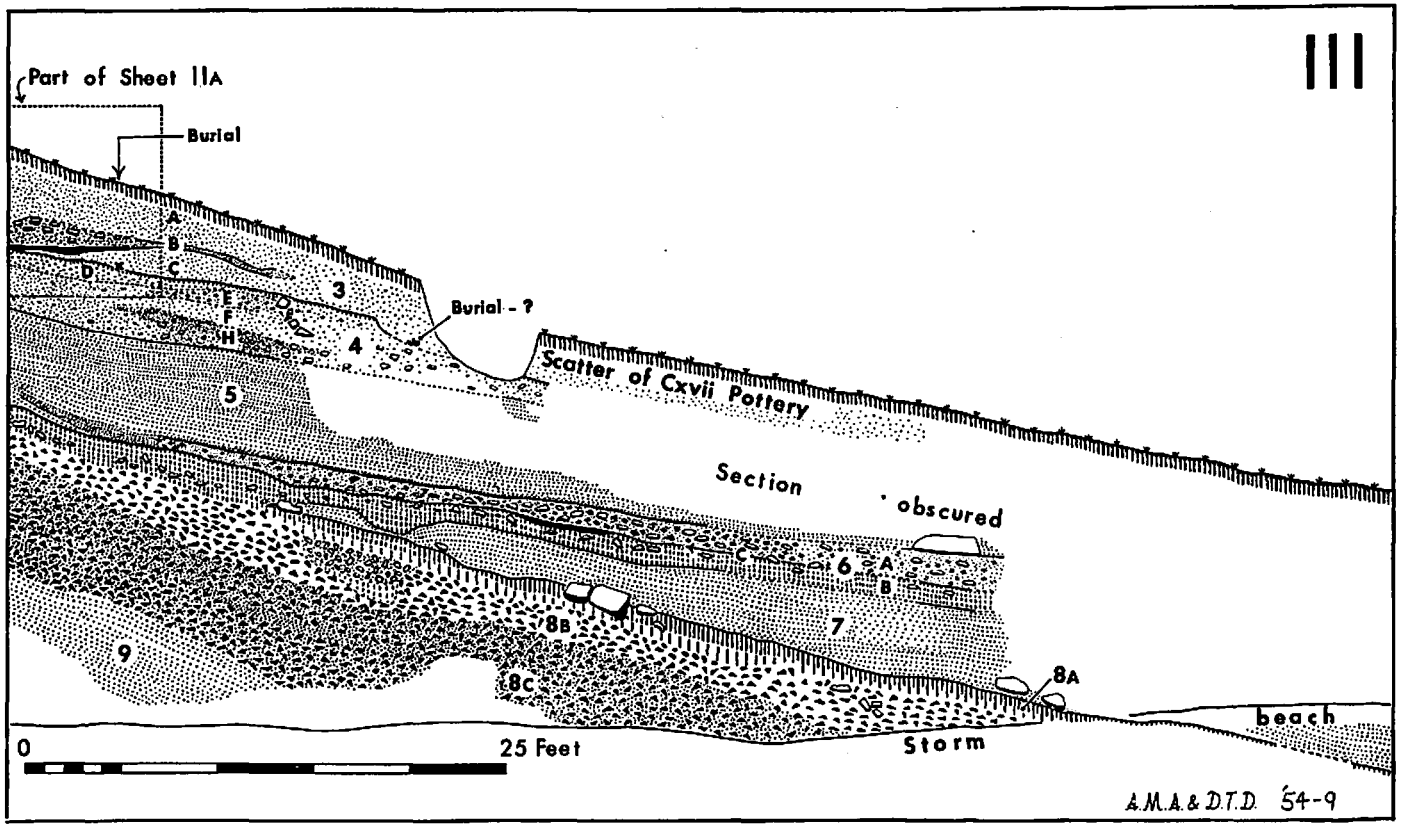


Fig. 19.—Brean Down Sand Cliff (site A): sheet III.

sand. It may be represented in sheet V by the green-stained, stony sand found by excavation.

Layer 5. *Blown Sand.* The highest point at which the layer is recognized lies at the north side of sheet II, where it rests on the weathered top of the upper breccia. Layer 5 remains thin for a distance of 30 ft. and then thickens. In the area covered by sheet III the bottom 2 or 3 in. of layer 5 are grey or greenish in colour, with a thin iron pan at the base, and sometimes another at the top. The rest of the layer is composed of clean yellowish sand, with two loamy bands. Further south the layer again decreases in thickness. The lower part of the outcrop of this layer is not well exposed, but excavation has proved its extent and stratigraphical relationships. In sheet V layer 5 may be represented by 3 ft. of sand beneath 4J.

Layer 4. *The Iron Age Sand.* The layer is first traceable from the same point as layer 5, and consists of a reddish sandy, loamy, stony horizon about 9 in. to 1 ft. thick. Between 40 and 45 ft. from the left-hand margin of sheet II, the following section was observed:—

4A. Reddish stony loam, 6 to 8 in.
4B–C. Greyish-brown, stoneless, sandy loam, 3 to 4 in.
5. Pale sand, 1 to 2 in.
Clean yellow sand, 1 ft. 6 in.

Layers 4B–C, together with the pale sandy horizon below, are interpreted as a leached soil horizon. About 10 ft. further south, the deposit thickens and three subdivisions of layer 4 have been distinguished:—

4A. Reddish-brown sandy loam with weathered limestones.
4B. Greyish-yellow sand with some stones. Two shards of Iron Age pottery from this layer.
4C. Reddish-brown stony sand, very gritty in texture.

Southwards this sequence passes into a more complex succession shown in the section below. This transition was not exposed in 1954 and the present section differs in some details from that observed then.

4D. Reddish-brown sandy soil with small weathered limestones = 4A. (Redder and stonier than 3C above.)
4E. Dark greyish-brown sand, slightly clayey, the lower limit sometimes confused by animal burrows.
4F. Clean yellow sand, over most of the section has been mixed with 4E by burrowing animals.
4G. Hearth level; blackish with much charcoal and burnt stone, extending laterally for at least 25 ft. This layer was not distinguished in 1959.
4H. Similar to 4E, heavily stained by ash from the hearth levels, giving a grey tint, contains limpet shells, animal bones and pottery. There

are numerous weathered limestones in this level, almost certainly part of ruined structures, and a pile of boulders up to 18 in. long has been observed which reached up nearly to the level of 4D.

A considerable amount of Iron Age pottery, remains of sheep, ox and pig, and other occupation debris have been found in layers 4E, G and H although the exact level is not known for all the material.

South of the pile of boulders referred to, layer 4 decreases in thickness, 4D becomes very much less distinct and the distinctions between the lower divisions disappear. This part of the layer is badly disturbed by burrows, by at least one grave and by the path on to the Down.

A small, isolated exposure of muddy brown sand with stones, now destroyed, lying south of the main section (sheet V) is referred to as 4J. The layer produced Iron Age A pottery, animal bones and teeth including those of sheep, ox and pig, and flint fragments. In the lower part of 4J was a hearth, which did not yield datable finds.

Three inches below the top of 4J a brass buckle, probably of 16th- or 17th-century date, was found before the war by Dr. Taylor, who observed weathered limestones in the top part as then exposed. The surface of 4J showed an erosion hollow filled with storm beach material, layer 2B. Beyond the limits of this, 4J was covered by blown sand of layer 2.

Layer 3. *Grey Stony Sand.* The layer is generally a fine, grey-brown stony sand. In contrast to 8A to 4, it is distinguishable over the whole length of the main section and is the deposit on which the modern turf rests. It is very much disturbed by rabbit burrows which make subdivisions hard to distinguish, and where burrowing has been most extensive it cannot be differentiated from other layers whose presence is suspected. Over the greater part of sheet I, 3 is divisible into two parts, the separation being marked by a slight change of texture and colour, apparently representing a weak weathering horizon. At the right-hand side of sheet I (*Fig.* 17) the upper division is a layer of reddish-brown stone-free sand. There is a sharp boundary between this and the lower division which consists of 15 in. of darker reddish-brown sand with some stones, resting on a less stony sand about 9 in. thick. This last rests on 8Z, here forming the weathered top of 8B. Probably these two intermediate layers are respectively equivalent to layers 4 and 5 further down the slope. This stratification cannot certainly be distinguished over the greater part of sheet I.

In the upper part of sheet II the layer is badly disturbed and no subdivision has been attempted. In the middle part of the area of sheet II, three divisions are present:—

3A. Dirty brown sand, locally less stony than usual.

3B. A mass of stones, 18 to 20 in. thick.

3C. Stoneless grey sand, locally passing into yellow blown sand. Rests on layer 4.

Layer 3C contains burials belonging to a cemetery the extent of which is indicated in *Plate* 11. The graves seem to have been dug from an old ground surface at about the level of 3B, and occasionally penetrate slightly into the top of layer 4; usually the skeletons lie on the surface of layer 4. A burial at the northern side of the cemetery rested on layer 8. The grave fillings appear slightly darker than the surrounding deposit, and are a little more stony. Burials here were first mentioned by Knight (1902, p. 303) and have been noticed by various later observers. During the past six years at least ten burials have been exposed, and taking into account the steady recession of the Sand Cliff, it is likely that a considerable number of skeletons have been destroyed since Knight wrote. The burials are of extended supine skeletons lying uniformly with their heads to the west. Both sexes and various ages are represented. No traces of coffins have been noted, nor any datable finds, save that a triangular iron knife, of medieval type, is said to have been found on the floor of one grave. A detailed description of some of the burials will be found on p. 121.

Immediately north of burial 3 layer 3B is represented by blocks of limestone, up to 18 in. long, which may indicate the site of a destroyed building. A similar debris level is present on the north side of the building described below.

In the area covered by the right-hand side of sheet II the remains of a building were exposed by erosion of the Sand Cliff during 1957–59 (sheet IIa). The building overlies one of the burials in the cemetery. Its position has been interpolated on the section drawn in 1954. The site for the building was prepared by levelling the slope, cutting through 3C into 4A on the uphill side. The floor of the building consists of a 1–2 in. thick layer of plaster, grey to pale purple in colour when fresh and with a well-finished surface, bedded on 2 to 3 in. of grey clay. These layers appear to end against small limestone blocks placed on the floor of the excavations and no wall-footing trenches or postholes have been seen in the 1959 section. The presence of much limestone in the debris suggests rubble walling. H. Taylor observed that part of the plaster floor was laid directly on the sand without the bedding layer of clay shown in the section, and that the floor had also been patched with clay. Lying directly above the floor there is a thin black layer locally up to 6 in. thick containing much fragmentary charcoal and scraps of window glass, thought to be relatively modern. The underlying floor is reddened in places. Above the burnt layer there is destruction debris with numerous pieces of grey clay, plaster and burnt clay daub. Some of the plaster bears impressions of twigs or wattles on its back and presumably

comes from walls or ceiling. Above this is a layer of stony debris and above the debris is undifferentiated brown sand with animal burrows (3A). The only finds directly associated with this building are iron bolts, nails and a knife, and scraps of slate. Fragments of hand-made calcite gritted pottery have been found in the debris layer but are identical with Iron Age A pottery from layer 4 below, from which they must be derived. A wash of reddish-brown sandy loam running out over the debris from the cut made in layer 4A at the north side of the house shows how they reached their present position.

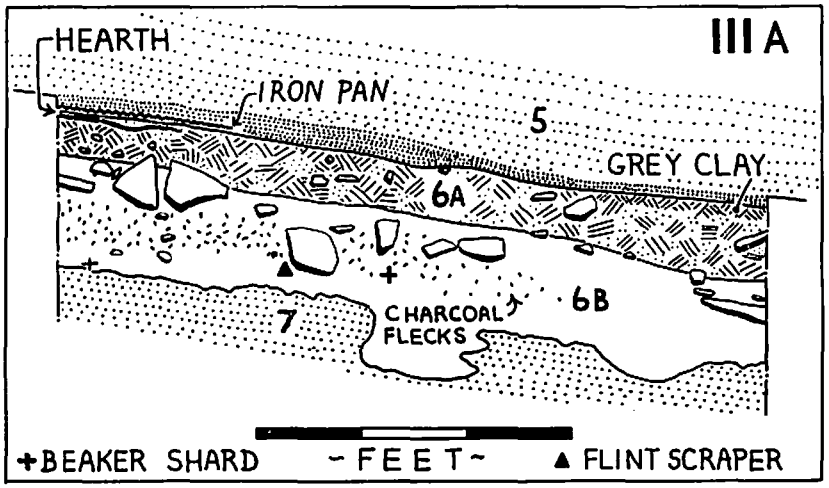


Fig. 20.—Brean Down Sand Cliff (site A): sheet III A.

To the south of the building, a thin spread of clay, stone and plaster debris can be traced down the slope for some feet (layer 3B). A single shard of 17th–18th-century pottery has been found in the section a few inches below layer 3B but was too close to the section face for its stratification to be regarded as certain. This building is believed to be of late 17th-early 18th-century date. The evidence for this date is discussed below (p. 127).

Traces of a building in a similar position were seen in 1936–37, when the Sand Cliff was probably between 10 and 20 ft. to the west of its present position. Only loose fragments of plaster floor were found and it was not seen *in situ*. At a level apparently corresponding to the floor a number of carbonized planks lying horizontally were found. These may have been flooring or perhaps part of a box. The charcoal has been identified by Miss A. C. Western (Institute of Archæology) as chestnut (*Castanea sativa*). Fragments of window glass, which had formed part of a rectangular lattice, were present.

In the middle part of the area covered by sheet III, the upper part of layer 3 has produced fragments of 17th–18th-century pottery.

Layer 2. Modern Pebble Bed and Blown Sand. This layer was only present in the area of the small isolated exposure now destroyed, south of the main section (sheet V). The following subdivisions were present:—

2A. Yellow blown sand containing a thin bed of shingle.

2B. Modern beach deposit of limestone shingle, interbedded with sand. This wedged out both northwards and eastwards. It contained clinker and Iron Age shards derived from layer 4J below. The shingle rested on a hearth containing coal lying in the top of 4J.

2C. Grey marine clay up to 1 ft. thick, interleaved between two parts of 2B. This bed was more sandy at its northern end.

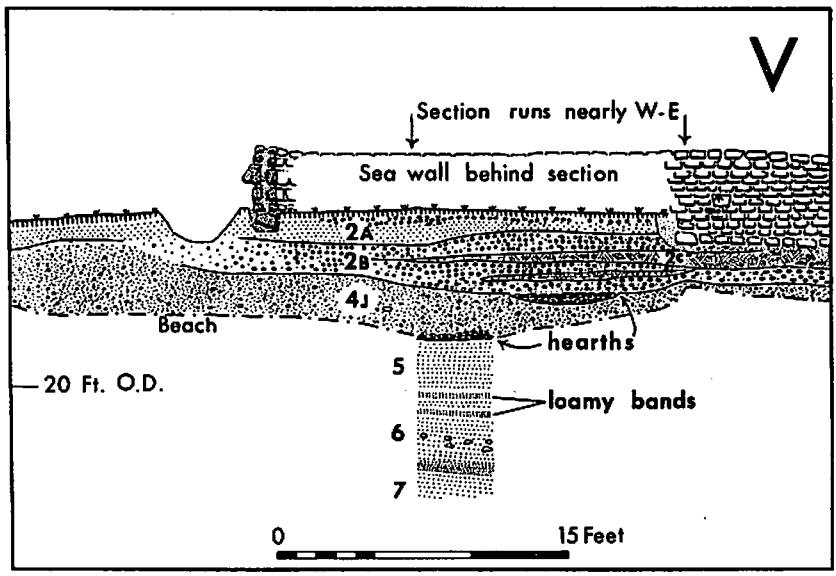


Fig. 21.—Brean Down Sand Cliff (site A): sheet V.

The sea-wall whose broken end is shown in this section (*Fig.* 21) is marked on the 25 in. O.S. (Somerset Sheet XVI.6) as extending as far as the limestone cliff along a line a little in advance of the foot of the Sand Cliff. Blocks of masonry derived from this wall still litter the beach. The sea-wall has been altered since our sections were drawn.

Site B. The "Reindeer Rift" (*Plate* 9A)

This site is approximately 125 yards west of the Sand Cliff (*Fig.* 22). It consists of a cleft in the limestone cliff which is here about 100 ft. high.

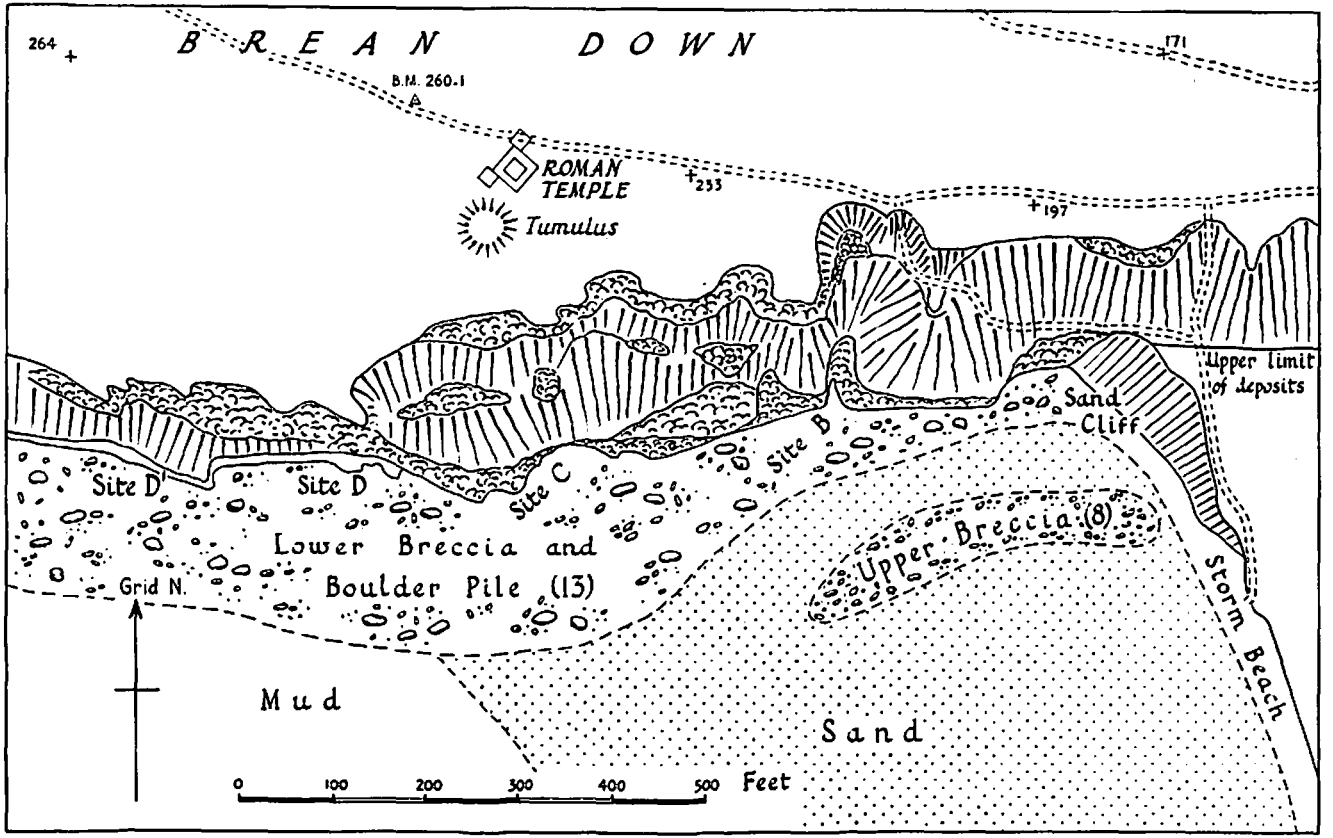


Fig. 22.—Plan showing the location of sites A–D, D′.

The mouth of the cleft is about 32 ft. wide, but it narrows rapidly until at 60 ft. from the mouth its width is from 7 to 10 ft. The walls are nearly parallel and nearly vertical. At about 60 ft. from the entrance the western wall arches over to join the other at between 50 ft. and 60 ft. up. The vaulted roof so formed is roughly horizontal for about 10 ft., from this point the roof rises steeply and the cleft widens. Immediately in front of the roof arch a large boulder is wedged between the side walls. The walls of the rift appear to have undergone frost weathering.

The cleft is floored at the mouth with modern beach shingle through which limestone boulders project. These boulders rise in a pile towards the back of the rift and at 90 ft. from the mouth their surface is about 35 ft. above the beach. At this point the cleft is blocked by a deposit of limestone breccia which rests on the boulder pile and has been cut back to a nearly vertical face. The breccia is composed of angular limestone fragments, mainly small but with larger blocks near the base. Some bands of breccia are without matrix, elsewhere the matrix is light reddish-brown, mainly composed of finely divided limestone. The bands within the breccia dip towards the mouth of the cleft at about 20°–25°, with much the same inclination as the boulder pile. Traces on the walls show that this deposit formerly filled the cleft. Mammalian remains from the breccia include reindeer antler and rodent bones. Immediately above and in front of the breccia section the roof of the cleft is formed by a deposit containing limestone blocks about 18 in. in size, apparently in a pale sandy-coloured matrix.

The cleft continues above as a steep-sided gully. At about the level of the cliff top a small cave penetrates about 6–10 ft. of sandy breccia filling this gully. This may be the top of the deposit seen in the cleft below. Above this the gully widens and rises with a slope of about 33° to the crest of the ridge at about 200 ft. O.D.

Site B is probably a sea-cave resulting from erosion along a principal joint in the limestone cliff during the sea-level phase corresponding to the Howe Rock platform. The aven or blow-hole in the roof, now choked with deposit, would accord with this origin. The deposits within the cave either resulted from frost erosion of its walls or have been introduced from above through the "blow-hole". The basal boulder pile and the breccia above appear to be similar in their composition and contained fauna to layer 13 of site A. The sandy breccia in the gully above is probably the same as the upper breccia (layer 8) of the Sand Cliff.

Site C

This site is about 200 yards to the west of the Sand Cliff (*Fig.* 22). It lies in a recess of the limestone cliff about 100 ft. wide and 50 ft. deep. At this point the height of the cliff is about 80–90 ft. and there is a narrow shelf

(*Photograph*: H. Taylor)

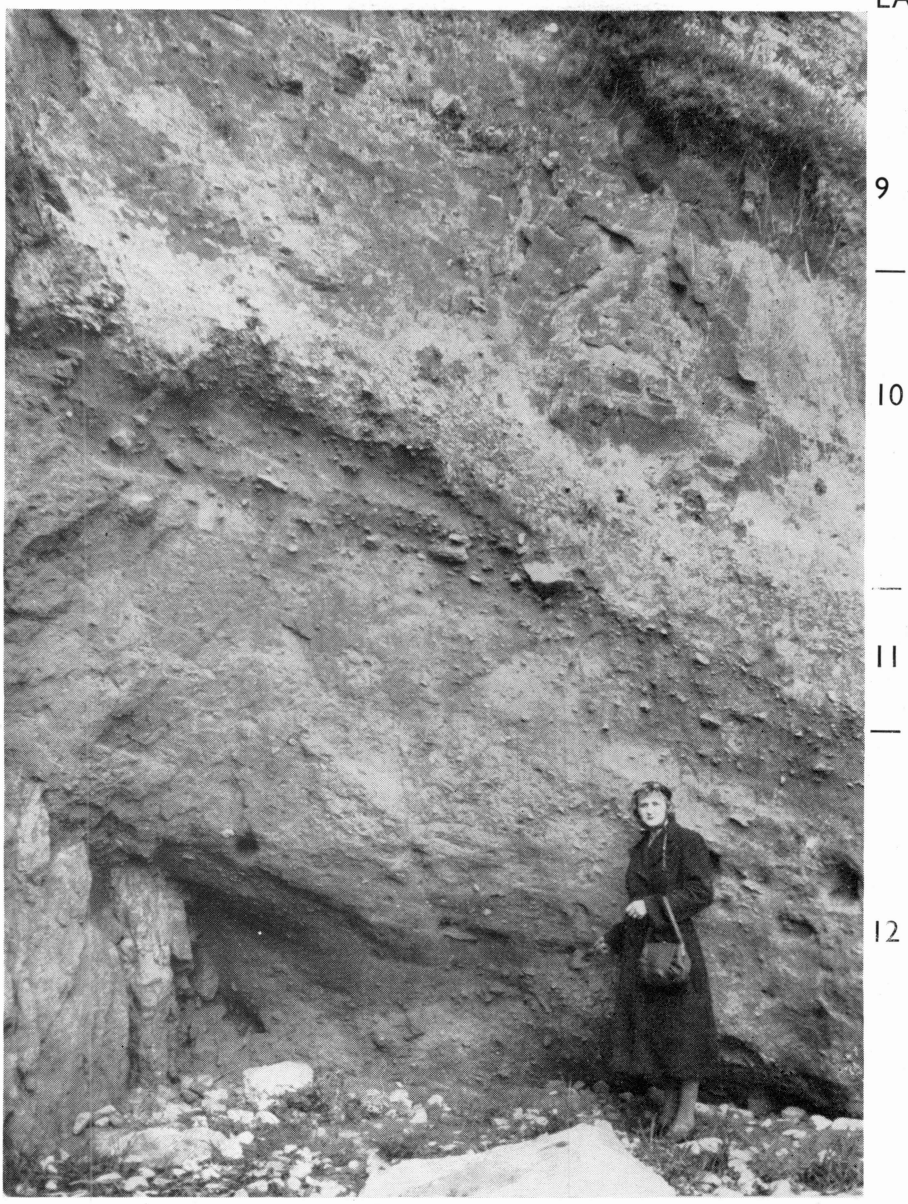
PLATE 6

General view of the south side of Brean Down, looking north-west. Black Point is seen at the extreme left, and the Sand Cliff at the extreme right-hand side of the picture.

(*Photograph*: H. Taylor)

PLATE 7

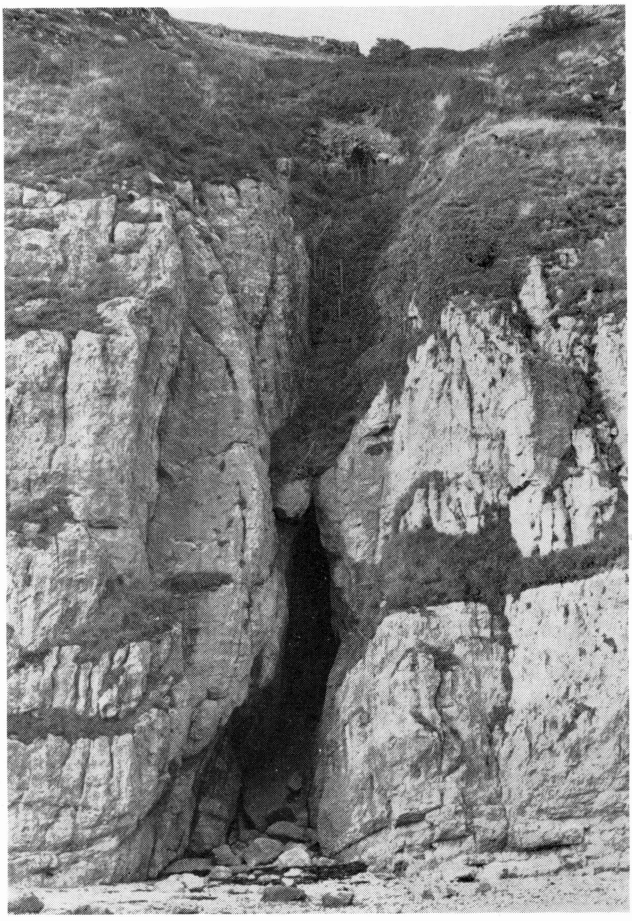
Brean Down: the Sand Cliff.



(*Photograph*: H. Taylor)

PLATE 8

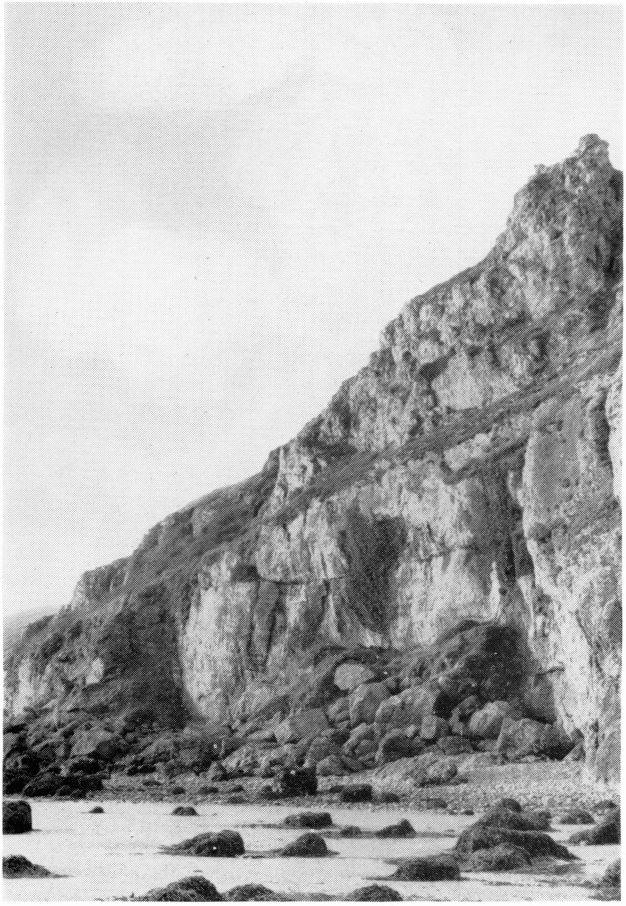
Brean Down: detail of the lowest part of the Sand Cliff section, shown in sheet VI (*Fig.* 16). The point of the trowel indicates layer 12B.



(*Photograph*: H. Taylor)

PLATE 9A

Brean Down: site B.



(*Photograph*: H. Taylor)

PLATE 9B

Brean Down: boulder piles at sites D (right) and D′ (left), looking approximately north-west. The section shown in *Text-figure* 23 was excavated at the top of the right-hand boulder pile.

(*Photograph*: E. K. Tratman)

PLATE 10A

Boulder of cemented breccia 750 yards east of site E. Scale graduated in feet.

(*Photograph*: E. K. Tratman)

PLATE 10B

Brean Down: boulder of cemented breccia at site D′. Scale graduated in feet.

corresponding to one of the major bedding planes in the limestone, at about 35–40 ft. above the beach. The deposit rests partly on this shelf and partly against the cliff below.

The succession is as follows:—

(*a*)	Silty sand, colour 10 YR 7/4 - - -	approx. 3 ft.
(*b*)	Limestone breccia in silty matrix - - -	approx. 1 ft. 6 in.
(*c*)	Stone-free silty sand - - - - -	approx. 0 ft. 6 in.
(*d*)	Fine limestone breccia with some blocks, with a stoneless band at the base - - - -	approx. 1 ft. 9 in.
(*e*)	Limestone breccia, colour approx. 7·5 YR 5/6, a reddened zone at the top - - - -	approx. 7 to 8 ft.
		Total about 14–15 ft.

The bottom of the exposure is about 20–25 ft. above the beach. An excavation at the foot of the cliff exposed reddish-yellow silty breccia to a depth of 3 ft. The silty nature of the layers exposed here suggests that they correspond to layers 10–12 of the main section. Layer *a* of site C may be equivalent to 10B, layers *b* to *e* to layer 11 and perhaps the top of 12A, and the exposure in the beach to some part of layer 12.

About 25 ft. from the cliff a limestone boulder more than 20 ft. long and 15 ft. high projects from the beach. This boulder almost certainly forms part of the boulder pile referred to above (p. 74), the general features of which it is convenient to describe here. This boulder pile extends almost the whole length of the Down from near the western end where it is believed to overlie the Howe Rock platform. Here the boulder pile does not rise above present high-water mark, but along much of the south face of the Down it rises well above this level and in some places reaches almost to the top of the limestone cliff. The level of the modern beach deposits rises eastwards, so that only isolated boulders project above its surface. Where the boulder pile rises above high-tide level, the boulders are notched at that level, whereas the limestone cliff behind is not. Only where unprotected by either boulder pile or modern storm beach is the cliff notched at high-tide level. Local features of the boulder pile are described under sites A, B, D, D′ and E.

Site D (*Plate* 9B)

This site lies 300 yards west of the Sand Cliff (*Fig.* 22). The limestone cliff is here about 70 ft. high, separated by a steep slope from a higher cliff behind. Against the main cliff rests a boulder pile composed of blocks up to 28 ft. long. It is about 150 ft. long, 50–60 ft. wide and its top is about 20–25 ft. above the storm beach. Close to the cliff the interspaces are

occupied by a predominantly silty deposit rising above the top of the pile. Sections of this deposit are exposed at either end of the site and also by a trench dug for the purpose in 1955. This trench showed the following sequence (*Fig.* 23):—

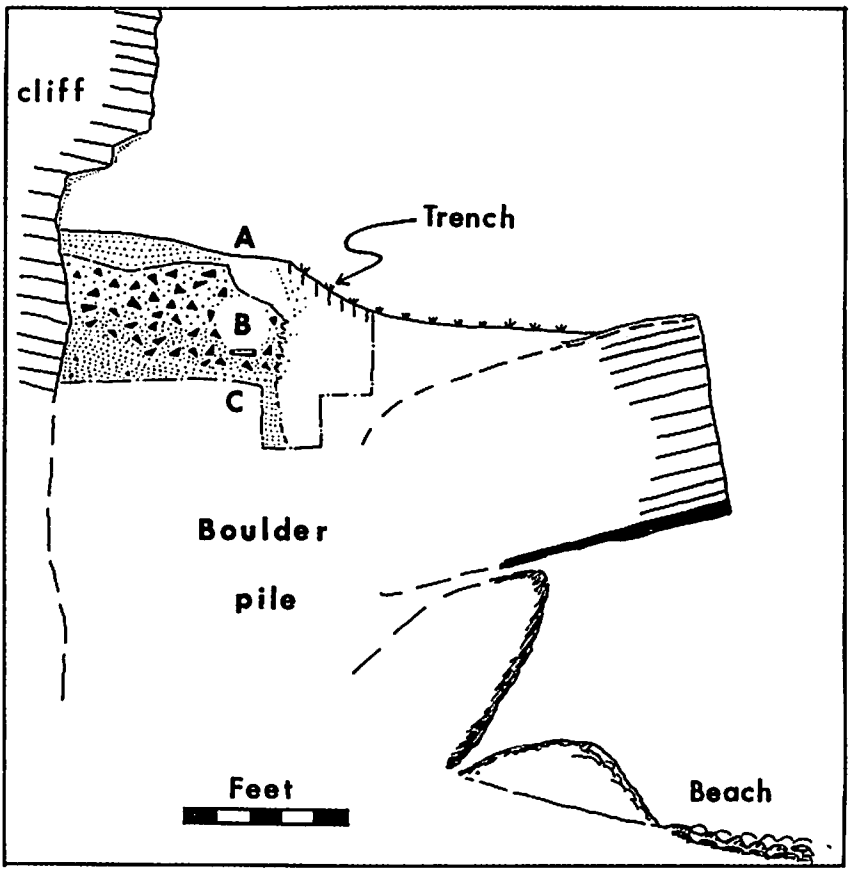


Fig. 23.—Brean Down: section at site D, looking east.

A. Yellowish (7·5 YR 5/4) silt with fine horizontal laminations. Traces of this deposit remain on the face of the cliff immediately above the site.

B. Limestone breccia with reddish silty matrix, redder than A (7·5 YR 5/6). The limestone fragments were mostly small but one block 3 ft. by 2 ft. was found. The upper and lower boundaries of this layer were moderately well defined but there was no evidence of weathering. The layer contained animal bone fragments and teeth

including those of horse. These fragments were partly mineralized and there was some cementation of the deposit to them.

C. Fine-grained reddish silty sand (7·5 YR 5/6). This layer also contained animal bone.

The exposure at the west end of the site shows a similar succession. Layer A is here at least 3 ft. thick.

Newly exposed surfaces of both boulders and cliff are frost shattered. Some of the topmost boulders of the pile may have fallen when the lower silty layer was already in place and may correspond to the episode of frost weathering represented by the breccia, layer B.

The silty nature of the layers exposed here corresponds to that of layers 10 to 12 of the Sand Cliff. Layer A is probably equivalent to 10B, layer B to layer 11, the bone bed; and layer C to layer 12A.

Site D′ (*Plate* 9B)

This exposure is about 40 yards west of site D and extends for about the same distance. At this site the top of the limestone cliff descends from about 50 ft. above the beach on the east to about 30 ft. on the west side, due to the presence of one or more of the lower erosion levels mentioned above (p. 71). In front of this cliff the boulder pile rises at least 25 ft. above the beach, in places almost reaching the cliff top. It is partly masked by an accumulation of breccia. This may be in part recently derived from the cliff top which is capped by from 6 to 10 ft. or more of breccia resting directly on shattered rock. The breccia is banded with some bands almost devoid of matrix and others with a varying content of reddish silty matrix. Bands without matrix are prominent in the middle and upper parts of the breccia. Large boulders are common in the upper part of the breccia and on the east face of the exposure there is a conspicuous band of very coarse breccia with air spaces in the middle of the layer. With the exception of site E this is the westernmost substantial exposure of the deposits.

The alternation of bands of breccia without matrix and bands of silty material and the fact that the exposure lies directly on rock may indicate that this exposure corresponds to the lowest part of the Sand Cliff section, layer 12C and the upper part of layer 13.

Site E. The "Cemented Breccia"

This deposit is only known in place at one point (site E, *Fig.* 14) about 1,300 yards west of the Sand Cliff, where it has an outcrop about 40 ft. long, rising 18 ft. above present beach level. It is roughly bedded, with a seaward dip, but quite unsorted and consists mainly of limestone boulders up to 3 ft. across. A subordinate constituent is red and yellow Triassic material derived from fissure-fillings in the Carboniferous Limestone, the

presence of which proves that the breccia is post-Triassic in age. The breccia is cemented by a film of calcite, with many air spaces. It is possible that the spaces were filled with softer material which has been removed by recent erosion. Fragments of snail shells are embedded in the calcite matrix. The breccia is banked up against a limestone cliff which descends behind the present beach and must, from its low level, belong to the Howe Rock platform.

The age of this breccia cannot be determined either by fossil content or by observed stratigraphical relationships. At a point 750 yards east of its outcrop there is a single boulder about $12 \times 7 \times 7$ ft. of the same rock lying about 20 ft. from the cliff (*Plate* 10A). This boulder occurs in an area where lower breccia of normal, uncemented type occurs and, in fact, has the appearance of being one of the many large boulders in the lower breccia. Its recent descent to the beach is improbable because there is no outcrop of cemented breccia in the low cliff above, and the higher cliffs from which it must have come are overgrown. Another boulder about $6 \times 3 \times 3$ ft. forms part of the fall on the west side of site D′ where there are patches of cemented breccia adhering to the cliff face. Site E cannot be correlated with any of the deposits exposed in the Sand Cliff. The cemented breccias at sites E and D′ are apparently younger than the Howe Rock platform, the age of the boulder between these sites being unknown. The cementation observed close to the cliff in layers 12A and 11B of site A and B of site D shows that cemented breccias need not represent an independent stage and that they are not necessarily of the same age.

Site F

This site lies on the foreshore about 1,000 yards south-south-west of the Sand Cliff and about 400 yards south of the Down. Most of the foreshore is covered with estuarine mud which is scored with erosion channels cut by water draining from the foreshore at low tide. Near the Down a spread of limestone detritus derived in particular from Black Point (*Fig.* 14) lies in these channels. In the area of site F these superficial deposits are locally absent and a thin bed of reed peat with a nearly horizontal surface is exposed over an area of about an acre. This bed is composed of the leaves and stems of *Phragmites* and varies in thickness from a thin seam up to 3–4 in. The peat rests on a deposit of blue-grey, buttery, marine or estuarine clay, exposed in runnels where not protected by the peat. It has been augered to a depth of 9 ft. below the peat.

Admiralty Chart 1152 indicates that the foreshore surface in this area is about 15–20 ft. above the datum of soundings (−19 ft. O.D.). The surface of the clay must lie between −4 and +1 ft. O.D. To the west the deposits are truncated by marine erosion, to the east they are apparently covered by the beach deposits.

4. INTERPRETATION OF THE SECTIONS

The formation of the limestone cliff against which the deposits are banked antedates any of the deposits themselves, but it truncates earlier erosion features on this side of the Down, referred to on page 71. The cliff is believed to have been originally formed by marine erosion, the final stage of this being at a time when sea-level was lower than it is today. Between sites A and E, the bench at the base of the cliff is everywhere formed by Pleistocene deposits, and there is no outcrop of the rock platform which must exist at its base, at an unknown depth beneath the deposits. The sea-level remained low at least until after the formation of layer 8, for this and earlier deposits dip below the present beach but the rock fragments in them show no trace of marine action.

Site A

Layer 13. The formation of this layer and the boulder pile which forms its westward continuation belong to an episode of intensive erosion, attributed to violent frost action in an extreme periglacial climate. The comminuted material at the top of the layer may be the result of further frost action on already fallen material. The interpretation is confirmed by the "cold" fauna from the top of the layer.

Layer 12. The scarcity of rock fragments indicates that frost action was much reduced from the preceding period, and the mechanical analyses show that two sources contributed to the layer: beach sand blown by wind, and silt and clay grade material washed down from the cliff or the slopes above. Some of this is likely to have been derived from elsewhere by wind transport. The fine lamination implies slow and long-continued deposition. The clay fraction is believed to have come principally from Triassic deposits. The concentration of the material in 12B must have been due to a temporary cessation in the supply of wind-blown material. This layer is interpreted as the product of a cool, wet climate, too unfavourable at this site for soil formation, but permitting the presence of large mammals, fragments of whose bones are found in the layer.

Layer 11B. The layer denotes a return to the conditions responsible for the formation of the upper part of 13, with frost weathering playing an important part. Reindeer antler was found in this breccia showing that tundra vegetation, at a minimum, was present in the area. The layer increases in thickness southwards, where it becomes obscured, and may, therefore, represent a longer period than the thin exposed portion suggests.

Layer 11A. The cold climate of layer 11B was replaced by conditions under which soil formation could take place. The vertebrate fauna includes Horse, which demands conditions of open grassland, suggesting a climate appreciably milder than during 11B, but also Arctic Fox and Lemming.

Regarding the non-marine mollusca Dr. Kerney writes, "this meagre assemblage is a 'cold' fauna such as would live in a bleak, open periglacial area, with very little vegetational cover. The abundance of *Pupilla muscorum* is particularly characteristic."

The third line of evidence is provided by study of the soil by Dr. Ian Cornwall. He identifies the soil as an immature *terra fusca*, formed under moist climatic conditions at temperatures higher than those of the present day.

The apparent anomaly between the different lines of evidence may be partly explained as follows. Firstly, the slight erosion of the top of the bone bed has presumably destroyed the superficial A horizon of the soil. We cannot tell whether the snails are contemporary with the deposition of the parent material, 11B, or with its subsequent weathering. The molluscan fauna could relate to the environment of the cold phase represented by 11B. Even if contemporary with the weathering, the snails could represent the winter extreme of the environment, the composition of the fauna being determined by hardiness.

The evidence from the soil relates to summer soil temperatures, and here the southerly exposure with a dry, because well-drained, and sunny micro-climate can have been effective in giving soil temperatures high enough for the weathering processes even if general air temperatures were not as high as today.

In contrast to the molluscan and soil evidence, both of which relate to strictly local environment, the mammalian fauna is that which was living in the surrounding area and the vegetation it implies need not have grown on the actual site. The animal bones incorporated in the soil presumably belong to an early part of the mild phase. This association is not a natural one; the presence of remains of larger mammals was probably due to human activity and those of rodents to owls or other birds of prey perching on the cliff above.

Layer 10B. Steady deposition was resumed after the standstill during which the 11A soil was formed. The layer indicates a return to the conditions represented by 12A, cooler and wetter than during 11A, with practically no weathering of the limestone cliff. The increase of the sand fraction upwards denotes increasing importance of wind transport, heralding the conditions which produced layer 9.

Layer 10A. The layer marks a brief episode of weathering of the limestone, perhaps by frost, but we are not inclined to attach too much importance to it. It does approximately coincide, however, with the change from loamy deposits (10B) to sand (9).

Layer 9. The abundant marine shell fragments show this to be derived from beach sands or estuarine sandbanks. Although the layer is by far the

thickest in the main section, its doubtless rapid accumulation may have been due to some local accident. Evidence at site C suggests the former presence of about 40 ft. of the main sand. The climate may have been cold, but not so cold as to produce frost weathering.

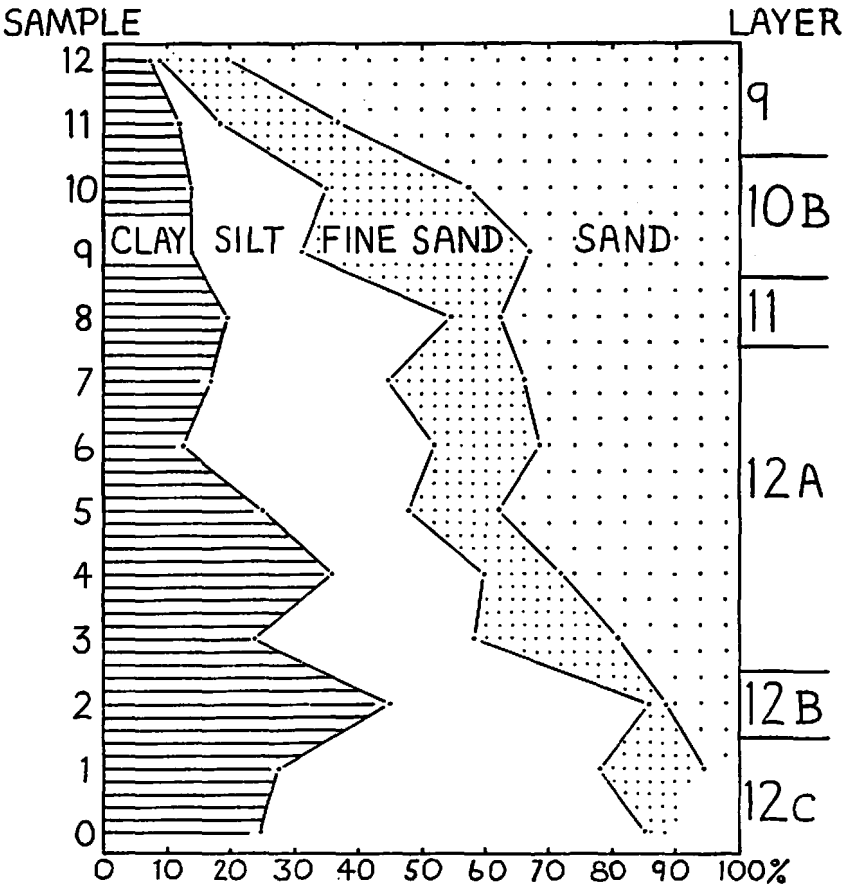


Fig. 24.—Diagram to show changes in composition of layers 9 to 12 of the Sand Cliff, based on particle size distribution curves shown in *Figs.* 34 and 35.

Layer 8B–C. The source of the fragments in this breccia was probably the rocky slope at the top of the limestone cliff, after the latter had become completely buried by layer 9. The small size of the fragments suggests that the slope was much weathered and broken up, and largely bare of soil. The breccia indicates a further period of intense physical weathering,

presumably due to frost action. In this case there is no faunal evidence as to climate. The appearance of the southern end of the section (*Plate* 11) suggests that the breccia began to accumulate at the foot of the dune (9), and gradually covered the latter completely.

Layer 8A. This is a buried land surface formed by weathering of the underlying breccia. Dr. Cornwall identifies it as a mature *terra fusca*, formed under temperate conditions. The maturity of the profile and the depth to which decalcification has occurred indicate a long-continued stage for its formation. Soils of this type are not forming in the area at present, but characterize climates which may be as moist as but warmer than that of southern Britain. The layer marks a notable amelioration of climate compared with the conditions which produced the underlying breccia. The change towards brown earth in the upper part of this profile is interpreted as indicating lower summer temperatures or a more oceanic type of climate.

It is noteworthy that during the period of soil formation marked by 8A, sand accumulation was in complete abeyance. In view of the conclusions reached from the soil type, sand movement may have been inhibited by spread of vegetation.

Layer 8Z. This is the lateral equivalent of 8A, developed on the upper, steeper part of the slope where erosion either kept pace with soil formation or even prevented it. On this part of the slope deposition was not resumed until after the end of the Middle Bronze Age when wind-blown material corresponding to layer 5 was laid down.

Layer 7. The Beaker sand is thought to be a wind-blown deposit on account of the presence of unworn potsherds, the presence of which rules out marine deposition. The layer therefore represents a renewed period of sand movement after the long interval marked by layer 8A. This could have been due to a reduction of vegetation cover, due either to natural changes or to human interference, or to a rising sea-level bringing the source of sand supply nearer. Archæological considerations require the length of time represented by the layer to be no more than a few years.

Layer 6B. The slowing down of accumulation of the Beaker sand, and perhaps the stabilization of the surface by some vegetation, permitted Early Bronze Age people to occupy the site. The reddish colour and loamy texture are attributed, at least partly, to hillwash bringing down sediment resulting from the surface erosion of layer 8A/Z higher up the slope. The hearth levels at the top of the layer (6C) suggest more settled occupation during the Middle Bronze Age.

Layer 6A. The features of this layer are partly due to human interference. The stones and clay probably formed part of hut floors. The

gley-like features of the layer would then be due to the impediment to drainage constituted by this imported material. The abundance of limpet shells in the occupation debris demonstrates the proximity of a rocky shoreline.

Layer 5. The absence of any finds from this layer suggests that the Middle Bronze Age occupation of layer 6A was brought to an end by further accumulation of blown sand.

Layer 4. This layer marks a return to conditions under which material eroded from 8A/Z higher up was washed down the slope. The surface presumably became covered by vegetation, but the red-brown colour is attributed to material derived from 8Z rather than to soil-forming processes. Slow accumulation of sand continued, but was insufficient to deter Iron Age people from settling. The well-defined upper surface of layer 4 probably marks an interval free from deposition. Layer 4 seems to grade to a land surface a little below the present one.

Layer 3. At the beginning of the formation of this layer some wind-blown sand accumulated on the slope. The appearance of the deposit suggests that the slopes soon became covered by vegetation and that although sand accumulation continued it was not so rapid as to interfere with the plant life. These conditions appear to hold at the present day. A halt in accumulation is marked by the faint weathering horizon which, at the upper end of the cemetery, was the surface from which the graves were dug. It is not clear whether this corresponds to the land surface further down the slope at the time when the 17th-century structure was built. The presence of this carefully finished building must indicate that at the time the edge of the Sand Cliff lay a considerable distance to the west of its present position. A calculation based on the present rate of recession might suggest a distance of 100–200 ft. or more. Resumption of deposition led to the final burial of the hitherto-exposed weathered upper surface of the upper breccia (8Z) at the top of the slope.

Layer 2. This was part of a relatively recent storm beach.

5. CORRELATION

Local Correlation

The only local section which shows a succession of deposits comparable to the Sand Cliff at Brean Down is at Holly Lane, near Clevedon. The exposure is now poor, but the deposits were studied by a number of workers when they were being worked for gravel. The fullest account is by Greenly (1922, p. 374), whose section may be summarized as follows:—

5. Sandy breccia, the limestone fragments usually about 3 in. across, occasionally larger.

4. Loamy sand "with about one stone to a square foot of section", and land molluscs.
3. Sandy loam.
2. Breccia with blocks up to 5 ft. long.
1. Sandy breccia.

An earlier version briefly recorded by Davies (1907) differs from Greenly's section and cannot be reconciled with it. A trial pit which had exposed 30 ft. of deposit below the floor of the pit, resting on solid Carboniferous Limestone, was mentioned by Palmer and Hinton (1929). The deposits at Holly Lane (ST 418726) sealed a cave which yielded a fauna (Reynolds, 1907) of Upper Pleistocene aspect.

Greenly's bed 5 is clearly equivalent to the upper breccia (layer 8C) at Brean, and the sandy loam (No. 3) to the silty sand (10). The lower breccias (Nos. 1 and 2) may be contemporaneous with the middle breccia (11) and part of the stony silt (12).

The breccia opposite the Anchor Inn, Bleadon (ST 332570), on the main road from Weston-super-Mare to Bridgwater, described by Palmer (1934, p. 151) is still well exposed, but cannot with certainty be correlated with the Brean Down section.

The stratigraphy of the Upper Pleistocene cave deposits in north Somerset was summarized by Donovan (1955, pp. 98–99), and later amplified by the excavation of Bridged Pot shelter, Ebbor Gorge, near Wells (McBurney, 1959, p. 262). The last period of breccia formation, which gave rise to the upper breccias at Brean and at Holly Lane, is represented in Gough's Cave, Cheddar, at Bridged Pot and at other Mendip caves by cave earths and breccias which have yielded a flint industry formerly identified as Creswellian but recently distinguished as Cheddarian by Bohmers (1956, p. 24). In several caves the Cheddarian breccia rests on silty or loamy deposits, and at Bridged Pot and Soldier's Hole these deposits contain weathered limestone blocks. Soldier's Hole yielded parts of three leaf-points of Solutrean type and a long blade from this level. The sub-Cheddarian layers cannot be directly correlated with the Brean sequence, but the textures recorded for them are similar to those of layers 10 and 12 at Brean, in the deposition of which colluvial action was important. In the next section we suggest that layer 12 is probably contemporary with the Solutrean culture.

The weathering horizon (8A) which caps the highest breccia is correlated with the stalagmites which cap the Creswellian or Cheddarian deposits in several Mendip caves and at sites further afield including Kent's Cavern, Torquay, and Pin Hole, Creswell Crags. In addition to the agreement in stratigraphical position, the stalagmites demand a climate wetter than at

present* and correspond climatically with the later stage of weathering of 8A which gave rise to brown earth soil. At open sites in different parts of the country the same climatic episode is marked by deposits of tufa. The tufa at Wateringbury, Kent, has been referred to the Atlantic period (Kerney, 1956) on the basis of the molluscan fauna, which indicates a climate damper, and perhaps warmer, than at present. The Wateringbury tufa contains no archæological material, but at Prestatyn, North Wales (Smith, 1927), and Blashenwell, Dorset (Reid, 1896; Clark, 1938), Mesolithic flints have been found in the tufas, and at Blashenwell formation had ceased by the Middle Bronze Age.

A site between tidemarks at Blackstone Rocks, Clevedon (Sykes, 1938), has yielded Mesolithic flints from a "stiff red clay", the description of which recalls that of layer 8A at Brean. It may have been a soil developed on the Carboniferous Limestone, of which Blackstone Rocks are composed, during Boreal and Atlantic times.

To the Atlantic Period, also, should probably be referred some of the many "submerged forests" which lie between tidemarks on the shores of south-west England. They have been described from the Bristol Channel, at Stolford and Shurton Bars (Horner, 1816), Minehead (de la Beche, 1839, p. 419), Porlock (Godwin-Austen, 1866) and Westward Ho! (Rogers, 1946, with earlier references). The trees have not been systematically studied, but most observers remark on the presence of large oaks. Alder and yew have also been noted. On this meagre evidence the forests could be late Boreal, Atlantic or later in date. The forest at Porlock was rooted in angular detritus continuous with the head of the neighbouring slopes, and doubtless to be correlated with layers 8B, C at Brean. The forest-beds, like layer 8A at Brean, were formed before the final stages of the post-glacial rise in sea-level from the low level of Late Glacial times to its present level. In South

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* The climatic conditions under which stalagmite was formed in the outer, inhabited parts of caves in Britain are not well established. In general, the places in question are too dry for stalagmite formation at the present day, and in an earlier paper I suggested that they were wetter and probably warmer than at present. The fact that stalagmite deposition occurs in the interior of caves, where temperature is low (*c.* 50° F.) and humidity is high, suggests that the controlling factor is moisture rather than temperature, although glacial conditions can probably be ruled out on the grounds that stalagmite formation is favoured by the presence of CO_2 or organic acids in solution, necessitating abundant vegetation. In many caves around the Mediterranean stalagmite is not forming today, and Zeuner (1959, p. 221) has postulated moister conditions during the formation of buried layers of stalagmite which occur in them.

In addition to climatic influence local factors were of importance. At Aveline's Hole, Burrington, stalagmite formation appears to have started when the cave mouth became blocked. At the exposed, shallow cave, Soldier's Hole, Cheddar, isolated bosses only were formed at the top of the Palæolithic layers. Nevertheless, occurrence of stalagmite at this level seems sufficiently widespread to demand a general cause, modified by local factors.—D. T. D.

CORRELATION TABLE

Brean Down		Layer	General Correlation*			B.C.	Local Correlation	
Iron Age Sand		1–3 4						
Blown Sand		5	Post-Glacial		Sub-Atlantic	450–950	Flooding in Somerset levels; Late Bronze Age trackways	
Bronze Age Sand		6			Atlantic	1800	Merthyr Mawr, earliest blown sand	
Beaker Sand		7					Porlock Submerged Forest; Raised Peat Bogs and Neolithic trackways of Somerset levels; Stalagmite in Caves	
Red Loam		8A			Boreal	5000	Marine Clays below Somerset levels. Mesolithic Red Loam with Limestones: Nanna's Cave, Caldey†	
Upper Breccia	earthy	8B			Pre-Boreal			
	sandy	8C				8000	Cave breccias with local Cheddarian Industries	
Main Sand		9	Main Würm	Late-Glacial	Younger Dryas			
Breccia Band		10A				8600		
Silty Sand		B 10 C			Allerod Interstadial optimum		"Creswellian" Yellow Silty Sand: Nanna's Cave, Caldey†	
Bone Bed		11A				10000		
Middle Breccia		11B			Older—Oldest Dryas amelioration	12000	Local Solutrean Industries	
Stony Silt	silty	A				14000		
	clayey	12B			Younger Würm			
	silty	C						
Lower Breccia		13A–C			Paudorf Interstadial	23000	Howe Rock strandline	Worcester terrace of Severn
Boulder Pile		13D			Middle Würm	26000		
Howe Rock Platform			Gottweig Interstadial				Swallow Cliff Beach	Main terrace of Severn
			Early Würm			40000		
			Last Interglacial				Spring Cove Beach, Burtle Beds	Kidderminster terrace of Severn

* Column 2 adapted from Gross, 1957. † Caldey Island after Lacaille and Grimes, 1955.

Wales this period has been studied in detail, and according to Godwin (1955, pp. 161–162), "Borings in Swansea Bay . . . have yielded peats intercalated between marine clays that prove upon pollen analysis that the last stages of the rise in sea-level were accomplished during the closing stages of the Boreal Period (*c.* 4500 B.C.). This rise of the sea flooded the valleys of the Somerset levels and filled them with an estuarine clay whose surface now lies a few feet above mean sea level."

The estuarine clay in the Somerset levels supported raised peat bogs of which the basal layers are dated as early Atlantic by Godwin. The sequence at site F at Brean, of reed peat resting on clay at between −4 and +1 ft. O.D., is probably to be correlated with the base of the raised bogs. As reed swamps in coastal locations lie at about H.W.M. it can be deduced that at this time H.W.M. was about 18–20 ft. lower than now. Similar basal reed peat in the Somerset moors has been dated by radiocarbon determination to about 3500 B.C. (Godwin, Suggate and Willis, 1958), that is, roughly contemporary with the earliest Neolithic settlement in Britain.

Layer 8A dips below the present beach and the Beaker burial was made in it between present tidemarks at about 15 ft. O.D. At that time H.W.M. is unlikely to have been above +10 ft. O.D. and may have been lower. In the Taw estuary the Yelland Stone Row, which is likely to be of Early or Middle Bronze Age date, was built on a land surface which is now 10 ft. below the level of high spring tides (Rogers, 1933). The Brean evidence shows that during the Middle Bronze Age H.W.M. was less than +16 ft. O.D., a deduction confirmed by the trackways built on formerly dry surfaces of the Somerset raised bogs between +7 and +13 ft. O.D. and dated to the Late Bronze Age (approx. 900–450 B.C.) (Godwin and Willis, 1959). The high-tide level was still below the present level during the period of Iron Age occupation at Brean.

The Beaker sand (7) finds a parallel in the Merthyr Mawr area of South Wales (Higgins, 1933, pp. 53–55) where blown sand was absent during Mesolithic and Neolithic times but had arrived by the Beaker period. Sand was also accumulating at Merthyr during the Early Iron Age but this episode is not clearly separated from the earlier one as it is at Brean. The sand layer (5) can be correlated with the sand cover on the summit of the Down which was exposed beneath the Roman Temple, covered by a thin fossil soil which yielded a shard of Iron Age pottery.

The blown sand layers in the Sand Cliff section cannot be correlated with the dune system which extends from the foot of the Down southwards to Burnham-on-Sea. Phelps (1836, pp. 37–39) recorded two wells in which "black loam" was encountered beneath the blown sand, and at the present time (1960) an old land-surface of comparatively recent date (? medieval or later) is exposed a few feet above high-water mark on the seaward side of

the dunes north of Burnham-on-Sea. Recent dune migration is thus demonstrated, but the earlier history of the dunes is unknown.

General Correlation

This may be approached in two ways. First, if the age of the limestone cliff against which the deposits are banked can be determined this will give the maximum possible age for the deposits. Secondly, starting from a layer of which the age is known, the sequence of deposits can be compared to other sequences.

The Limestone Cliff. This is known to descend below the present beach level to +17 ft. O.D. and to Ordnance Datum at the west end of the Down. The cutting of this cliff line cannot therefore be older than some part of the Catuvellaunian (= Riss = Saale = Penultimate) Glaciation, as the rock bench of the Bushley Green Terrace of the Severn (Wills, 1938) lies at about +75 ft. O.D. at the Severn Tunnel. (The aggradation of this terrace is now thought to date from an advanced phase of the Catuvellaunian Glaciation (Bishop, 1958, *Table, Fig.* 12).) Extrapolation of the longitudinal profile gives a height for the valley floor of this stage at Brean (23 miles downstream) of hardly less than +50 ft. O.D.

Further, the cliff truncates presumed ancient shore-line features at about 70 ft. and 50 ft. O.D., and bears on its face possible traces of a stage of sea-level about 10 ft. above the present sea-level. These correspond, in their relation to present high-water mark, to the three Monastirian sea-level phases —Main, Late and Epi-Monastirian—recognized by Zeuner and reported from numerous, widely dispersed localities (Zeuner, 1955). The first two Zeuner dates to the Last (Riss-Würm) Interglacial, the third to the First (= Gottweig) Interstadial of the Last Glaciation.

This dating can be confirmed from local evidence. The Main Monastirian transgression is represented by estuarine/marine deposits in the Vale of Gordano (ApSimon and Donovan, 1956), north-east of Clevedon, a valley draining to the Severn mouth at Portishead. These deposits descend to +36 ft. O.D., implying that before their deposition the bed of the Severn estuary had been cut down at least to the level of the Kidderminster Terrace bench (*c.* +25 ft. O.D.).

The Late Monastirian shoreline is represented locally by a rock platform and beach deposits at Spring Cove, Weston-super-Mare (Day, 1866; Mackintosh, 1868), and probably by sites referred to in the literature as the Fifty-foot Raised Beach (Palmer, 1931). The Epi-Monastirian shoreline is represented by a rock platform and beach deposits at Swallow Cliff, Middle Hope (Woodspring) (Sanders, 1841). Both shorelines can be traced northwards along the coast and are present at Portishead Point (ST 644776), where they lie well below the extrapolated level of the Bushley Green Terrace.

Their correlation on grounds of relative height with the final aggradation phases of the Kidderminster and Main Terraces of the Severn seems probable, in view of the mean sea-levels for these phases suggested by Wills (1938, pp. 223, 227). The Interglacial position of the Kidderminster Terrace between the Catuvellaunian and Cornovian (= Main Irish Sea) Glaciations is generally accepted (Shotton, 1953, pp. 238–239; Bishop, 1958, p. 303). The Main Terrace is known to be contemporary with the Main Irish Sea (= Cornovian = Early Würm) Glaciation, its final aggradation belonging to the succeeding Interstadial. Confirmation of this is supplied by the radiocarbon dating of Main Terrace deposits at Upton Warren near Droitwich (Wills, 1938, pp. 201–203) to about 40,000 B.C. (de Vries, 1958). These datings therefore confirm the ages assigned to the three Monastirian sea-levels by Zeuner.

If the Howe Rock platform is, as we have suggested, younger than any of the higher shorelines, then it cannot have been formed until after the regression of sea-level from the Epi-Monastirian level of the Gottweig Interstadial. There is some local evidence in favour of this view. The Howe Rock level seems to be represented on the inter-tidal rocks of the Severn estuary as far as the Portishead area. North of this point a recent line of borings along the line of the Mere Bank Rhine on the alluvial flats north of Avonmouth showed the presence of a succession of shelves cut in the Keuper Marls and covered by alluvium, etc. The highest of these (ST 540785) is about 650 yd. wide and lies at about −5 ft. O.D., corresponding in level to the Howe Rock platform.

Mean sea-level when the Howe Rock platform was being formed must have been about −15 to −20 ft. O.D. since the upper limit of the platform lies at about O.D. This corresponds with the mean sea-level at the time of the aggradation of the gravel with marine shells seen in the eastern approach cutting of the Severn Tunnel, tentatively referred to the Worcester Terrace by Wills (*see* Donovan, 1960, p. 65). This therefore gives a maximum age for the erosion of the limestone cliff to its final form, and also, of course, for the earliest deposits against it.

The Deposits. The oldest fixed point is provided by the occurrence, in the red loam layer 8A, of Early Bronze Age pottery likely on archæological grounds to date from about 1800–2000 B.C. Above this level archæological finds provide sufficient evidence of date and no detailed discussion of correlation is necessary. The soil formation which produced layer 8A was ended by the deposition of the Beaker sand not later than about 1700 B.C. The formation of the red loam therefore occupied the preceding part of the Post-Glacial stage. In the local correlation it has been shown that this layer corresponds to the submerged post-glacial land surface found along the shores of the Bristol Channel and elsewhere, and that Mesolithic

industries are associated with this surface. The change from *terra fusca* to brown earth formation may have resulted from the change from Boreal to Atlantic climate about 5000 B.C. The stage represented by 8B, when vegetation cover had not yet been established sufficiently to prevent sludging of talus down the slope, may belong to the beginning of the Post-Glacial.

The layers below indicate an alternation of conditions favouring frost weathering and colluvial action. They may be summarized as follows:—

Layer 8C	Upper Breccia (Layer 9, Main Sand)	Frost weathering
Layer 10A	Breccia band	
Layer 10B–C	Silty Sand	Colluvial action
Layer 11A	Bone Bed	Soil formation, slight erosion
Layer 11B	Breccia	Frost weathering
Layer 12	Stony Silt	Colluvial action
Layer 13A–C	Lower Breccia	Frost weathering
Layer 13D	Boulder Pile	Intense frost erosion

Layer 9, the main sand, has not been considered separately because as we have suggested in the interpretation (p. 97) it seems probable that the great thickness at the Sand Cliff exaggerates the importance of the episode of sand blowing, which may have been only a brief phase in the shift towards the cool maritime climate, which is inferred for the upper breccia.

There is no evidence, which would permit the interpolation within this sequence, of a period of interglacial climate. The only horizons which need even be considered in this respect are the bone bed, 11A, and the top of the main sand, 9, where it is covered by 8B. The degree of chemical weathering of layer 11A is slight, in sharp contrast with the mature weathering soil, 8A, and the slight erosion of the surface did not affect the stones which it exposed. The thin covering of vegetation on the surface of the main sand appears to be absent where there is a substantial covering of upper breccia, 8C, and probably flourished for a brief period before the dune was completely buried.

Layers 8C to 12 appear to require moderate rather than severe periglacial conditions for their formation. Layer 13, on the other hand, implies a period of violent frost erosion suggestive of a glacial maximum. We suggest that 8C to 12 should be correlated with the Late Glacial stage of the Last (Würm) Glaciation, and that layer 13 should be correlated with the last major stage of that Glaciation. This stage (= Younger Würm = *Würm* 3 of loess stratigraphy, but probably *Würm* 2 of the Alpine sequence) and its equivalent in North America (*Tazewell* stage of Wisconsin Gln.) can be dated by the results of radiocarbon determinations to *circa* 19,000 to 14,000 B.C. (Gross, 1957).

The climatic sequence, represented by layers 11B to 8C, may be compared to the well-known Late Glacial climatic oscillation represented by the Older Dryas, Allerød Interstadial and Younger Dryas phases (Gross, 1954, and accounts in much recent literature). Layer 11B could then be correlated with part of the Older Dryas; and the bone bed, 11A, with the cool temperate Allerød Interstadial, during which birch woods are known to have flourished at least as far north as the Lake District (Pennington, 1949). Layers 10B–C could have been the result of the climatic deterioration of the latter part of the Allerød period. The main sand and upper breccia would then have to be assigned to the Younger Dryas stage (Zone III), which ends the Late Glacial.

The thickness and extent of the upper breccia might be thought to imply a longer period of vigorous frost action than that afforded by Zone III which is believed on the evidence of Carbon-14 and varve chronology to have been no more than 600–700 years long. In fact, however, a wet climate with frequent winter frosts would account for the rapid formation of this layer.

These indications are in substantial agreement with what is known of climatic conditions in Atlantic Europe at the end of the Late Glacial. Thus in the lake deposits of Windermere alluded to above, the Zone I and III deposits were very poor in pollen of any kind and local tree pollen absent. In France recent work by Mme Leroi-Gourhan (1960) on polleniferous deposits from the famous Pyrenean cave site of Isturitz has shown that during the Upper Magdalenian (Magdalenian V–VI of Breuil, which can be shown elsewhere (Bordes, 1956) to be datable to the Allerød and Younger Dryas phases both on stratigraphic grounds and by the results of radiocarbon determinations), tree pollen fell to a very low percentage, and steppe plants were absent, leaving only mosses and marsh plants. The cold humid environment inferred from this is in perfect accord with the presence of Reindeer in the Pyrenees, especially in Magdalenian V–VI times (Breuil, 1954). Direct comparative figures are not available for southern England but Manley (1952) has published estimates suggesting that in Zone II mean July temperatures in the Midlands were about 53° F., and in Zone III about 48–50° F. Reductions of this order applied to the climate of the Brean area (present July mean 62° F., January mean 41° F., rainfall 30 *in.*, 35 frost days per annum) would probably have resulted in tundra conditions during Zone III.

This leaves layer 12 to be considered. If the previous correlations are accepted, this layer should represent a period of cool humid climate in the early part of the Late Glacial. It is not difficult to find evidence for such a period elsewhere. Firstly we may note the French archæological sites in which Solutrean and Early Magdalenian occupation levels are often associated,

either with earthy deposits (e.g., Combe Capelle; Peyrony, 1943), or with deposits free from rock fragments which contrast with underlying frost weathering breccias with Perigordian (Gravettian) occupation, and overlying Middle Magdalenian levels also associated with breccias and rock falls. A recent study of Laugerie Haute may be summarized as follows from the 42 layers recognized by the excavators (Bordes, 1959):—

Culture and Lithology	*Correlation with Brean Down*
Magdalenian III: evidence of frost weathering	? Middle breccia (11B)
Magdalenian I and II: clayey deposit indicating climatic amelioration	Stony silt (12A, B, C)
Middle and Upper Solutrean: sandy deposit, with no evidence of frost weathering, but possibly cryoturbified	? Base of 12C
Lower Solutrean: in top of frost weathering breccia (*see below*)	Top of lower breccia (13A, B)
Proto-Magdalenian, Perigordian III: frost-weathering breccia	Main lower breccia (13C, D, etc.) and boulder pile

Meticulous examination of the deposits of the Salpêtrière (Gard) (de Fonton and Bonifay, 1957) revealed that there also a period of increased humidity and reduced wind and frost action coincided with the Solutrean occupation. Radiocarbon determinations confirm the stratigraphical dating of the Perigordian breccias to Younger Würm and thus the "Solutrean amelioration", which has been called Würm III/IV by Bordes (1957), falls into line with other indications of amelioration following on the Younger Würm stage in Europe and separating the Tazewell and Cary stages in North America. (*See* Appendix III, p. 136.)

Finally, the pollen analyses of the Isturitz cave deposits have enabled us to relate archæological and climatic successions with reasonable certainty. Thus, the Gravettian layers there, which are stratigraphically dated to Younger Würm, represent the coldest and driest stage with characteristic steppe vegetation (0·25 per cent tree pollen, 2 per cent *Gramineæ*) and fauna (including *Saiga* antelope). Following this the Solutrean level has park-steppe type vegetation (3·2 per cent tree pollen), implying a tendency to greater humidity, probably with oscillations of temperature. The succeeding Middle Magdalenian level is described as moderately cold (1·8 per cent tree pollen, including birch and the snow-resistant juniper).

This sequence—maximum cold, dry : milder, more humid : colder—is like that of Brean, layers 13 : 12 : 11B, and both seem to occupy the same position in relation to the Würm Glaciation. This correlation has, therefore, been entered in the table.

6. POTTERY AND OTHER ARTEFACTS

Bronze Age Pottery (except No. 6—*Neolithic*) (*Figs.* 25–28)

Nos. 1–5 are from the red loam, layer 8A.

1. Body shard of hard reddish-brown "B" Beaker pottery, one line of small comb impressions, from near the base of the pot. Another thinner scrap of the same ware not figured. (M11.7/371.)
2. Rim shard of thin, dark Beaker ware with brown surfaces. Uncertainly stratified. (M11.7/320.)
3. Rim shard, black fabric with reddish-brown surfaces, three slanting lines of cord impressions on the outside. (M11.7/120.)
4. Shards of base and lower wall of a "B" Beaker in similar ware, grooved decoration. (M11.7/371.)
5. Shard of poor black ware with worn brown surfaces, decoration consists of a grooved chevron or herringbone pattern.

No. 6 is from a precisely similar layer of red loam beneath the Roman temple on the summit of the Down (ApSimon, 1958).

6. Shard of flint-gritted, black, Peterborough ware, very hard, the outside reddish in colour. Very worn and perhaps burnt. Part of the shoulder and the lower part of the neck of a Mortlake ware bowl, decorated with rows of slanting whipped-cord "maggot" impressions. (BD57,G10(5), No. 109.)

Nos. 7 and 8 are from the "B" Beaker grave dug into the red loam. These two pots were burnt in the destruction of the Society's museum. The drawings have been prepared using surviving shards and photographs.

7. "B" Beaker, base and lower wall missing, rim diameter 6½ in., very fine paste, inside buff to brown, outside red, rather soft, uniformly fired. Decoration consists of horizontal zones of herringbone pattern. The horizontal lines and a single line below the rim are made by impressing a thin twisted cord, the slanting lines by the impressions of a comb with very finely pointed teeth. (M11.7/376.)
8. Shard of "B" Beaker including rim and neck, about 7¼ in. diameter, fine dark brown paste without obvious sand or grit, surfaces dark greyish-brown, very hard and well fired. The rim varies in profile from slightly flattened to rounded or beaded. The outside is decorated with oblique finger-nail impressions set in roughly horizontal rows. (M11.7/377.)

   The finger-nail decoration of this pot is characteristic of "B" Beaker domestic ware from occupation sites, seldom found in graves, and must be distinguished from the rustication technique characteristic of "A" Beaker coarse wares. This pot was buried as a shard because the lower edge had been trimmed; No. 7 was found mouth down and may have been buried complete.

Nos. 9 and 10 are from the upper, "brown earth" horizon of the red loam and may have been dropped on the surface not long before it was covered by the Beaker sand (7).

9. Shard from near the base of "B" Beaker decorated with horizontal lines of cord impressions, brown ware with a little very fine grit giving the paste a rough feel. (M11.7/380.)
10. Shard of reddish-buff, sandy-textured "A" Beaker ware, on the outside is fine impressed comb decoration with traces of white infilling in the impressions. From the lower half of an "A" Beaker. The pattern of running lozenges with vertical hatching occurs at Gorsey Bigbury (Jones, 1938, *Fig.* 14, No. 27). (M11.7/381.)

Nos. 11 to 16 are from the "A" Beaker occupation level in layer 7 and the base of 6B.

11. Rim shard of fine, light brown-buff "A" Beaker ware, evenly fired, with impressed comb decoration with traces of white infilling. From the basal part of 6B. (*See Fig.* 20.) (M11.7/370.)
12. Shard of brown "A" Beaker ware with comb decoration. From the transitional zone, 1 in. above the top of 7. (M11.7/369.)
13, 14. Two scraps of "A" Beaker ware with comb decoration. From Beaker sand, layer 7. (M11.7/309, 308.)

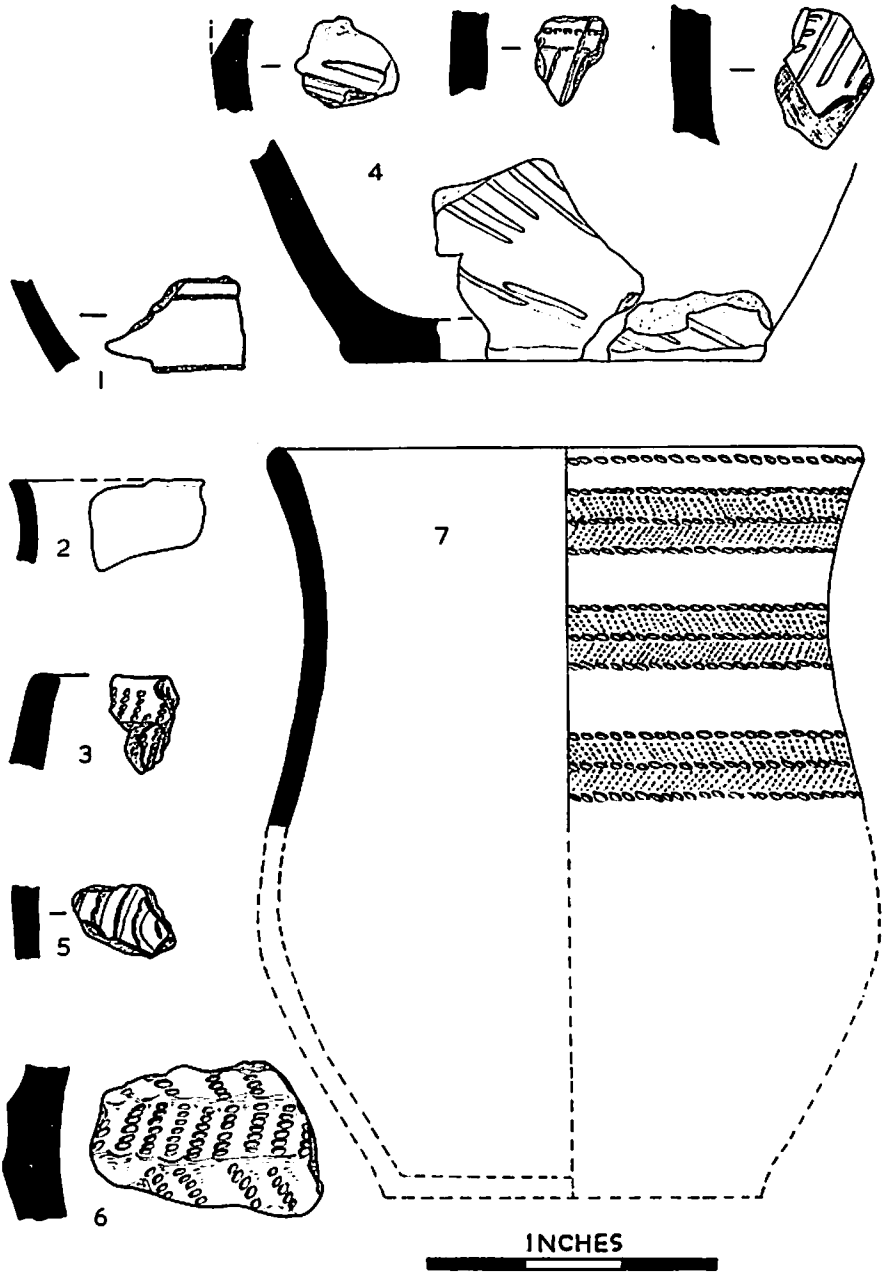

Fig. 25.—Neolithic and Beaker pottery from Brean Down Sand Cliff and the Roman Temple, Nos. 1–7. One-half natural size.

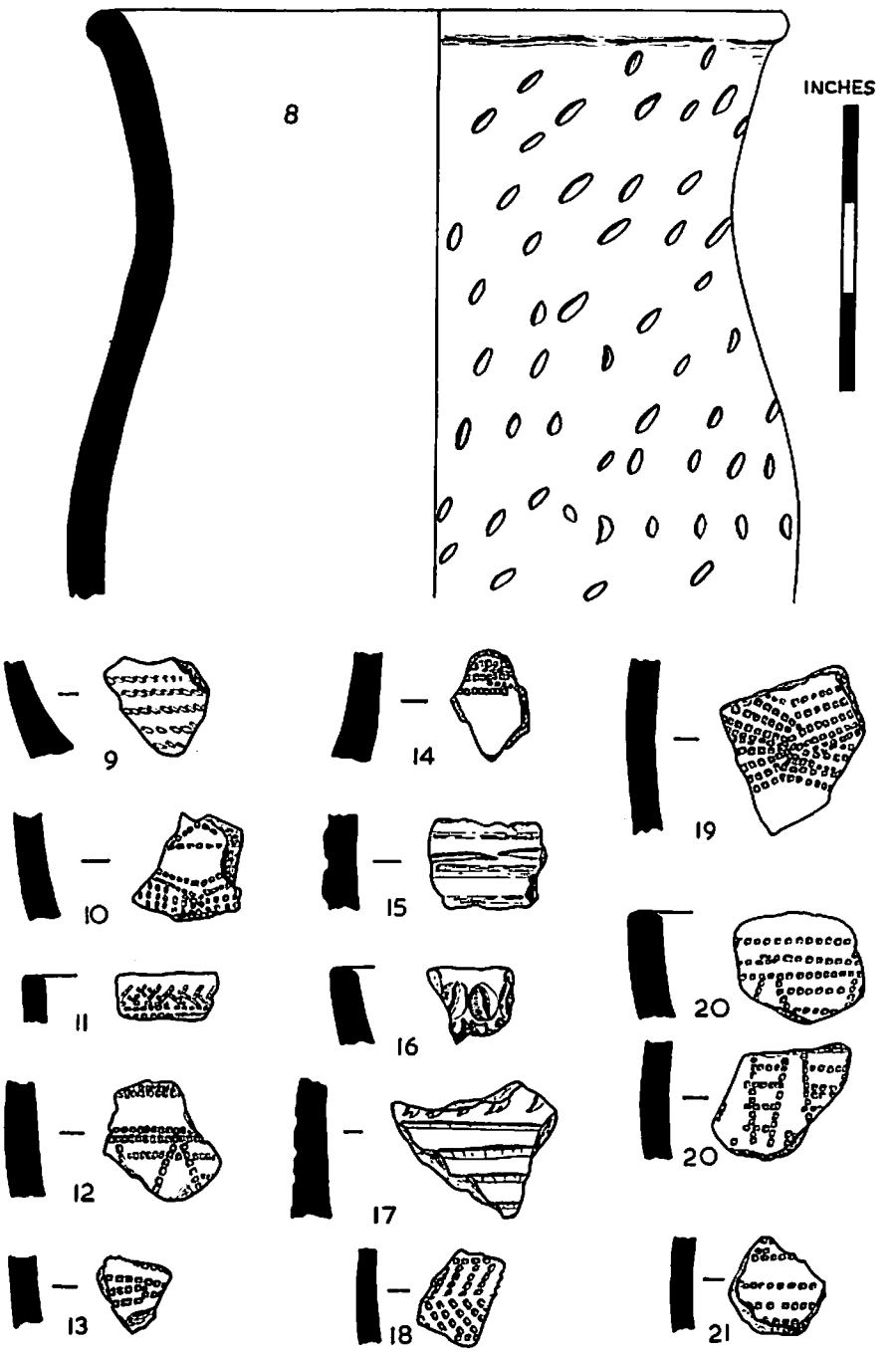

Fig. 26.—Beaker pottery from Brean Down Sand Cliff, Nos. 8–21. One-half natural size.

15. Shard of grey Beaker ware with buff-brown surfaces, three horizontal grooves on the outside, well fired. Found as Nos. 13, 14. (M11.7/311.)
16. Rim shard of pale brown Beaker ware with finger-nail impressions on the outside. This is a fragment of an "A" Beaker with rusticated decoration; compare No. 8 above. From 7, a few inches above top of 8A. (M11.7/382.)

Nos. 17 to 21 are unstratified.

17. Shard of black ware with some grey stone grit, outside pale brown, the horizontal grooves show faint septa so may be worn comb impressions. The ")"-shaped impressions are not of a finger-nail. Probably from a "B" Beaker. (M11.7/38.)
18. Shard of good "A" Beaker ware, much like a shard from 7, core grey to brown, surfaces grey, burnished, comb impressions. Pre-war find. (M11.7/312.)
19. Body shard of black "A" Beaker ware with coarse comb-impressed decoration. The pattern occurs on shards from Gorsey Bigbury. Pre-war find and, to judge from the adherent earth, probably derived from 6B. (M11.7/158.)
20. Two shards, one perhaps a rim, of "A" Beaker ware, fabric half red, half black, outside red to buff, inside brown, deeply impressed comb decoration, shards are weathered. Part of a Beaker with bar chevron pattern. (M11.7/25, 318.)
21. Shard of dark grey Beaker ware, outside brown, inside abraded, horizontal lines of impressed decoration. (M11.7/388.)

Nos. 22 to 30 are from the Middle Bronze Age occupation, layer 6B.

22. Rim shard of thick, flakey, dark brown ware with angular grits projecting through the inner surface, fired in places to a pale red. There are four parallel lines of deeply impressed cord ornament on the outer surface and the bevelled rim also has cord decoration. The character of the rim bevel corresponds to Glasbergen's rim type A on the series of Hilversum urns from the Low Countries described by him (Glasbergen, 1954, p. 90, *Fig.* 56). Similar rim decoration occurs on an urn from Hurston Ridge, Chagford, Devon (Plymouth Mus., unpublished), which belongs to the Wessex Biconical Urn type studied by Dr. I. F. Smith and thought to be the source from which the Hilversum urn series derives. It is alternatively possible, although less likely, that this rim was part of an Overhanging-Rim Urn such as that from Durrington B. 69, Wilts. (Abercromby, 1912, Vol. II, *Plate* 64, No. 36). (M11.7/123, 201.)
23. Shard from shoulder of a Biconical Urn of Wessex type, thick, buff-brown ware with very short angular fractures, no added grit visible, outer surfaces smoothed to resemble slip coating, horizontal applied cordon on the shoulder, partly flaked off, with six incised nicks, too deep for finger-nail. Above the cordon the shard shows the lower edge of a zone of impressed cord pattern. From the top of 6B, a few feet south of the beginning of the Beaker sand, 7. (M11.7/363.)
24. Base shard, probably from the same pot as 23, paste is half red, half black, the outside pale buff, very smooth, very friable, the fabric contains crushed pottery grits, a distinctive feature of this type of pottery. Found in 6B, 6 in. above the base. A plain body shard in the same ware was found in the hearth level 6C. (M11.7/322 and 291.)
25. Body shard of similar ware, half red, half black, paste contains much crushed pottery, outside reddish-brown with prominent traces of horizontal surface wiping, inside brown. A horizontal cordon with two finger-nail impressions and a finger groove beneath are worked in the outer surface of the shard. From near the top of layer 6B, south side of sheet III. (M11.7/372.)
26. Base shard of rather similar ware except for colour and the treatment of the outside, inside has black incrustations, from use as a cooking pot? Found with No. 24. (M11.7/322.)
27. Base shard of similar ware, fractures show mode of building up pot. Derived from 6B. (M11.7/15.)
28. Shard from basal angle of wall, rather similar ware but coarser and less well fired, core half reddish-brown, half black, outside brown, wiped surface,

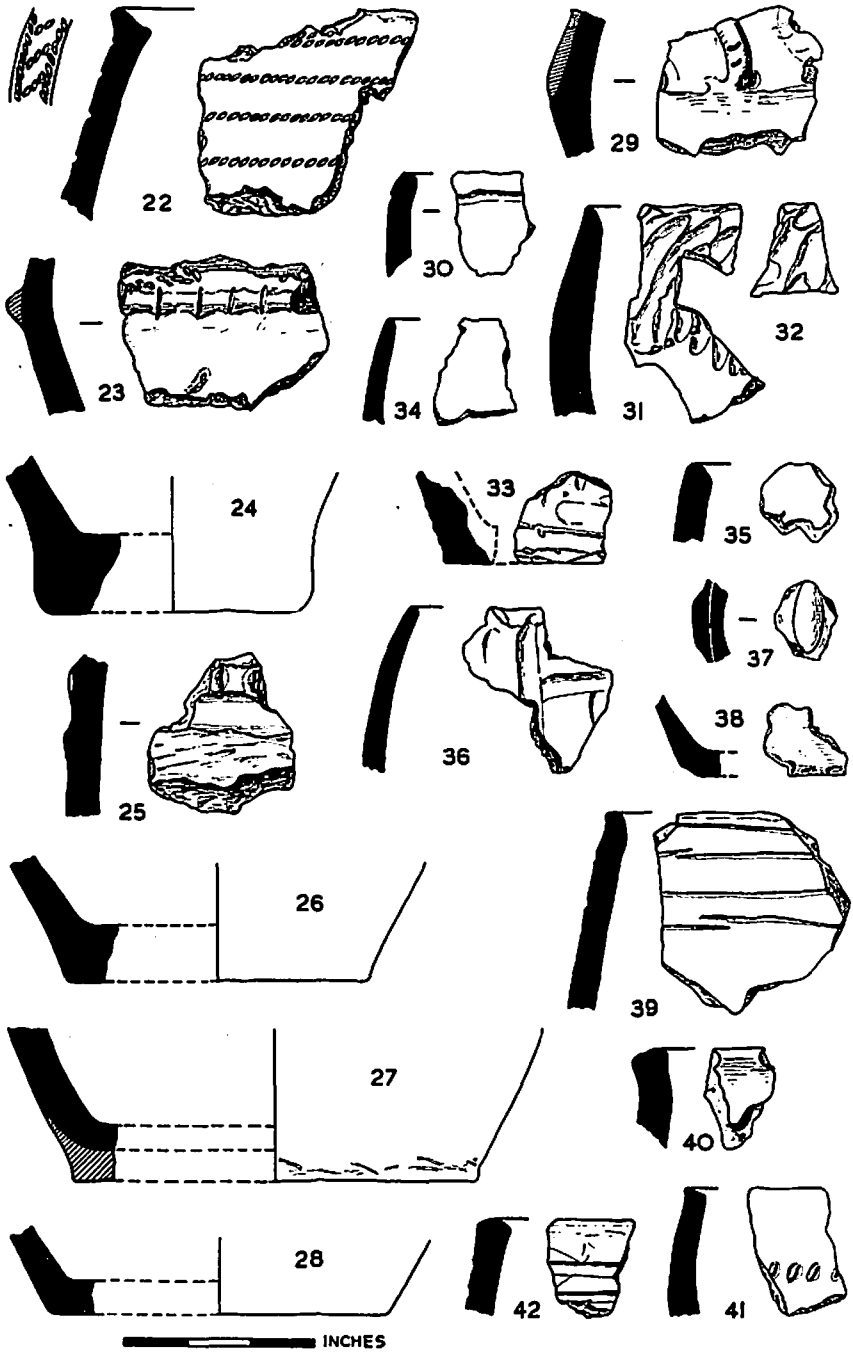

Fig. 27.—Middle Bronze Age pottery from layer 6, Brean Down Sand Cliff, Nos. 22–42. One-third natural size.

more like No. 26 than 24. Found in 6B, 4 in. above top of 7, 1 ft. below the base of hearth 6C. (M11.7/373.)

29. Shouldered shard of black gritty-looking ware (although there is apparently no added grit), inside reddish-brown, outside grey-brown, part of arc-shaped, applied "horseshoe" handle above shoulder. Finger-nail and tip impressions on upper side of shoulder. This is part of a Biconical Urn with horseshoe-shaped handles. Also another shard and one unstratified. From 6B, 6 in. above the Beaker sand. (M11.7/324.) There are 4 shards of similar ware, not illustrated, which include one of black ware with very short angular fracture, the outside brown, closely resembling the fabric of the style 3–4 pottery of the Cornish Middle Bronze Age Trevisker culture.
30. Rim shard of poor dark grey ware, irregularly rounded rim, a single scored groove outside the rim. From 6B, 9 in. above the Beaker sand. (M11.7/367.)

Nos. 31 to 38 come from the limpet hearth (6C) or from the nearby part of 6B, except for 36 which was unstratified.

31, 32. Rim and body shards of fine greyish-brown ware, very straight, square fractures, the outside roughened by oblique ridges worked in the surface of the pot, apparently with a finger. Simple pointed-rounded rim, the inside wiped horizontally. (M11.7/292–3, 295.)
33. Base shard of similar ware, the inside abraded, bright red due to being burnt in the hearth, as is much of this very fragmentary pottery from the hearth. (M11.7/297.)
34, 35. Two rim shards of rather similar ware. (M11.7/213, 301.)
36. Rim and body shards of red ware, inner half shading to black. (M11.7/12.)
37. Shard with small vertical (?) applied unperforated lug. This and some other better-preserved shards from the limpet hearth are made of a fabric apparently deriving from that of the Biconical Urns described above. (M11.7/239.)
38. Base shard, ware as above. (M11.7/251.)

Nos. 39 to 41 are from the later Middle Bronze Age occupation, layer 6A, No. 42 from the limpet hearth, 6C.

39. Rim and upper wall of pot, black ware, decorated with rough horizontally grooved lines. From layer 6A in area between sheets III and V. Fabric and decoration look like a derivative from style 3 pottery of Trevisker culture. (M11.7/359, 361.)
40. Rim shard of hard dark brown ware with reddish-brown exterior, paste has very fine texture and contains very little added grit. The inside is wiped over in the same manner as in Nos. 31–32. The paste approximates to that of the style 4 pottery of the Trevisker culture. From 6A, 2 in. below top, 9 in. from south end of 1955 excavation. (M11.7/375.)

    Also (not figured) 2–3 other shards of rather similar ware and an unstratified shard, with the characteristic green staining of material from this layer, whose dark grey fabric can be matched among Trevisker pottery of style 3–4. (M11.7/356.)
41. Rim shard of hard, gritty, dark grey ware, no added grit, surfaces grey-brown, patchy. Sharply cut, inwardly bevelled rim and a line of oblique finger-nail impressions on the rounded shoulder. This is a pot of "sub-biconical" type. From sheets II–III, resting on hearth at the top of 6A. (M11.7/337.)
42. Rim shard of black ware, rather like No. 46, two horizontal grooves on the outside. (M11.7/220.)

Nos. 43 to 51 are unstratified.

43. Rim shard of black ware, diameter 10·6 in., some sub-angular stone grits in the paste. Four horizontal tooled grooves on the outside, the same ware as No. 42. Said to be from layer 4 but the character of the ware and its condition show that it must really be from 6A–6C. (M11.7/56.) A body shard of very similar paste, $\frac{3}{8}$ in. thick, surfaces reddish with 5 horizontal flat-bottomed grooves, is in Taunton Castle Mus. (No. 53.A.5, finder H. S. L. Dewar).
44. Rim shard of coarse, lumpy, black ware, plain inwardly bevelled rim, the lower edge of the shard is concave in section showing that the rim was applied as a separate piece; the beginning of a single line of cord impressions on the outside. Pre-war find: "Inside Iron Age Sand near foot of slope",

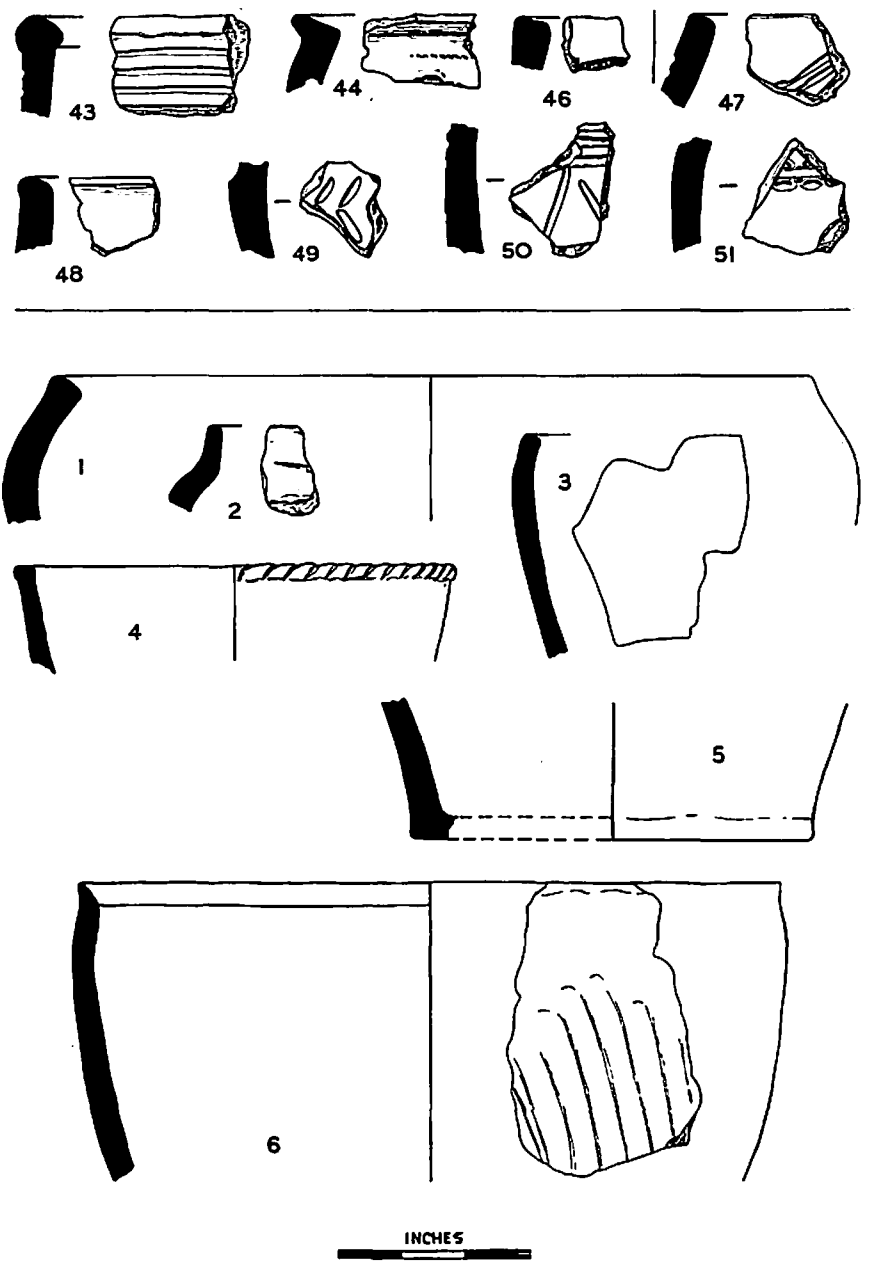

Fig. 28.—Middle Bronze Age pottery from layer 6, Nos. 43–51, and Iron Age pottery from layer 4, Nos. 1–6, Brean Down Sand Cliff. One-third natural size.

but it appears to be the rim of a Bronze Age pot like No. 22, and so may perhaps not really have been found stratified. (M11.7/314.)

45. Shard of dark grey ware, dark surfaces, paste contains some small grits, possibly crushed pot. Four finger-nail/finger-tip impressions on the outside. Unstratified but from paste and condition is likely to have been derived from 6A. (M11.7/247.)
46. Rim shard of hard black ware, resembles a body shard from 6A. (M11.7/368.)
47. Rim shard of hard black ware, two oblique, square-bottomed, grooved lines on the outside. (M11.7/243.)
48. Rim shard of similar ware, edge of one grooved line on the lower edge of the shard. (M11.7/111.)
49. Shoulder shard of hard dark grey ware, some angular grits in paste, on the shoulder the remains of a row of lateral grooved chevrons, one complete, those on either side imperfect. Found lying on the slope below layer 6, resembles pottery from 6A in fabric and condition. (M11.7/374.)
50. Body shard of hard dark greyish-black ware, outside has 3 horizontal, tooled, flat-bottomed grooves running to the remains of a broken-off lug or handle, beneath these two diverging, shallow, tooled lines. (M11.7/135.)
51. Body shard of hard black ware with dark brown surfaces, outside has a pinched-up horizontal cordon with deep finger-nail impressions paired on either side. (M11.7/155.)

Iron Age Pottery (*Figs.* 28, 29)

Nos. 1–3 are from layer 4, sheet III. Nos. 4, 5, 9 and 10 are from layer 4J, sheet V. The remainder are unstratified. Nos. 6 to 8 from sheets II and III, the others are pre-war finds of uncertain provenance.

1. Rim shard of thick, coarse ware, hard greyish-brown with some calcite crystals in the paste, outside black, a heavy squared-off rim. Perhaps an inbent rim from a very large vessel. A more or less complete pot from the site with a shoulder and inbent rim is now in Bristol Museum (unpublished). From hearth, layer 4G. (M11.7/288.)
2. Rim shard, hard black calcite-gritted ware, from a shouldered jar. (M11.7/315.)
3. Large rim and body shard from an open bowl or jar, hard, coarse, calcite-gritted, black ware. From layer 4F. (M11.7/312.)
4. Rim shard with notching on outer angle, black ware with calcite grit, inside grey, outside brown. (M11.7/327.)
5. Base shard, brownish-black ware, calcite grit. (M11.7/331.)
6. Rim shard of bowl or jar, black ware with calcite grits, inside brown. The rim bevel is common on the site. (M11.7/321.)
7. Rim shard, flat top, dark greyish-brown ware, calcite grits, outside slightly ridged by tooling. (M11.7/244.)
8. Rounded rim shard of hard black ware with a few calcite specks. (M11.7/322.)
9. Heavy cordoned shard with incised decoration above the cordon, grey ware with fine calcite grit, surfaces black.
10. Rim shard with rounded shoulder, black ware with calcite grits mostly leached out, a characteristic Iron Age fabric. (M11.7/63.)
11. Shard of bowl with everted rim and hollow neck, fine reddish-brown ware with some calcite grit, surfaces have been covered by reddish slip, a row of double punch marks on the shoulder. Shard is rolled, found among shingle on the beach. (M11.7/36.)
12. Rim shard with flat top, and inward overhang, black ware with calcite grits, greyish-brown surfaces. (M11.7/138.)
13. Rim shard with flat top, thick, coarse black ware with large calcite grits. (M11.7/236.)
14. Shard of coarse gritty ware, fired to reddish colour, inside abraded, core grey, outside brown, covered by smooth, highly burnished brown slip coating, some calcite grit in the paste. Perhaps part of a carinated bowl. (M11.7/277.)
15. Base shard, slightly projecting foot is decorated with a finger-tip impressed band or frill, core black, reddish-brown slip on surfaces, a few calcite grits visible, similar bases occur among the pottery from Little Solsbury (Adams and Falconer, 1935, *Fig.* 10, No. 250). (M11.7/248.)

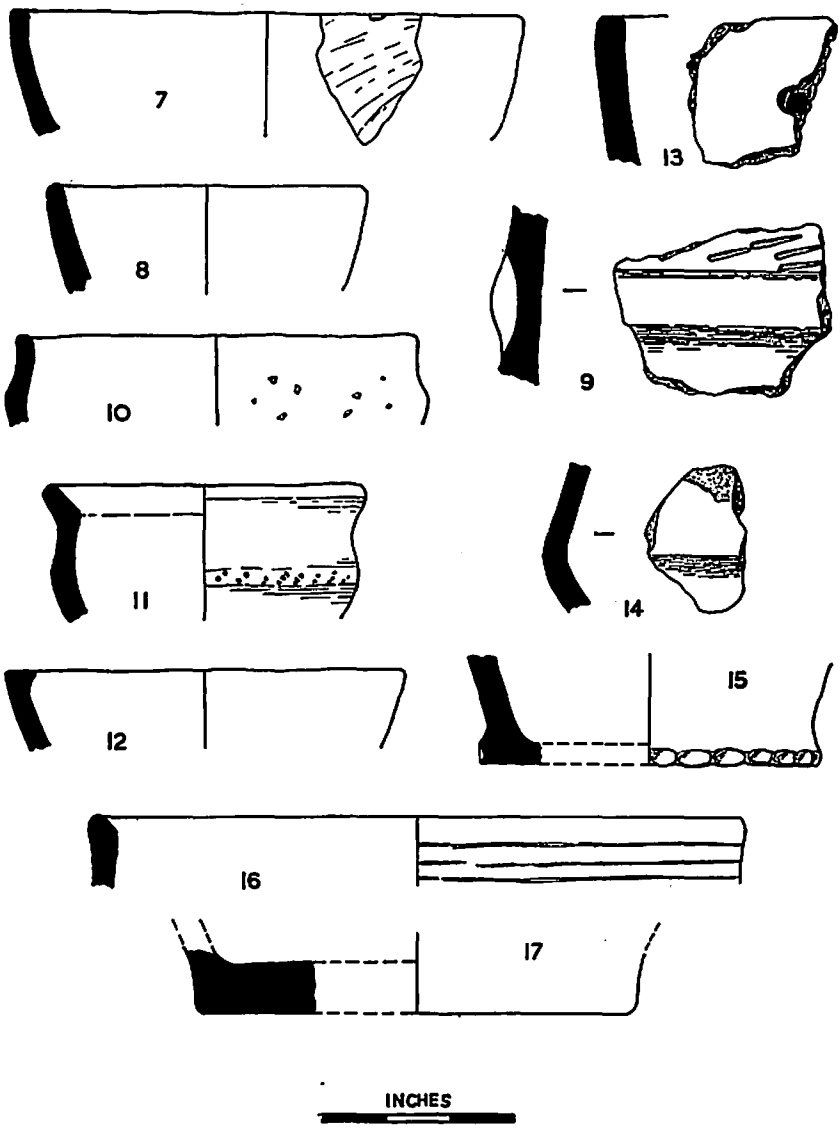

Fig. 29.—Iron Age pottery from layer 4, Brean Down Sand Cliff, Nos. 7–17. One-third natural size.

16. Rounded, inwardly bevelled rim shard, close-textured hard brownish-black ware with some fine calcite grits, faint scribed lines on the outside, much rolled. (M11.7/345.)
17. Base shard, hard ware with finely divided grit, inside black, red slip on outside. Also a few plain body shards of the same ware, but all unstratified. These may be compared to hæmatite-coated wares occurring at Pagans Hill,

Chew Stoke, and in the early group at Chew Park, Stowey-Sutton. The shapes at these sites include rather similar straight-walled jars. (M11.7/352.)

Seventeenth-century Pottery (*Fig.* 30)

1. Rim and body shards of open bowl, fabric red with grey core, covered with dirty cream-coloured under-glaze slip, base ring red. The rim and inside glazed yellow, patches of green in the glaze, 'sgraffito-type decoration on the inside consisting of grooved impressions in the slip surface coloured olive brown. Unstratified in area to south of house site. (M11.7/249.)

The only similar ware known comes from Stratford Mill, West Harptree, Somerset (to be published in *Chew Valley Lake Excavations*, H.M. Stationery Office, *forthcoming*), although not in a dated context. This ware does not occur to the south of the Parret (*teste* A. D. Hallam, Taunton). Mr. John Hurst has commented that the patches of green in the glaze occur in pottery from Bristol and that this was the only known source in England for the depiction of scenes in 'sgraffito technique.

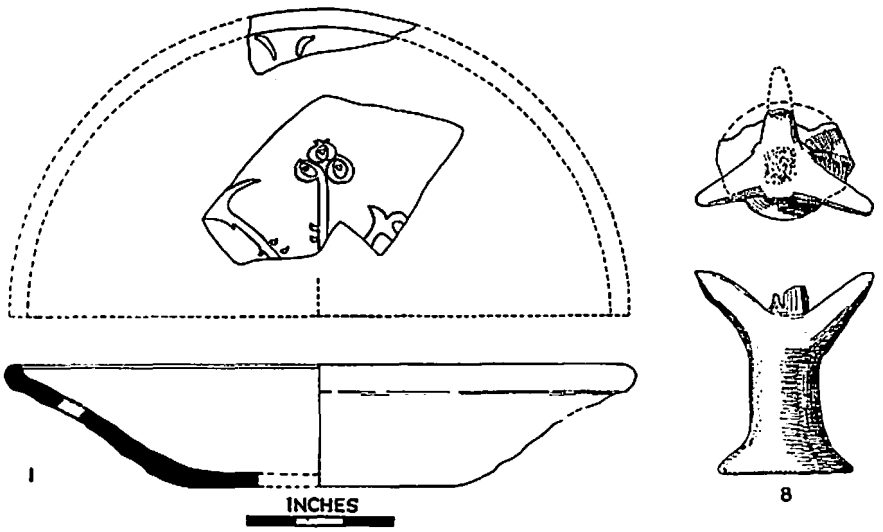

Fig. 30.—Seventeenth-century bowl, No. 1, and object of baked clay, No. 8, from Brean Down Sand Cliff. One-quarter natural size.

Comparison with 'sgraffito wares dated *c.* 1605–1652 from the St. Nicholas' Almshouses, Bristol (seen by courtesy of K. J. Barton, Esq.), suggests that the Brean bowl is of later date. Analogous 'sgraffito ware from the Jamestown excavations is thought to come from Barnstaple and to date between 1640 and 1680 (Cotter, 1958, pp. 203, 206). If this bowl derives from the occupation of the house then it may belong to the last quarter of the century.

Objects of Flint, Bone, Metal, Clay and Sandstone (*Figs.* 30–32)

1. Part of knife or scraper of white patinated flint, made on a blade, the point broken prior to patination. The right-hand edge is retouched on the dorsal surface and near the base on the bulbar surface. The left-hand edge is retouched on the bulbar surface only. Found unstratified on surface of main sand, sheet II. (M11/122.)

   Two other similarly patinated flint implements have been recorded from the Sand Cliff. The first, a scraper found by Dr. Oakley (Palmer, 1934, p. 151), is lost, the second, found by P. A. Rahtz, resembles our No. 1. Both were unstratified, but that found by Dr. Oakley had adherent traces of red

matrix. Patinated flint flakes have only been found in the red loam and these implements are probably derived from there. Typologically they could be Mesolithic; the trimming of both edges close to the base is found on a flint knife from Herriots Bridge, West Harptree, for which late Upper Palæolithic parallels have been suggested (ApSimon, 1957).

2. Small round scraper of grey flint, fresh and unpatinated. Unstratified. (M11.5/6.)
3. Round scraper of grey flint, fresh, unpatinated. From the lowest part of layer 6B, associated with "A" Beaker potsherds. (M11/206.)

Both these implements are of types frequently found in Beaker contexts and may be compared to examples from Gorsey Bigbury (Jones, 1938, *Plate IX*, Nos. 76–78).

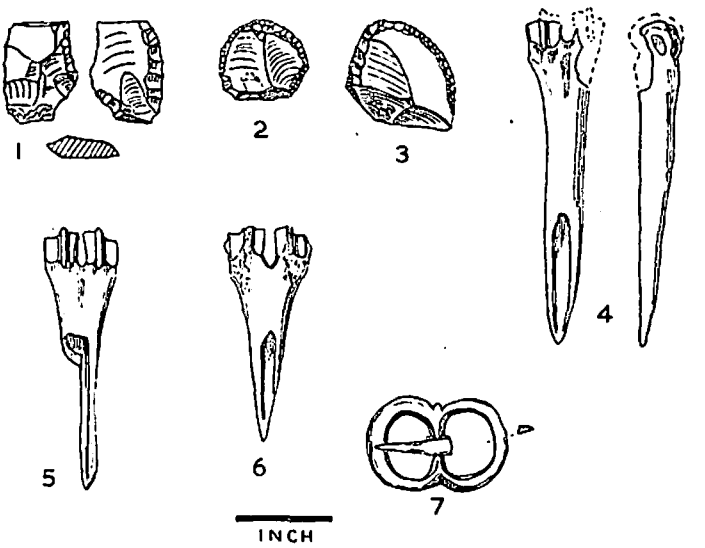

Fig. 31.—Small finds from Brean Down Sand Cliff. One-half natural size.

4. Bone point, made from metapodial of sheep/goat. Articular end is damaged. The surface is highly polished by use and the point is faceted on either side for about 0·2 in. Sheet II, unstratified. (M11/69.)

This closely resembles a bone point from Brean figured by Mrs. Dobson-Hinton (Dobson, 1935), but destroyed during the war.

5. Bone point, made by splitting the metapodial shaft. Damaged, a chip missing from the left-hand side and from the point. There are numerous fine transverse scratches on either side for 1·4 in. from the point. Partly encrusted with sand material, otherwise fresh, the bone a reddish-brown mottled colour. Sheet III, unstratified, condition suggests derivation from 6B, or 8A. (M11.6/2.)

This is very like a bone point associated with the Beaker burial from the ditch at Gorsey Bigbury (Jones, 1938, *Plate VI*).

6. Bone point, shaft cut obliquely as No. 4, weathered, adherent sand like that of layer 4. Sheet III, unstratified.

This resembles an Iron Age example from All Cannings Cross (Cunnington, 1923, *Plate* 9, No. 8).

These bone points have been conventionally called gouges. Their actual use is unknown but they may have been used in the preparation of

clothing from hides. Our examples belong to Mrs. Cunnington's Class E—without longitudinal or rivet holes. The cut type is found from Mesolithic and Neolithic times onwards. Such simple implements are not culturally distinctive.

7. Brass double buckle with pin on central bar. Post-medieval type, perhaps late 15th to 17th century, not closely datable. Sheet V, layer 4J, 3 in. below top.
8. Baked clay briquetage support, cylindrical body with expanded foot, terminated above in three prongs, one of which is broken. Unstratified. (Taunton Castle Museum, No. 53.A.3.)

   Fragments of other briquetage objects and a complete mushroom-shaped support have been found in layer 4. This support resembles examples figured by Brunn and Matthias (1958) from Halle. They were used to support clay vessels containing brine in the process of obtaining salt by evaporation. The forked supports from near Halle belong to the Late Bronze Age and to the Iron Age (Hallstatt C and D) and are probably older than the example from Brean. This particular type is apparently not represented among the Iron Age briquetage sites on the coast of eastern England. Saltworks were often sited on salt marshes and Romano-British briquetage sites of the 4th century are known from the valley of the Brue near Edington Burtle (Bulleid, 1914). General accounts of the processes used are to be found in Smith (1918) and Riehm (1960).

   We are indebted to B. V. Arthur, Esq., of Taunton Castle Museum, for the drawing of number 8.
9. Pink, quartzitic sandstone, probably derived from the Old Red Sandstone. Maximum length 9·3 in. One of the flat faces is entirely formed by a slightly convex facet due to wear. The other surfaces are natural. Presumably a grain rubber. Found in 1936, unstratified. (BD.3/2.)
10. Coarse, grey sandstone containing carbonaceous fragments. Probably derived from the Pennant Sandstone of the Coal Measures. Maximum length 8·5 in. One of the flat faces is a slightly concave facet due to wear. The other flat face is natural. The outline is a result of trimming, truncated by a later, presumably accidental, break at one end. Presumably a quern stone. From area of sheet V, unstratified. (M11/305.)
11. Well-rounded boulder of fine-grained, grey quartzitic sandstone. Maximum length 8 in. The two flat faces are smoother than the rest of the surface, and the pebble has presumably been used as a grain rubber. Found on the beach in 1938. (M11.9/4.)
12. Elongated, well-worn pebble of fine-grained, grey quartzitic sandstone, similar to No. 11. One end shows two areas of bruising and the pebble may have been used as a hammer stone. Unstratified.

7. THE CEMETERY

The general stratigraphy and dating are discussed on p. 125. All burials have been exposed by the recession of the cliff so that the remains are mostly fragmentary. Where it has been possible to examine burials *in situ* usually no more than half the skeleton has been recovered. Brief notes on these graves are given below. The catalogue lists only material in the Society's collection. There are at least two skeletons from the cemetery in Weston Museum and other material is at Taunton, Wells and Bristol, and in private possession. In view of the scattered and fragmentary nature of the material no anthropological study has been made.

Burial No.

1. Extended, supine, head to west, scrap of derived Iron Age pottery found in grave filling. Examined by A. M. A. and D. T. D. in 1954.
2. (11 ft. N. of plotted datum north of Skull 1.) Extended, head to west, supine, skull tilted forwards and to the right, arms extended with fingers by the pelvis. Skeleton only excavated as far as pelvis. Bones lay on layer 4A, around them was darker sand. Several large stones in layer 3 above the bones may have formed a rough grave lining or blocking. (1955.)
3. (13 ft. N. of datum.) Extended, supine, head to west, skull tilted forwards and to the right, finger bones close to pelvis. Only excavated as far as lumbar region. Burials 2 and 3 converged eastwards. (1955.)

6. (*See Fig.* 17.) Lower half of skeleton preserved only. Pelvis articulated, rested almost on bottom of grave, femora about 1 in. above, distal ends approximated, patellæ not preserved. Right elbow joint *in situ*. Radius resting for distal ¼ on lateral crest of Right Innominate, Right Ulna separated laterally about 2 in. at distal end. Right hand scattered, some bones above neck of femur, others under pelvis.

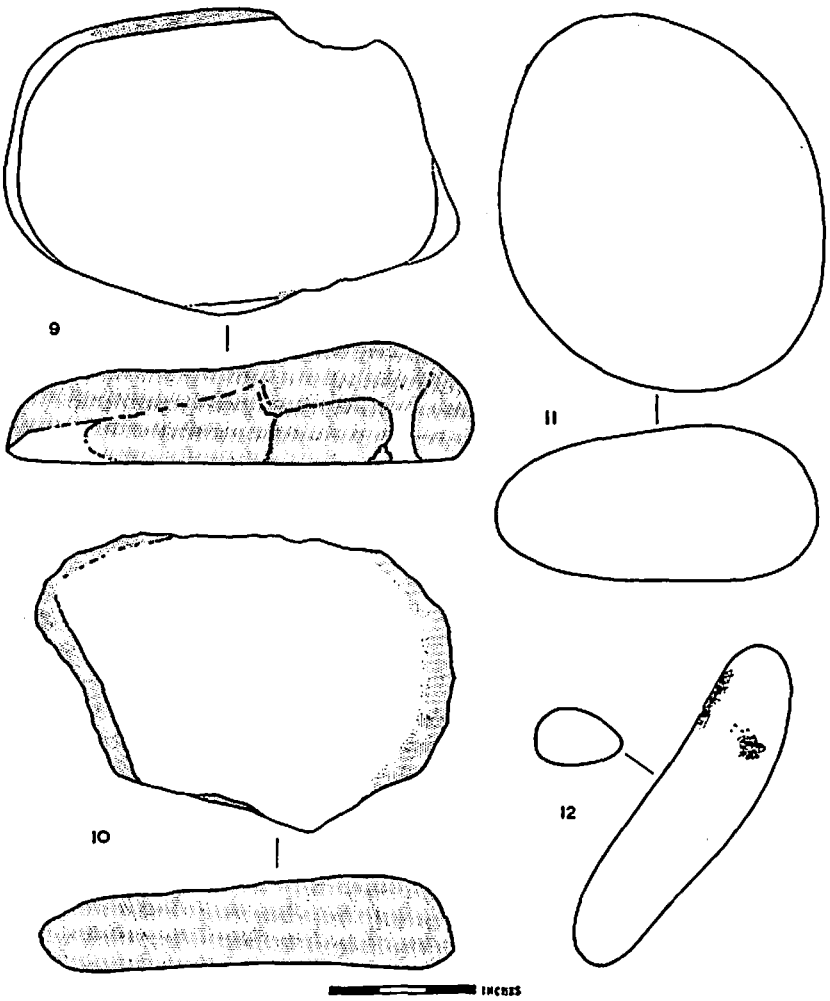

Fig. 32.—Sandstone objects from Brean Down Sand Cliff. One-quarter natural size. In Nos. 9 and 10 facets due to wear are left blank, other surfaces are shaded.

The filling of the grave was soft red/yellow sand with limestone fragments scattered throughout. Snail shells and a few small rodent (?) bones in the grave. Lower part of filling contained some patches of greyish sand probably due to rain wash. About 3 in. above the bones the fill was compact,

a little more stony and slightly cemented. No sign of coffin but the body protected by limestone blocks averaging 15 by 6 by 5 in. laid irregularly along the sides of the grave. No associated finds. (1959.) Bones in Weston-super-Mare Museum.

Human Skeletal Material in U.B.S.S. Collection

1933: (8) Rt. Clavicle, Scapula, Humerus, L. and Rt. Ulna and Radius.
(48) Vertebræ, Ribs. Adult, osteo-arthritic.
1936: (1) Clavicle, Radius, Ulna, 2 Femora, Vertebræ, 1 adult.
1948: (237) Skull fragments.
(241) Rt. Clavicle, child. Ulna, adult.
1949: (233) Rt. and L. Humeri, Rt. Ulna and Radius, young individual.
(238) Radius of child.
1950: (143) L. Femur, same condition as 233 and could be from same individual.
1951: (240) Rt. Humerus, scraps of Vertebræ and Ribs, young individual.
(245) L. Ulna.
1954: (232) Skull fragments.
(129) Skull, Mandible, Clavicles and Vertebræ, young adult/adolescent—Burial 1.
1954: (235) Loose, Skull, etc.
1955: Skeleton of child—Burial 40 ft. North of Burial 1.
(198) Distal end Humerus, scrap of Skull and Vertebræ—Burial 1 of 1954?
(196) Skull, Humeri, Clavicles, Ulna, Scapula, Vertebræ, Ribs, Hand.
(196) Skull fragments, face and base—Burial 4, 13 ft. North of Sk. 1.
(123) Skull fragments, Calvarium, as 196.
(189) Mandible, Ribs, fragments. Unstratified.
(197) Miscellaneous small fragments. Unstratified. (Two burials in Weston Museum, burial of 5-year-old child at Wells, other material at Bristol and Taunton.)

8. CONCLUSIONS AND ARCHÆOLOGICAL SUMMARY

If the interpretation and correlations suggested in the preceding sections are accepted, the Pleistocene deposits at Brean Down give detailed information (which adds to the knowledge gained by palæobotanical work elsewhere in Britain) about the climatic and environmental conditions of the Late Glacial. The main section is perhaps the finest of its kind and with improving methods more detailed information may still be obtained from it. It furnishes a standard with which other sections may be compared, in particular, talus sections at the mouths of occupied caves.

Our correlation enables us to date the local final Upper Palæolithic facies, the Cheddarian industry (Bohmers, 1956, p. 24), to the Younger Dryas phase. The presence of a Magdalenian VI type antler harpoon in the Cheddarian assemblage from Aveline's Hole (Davies, 1921) supports this correlation* which agrees with the dating of analogous industries in the Low Countries.

If the Cheddarian is dated as Younger Dryas, then the Solutrean implements from Soldier's Hole, Cheddar, are unlikely to be very much older. The account of the deposit in which they were found is so poor that positive correlation with the Brean section is impossible, but correlation with layer 12

* These conclusions were outlined in the course of a lecture to the Prehistoric Society in October, 1957, by A. M. A.

is likely in view of the fact that we have already equated this layer with deposits containing Solutrean industries in France (p. 108). On stratigraphical grounds there can be no question of the Soldier's Hole leaf-points being neolithic, so that their supposed similarity (with which we would not agree) to the undated pieces from Bridged Pot, which in our opinion could well be typologically neolithic (cf. the "palæolithic" forms from Grimes Graves and other neolithic flint mines), need not concern us.

McBurney (1959, p. 262) has considered the possibility of both groups being related to the evolved Mousterian leaf-point "Altmühl" industries of Southern Germany. The plano-convex flake technique of the Soldier's Hole pieces is indeed found in the Altmühl–Szeletian industries, which are dated to the Gottweig Interstadial, although they survive as late as the beginning of the Paudorf Interstadial in Moravia (Klima, 1957, p. 101), and thus are considerably older than the French Solutrean. This technique was also used, however, along with others, in the French Solutrean industries and both the bifacial leaf-points and unifacial points of the British assemblages are common in the Solutrean of Solutré (cf. Combier, 1956). The most northerly French Solutrean site is in Mayenne (Combier, 1956), although there is "Proto-Solutrean" material from Belgium (Eloy, 1956) and from the lower Seine valley, which is comparable to the British material.

At Brean the earliest evidence of human activity is worked bone from the bone bed.

From a faunal point of view the presence of what can hardly be other than Mammoth in a deposit of the Allerød period is of interest in connection with the disappearance from the area of Mammoth and Rhinoceros, Hyæna and Lion, before the rest of the Late Glacial fauna, which was first noted by Davies (1926, p. 270) and Taylor (1928, p. 81).

The relatively sheltered southern aspect of the slope is a common factor in explaining the repeated choice of the site for occupation during post-glacial time. The Down provided pasture and a certain amount of cultivable land, and, until the Somerset levels were embanked, must have been an island rising from shallow estuaries, reed swamps or ill-drained saltings. Limpet shells and occasional fish-bones (e.g., a jaw of a pike from the Beaker sand) from the Bronze Age and Iron Age levels point to another source of food supply, and continued exploitation of this is marked by the early 5th-century A.D. shell midden close to the Roman temple.

The "B" Beaker occupation and burial and the subsequent "A" Beaker occupation are important in that they confirm the priority of the "B" group, inferred from stratified burials in southern England and from the associated metal and stone artefacts. The "B" Beaker of Cord-Zone type (*Fig.* 25, No. 7) from the grave may be compared to a beaker from Wilsford Down, Barrow 54 (Wilts.), which bears the same type of decoration, zones

of diagonal impressions made with a very fine comb, flanked by horizontal lines of cord impressions (drawing kindly provided by Dr. Isobel Smith). This pattern is found on other "B" Beakers in Wessex but the comb impressions are generally coarser. In view of this there is no need now to look for Breton contacts to explain the location of this find. On account of the site's geographical position the presence of "B" Beaker pottery is of interest in connection with the increasing amount of "B" Beaker material from Ireland related to that from southern England.

Similarly, the "A" Beaker pottery is intermediate between that from southern England and from South Wales and Ireland. The bar chevron decoration of *Fig.* 26, No. 20, is comparable to that of Beaker pottery from Gorsey Bigbury on the Mendips and from both shores of the Bristol Channel (Savory, 1955a). To the well-known "A" Beaker from Lough Gur, Co. Limerick, can now be added new finds from Dalkey Island near Dublin (information from Dr. G. D. Liversage). The dusting of yellow sand in the bottom of the Beaker Grave, and the "A" Beaker shard from the top of the red loam, suggest that the "A" Beaker settlement began very soon after the burial was made, and was only briefly interrupted by the deposition of the Beaker sand.

The Middle Bronze Age pottery from layer 6 is one of the most important stratified groups of such pottery yet found. The fragment of cord-decorated Biconical Urn (*Fig.* 27, No. 23) belongs to a group represented on Mendip by the fine example from Tynings Farm South Barrow (Taylor, 1951, *Plate* XVII, B). Similar pottery in Holland is dated to Montelius period II, *circa* 1400–1200 B.C. Pottery of this group is most common in Wiltshire and Dorset although finds are known from a wide area of southern England. This pottery is strongly influenced by the early pottery of the Middle Bronze Age Trevisker culture of south-west England (Greenfield and ApSimon, forthcoming). The urn from Tynings Farm was associated with potsherds of Trevisker type, and later material from Tynings Farm and from the cremation cemetery at barrow T.5, Burrington (unpublished, U.B.S.S. Mus.), has features such as sharply incised decoration which are due to Trevisker culture influence, and which are less common on the pottery from sites further east. Another local find of a Trevisker derivative is from Weston-super-Mare (Weston Mus., unpublished). As might be expected pottery related to the Tynings Farm Biconical Urn has been found in South Wales (Savory, 1955b).

Also roughly contemporary and belonging to the Wessex Biconical Urn group are urns with applied arc or horseshoe-shaped handles such as *Fig.* 27, No. 29. Later developments are represented by the rough biconical cooking pots from the Limpet Hearths, whose simple lugs (*Fig.* 27, No. 37) are of Trevisker culture derivation, as is the grooved decoration of No. 39.

From this Biconical Urn element derives the "sub-biconical" (e.g., No. 41, from layer 6A) and "straightened biconical" pottery of the Deverel Rimbury culture of Dorset. Nos. 42, 43, 46–50 display signs of Trevisker culture ancestry or influence, clearest in the flattened rims, slightly biconical shape and dark, hard fabric. With these, and in particular with 50, there is a strong hint of relationship to the pottery of the later Middle Bronze Age Cranborne Chase culture, which bears a cousinly relationship to the Deverel Rimbury culture, and which is represented on the Mendips by finds of Globular Urns of Calkin's type I (Calkin, 1958) from Cheddar (Soldier's Hole, Sun Hole). Pottery closely related to that of the Deverel Rimbury culture was found in the Tynings Farm West and North Barrows.

The evidence of the stratification of this assemblage of Middle Bronze Age pottery agrees with the succession worked out for Wessex and south-west England on the basis of stratigraphy, associations and typology. The occupation of the site probably dates from between 1500 and 1000 B.C.

The Iron Age occupation belongs to a developed local facies of the All Cannings Cross culture (Iron Age A). The abundant use of calcite gritting in the pottery which is a characteristic of the site makes it very difficult to compare with the wares speckled with fossil shell fragments characteristic of most Iron Age A sites in north Somerset and Gloucestershire. Some of the pottery from Gough's Old Cave, Cheddar (Tratman, 1960), is similar to that from Brean in this respect. Other than this there are only the rather distant analogies with the pottery from Pagans Hill (ApSimon, Rahtz and Harris, 1958) and the later site of Little Solsbury (Adams and Falconer, 1935) to record. The presence at Brean of decorated pottery and fabrics related to true hæmatite-coated wares favours a date hardly later than the 3rd century B.C.

The age of the cemetery remains to be determined. On stratigraphic grounds it is later than the Iron Age occupation and an interval must be allowed for the accumulation of 4A and 3C. The absence of associated artefacts is a strong argument against either later Iron Age or Romano-British date although extended inhumation burials with head to the west are certainly known from the 4th century A.D. Occupation on the Down in the later 1st century may be deduced from finds (e.g., a "Durotrigian bowl" from the "top of Brean Down" in Taunton Mus.) and from the 4th century we have the temple site and stray finds from the camp. This is in sharp contrast to the absence of Romano-British finds from the sand-cliff collections (30 years' collecting has produced 1–2 unstratified potsherds). The burials are therefore probably not earlier than the 5th century. The building of a house (*see below*) on the site probably indicates that there was then no local memory of the cemetery's existence. The presence of a medieval

church and churchyard in this thinly populated parish (*c.* 70 persons in 1801) implies that the cemetery is older still. Pevsner (1958, p. 92) thinks that Brean church may perhaps be of 13th-century construction, and an 11th to 13th century date for the dedication to St. Brigit is plausible (Fisher, 1908; Bowen, 1954) in the absence of documentary evidence. This dedication seems likely to reflect Glastonbury interest in the cult of this saint recorded in the 12th century by William of Malmesbury (*De Gestis Regum*, Bk. I, Chap. 2; Giles, 1847, p. 25), rather than any earlier British or Irish foundation (cf. Chadwick, 1954, pp. 167, 187–188). This is not to deny the geographical significance of the local group of Celtic saints' names applied to manors—Kewstoke, Congresbury (Ekwall, 1960: *Kiustok* 1274, *Cungresbyri* *c.* 894) or dedications to Celtic saints (Bates, 1906; Turner, 1953), many of which may go back to the 7th century. Those examples, which are unsupported by early documentary evidence, and for which some connection with Glastonbury Abbey is to be suspected (e.g., St. Gildas at Street), are of less evidential value. The origin of Brean church is probably to be connected with the manor of *Brien* recorded in the Domesday survey (V.C.H., I, p. 500), which may have originated by the taking in of the coastal levels in the late 10th or early 11th century, as a charter of King Edgar, s.a. 973, begins the bounds of Berrow (*Berghes*) on the sea "on Hamberghes"* and ends them "on Axen" (Watkin, 1952, p. 529, No. 981). At this time Brean may have been largely waste, as suggested by the sea-banks on the pill at Brean Cross (ST 302559), which show that the Brean levels were embanked later than those of Berrow.

The Domesday survey makes it clear that by the 11th century the area under cultivation on the coastal levels was hardly less than that of today. This state of affairs probably can be extended back into the 10th century at least. It seems possible that the Sand Cliff cemetery relates to a settlement on the flank of the Down before the focus of settlement shifted 1½ miles to the south as a result of the exploitation of the levels by the late Saxon and medieval manor. The position of the cemetery on the hillside might be compared to that of the cemetery attached to the Dark Age village at Mawgan Porth in Cornwall (Bruce-Mitford, 1956). The cist-like stone lining of the grave found in 1959 (p. 121, No. 6) supports this comparison.

The transference to the manor of the Celtic name for the most prominent local feature, in this case the *hill* (Ekwall, 1960, p. 62, *Brean*), is common in Somerset and implies continuity of settlement (Turner, 1951, 1952). However, in the circumstances we can go no further than to suggest that the cemetery was early Christian and in use within the period covered by the 5th to 10th centuries.

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* I.e., the coastal sand dunes, the only possible "*berghes*" in the parish.

We believe the building exposed in layer 3 to be of late 17th-century date. This is the earliest period likely for the fragments of sheet window glass found in the debris, and seen by Dr. Harden (cf. Singer *et al.*, 1957, pp. 237 ff.). The scatter of potsherds to the south of the building is made up of types later than the finds dated between 1605 and 1652 from St. Nicholas' Almshouses, Bristol, excavated in 1960 (pottery seen by courtesy of Mr. K. J. Barton). A date in the last quarter of the 17th century, and the early years of the 18th, seems probable.

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APPENDIX I

FAUNA

By R. J. G. SAVAGE

Bed 4 (Iron Age A)	Fish, Pig, Ox, Sheep.	
Bed 6 (Bronze Age)	Horse, Wild Boar, Pig, Ox, Sheep.	
Bed 7	Sheep.	
Bed 8 (Beaker)	Ox.	
Bed 11 (Allerød)	Bird bones; several species, including owl.	
	**Dicrostonyx gulielmi* (Sandford)	Snow Lemming
	* ,, *henseli* Hinton	Hensel's Lemming
	Lepus timidus Linn.	Arctic Hare
	Alopex lagopus (Linn.)	Arctic Fox
	Canis lupus Linn.	Wolf
	**Mammuthus primigenius* (Blum.)	Mammoth
	Equus caballus Linn.	Horse
	**Megaceros giganteus* (Blum.)	Giant Deer
	Rangifer tarandus (Linn.)	Reindeer
	Bos/Bison sp.	Ox/Bison
Bed 12	Bird bones, including owl and duck.	
	Microtus agrestis (Linn.)	Field Vole
	Rangifer tarandus (Linn.)	Reindeer
	Bos/Bison sp.	Ox/Bison
Bed 13	Small fish bones.	
	**Microtus anglicus* Hinton	Vole
	Alopex lagopus (Linn.)	Arctic Fox
	Rangifer tarandus (Linn.)	Reindeer
	Bos/Bison sp.	Ox/Bison

* Extinct

The bone remains are all fragmentary and no associations were found: in the upper faunal levels, beds 4–8, the remains are typical kitchen middens. The fish in the Iron Age level (bed 4) are small, about the size of plaice. A fragment of ivory in bed 6, possibly used as an ornament or charm, is from a suid canine and on size is more likely to be wild boar than domestic pig.

Bed 11 is the main bone-bearing horizon, often referred to as the "Brean Bone Bed": the structural details are described above. Many of the bones are broken and the coarse angular Carboniferous Limestone inclusions are partly responsible for this. Many of the long bones, however, have been broken for marrow and some have gnawing marks: in the absence of hyæna the two most likely agents are wolf and man. Reindeer and horse are by far the commonest species; bones, antlers and teeth are very plentiful. The horses vary in size, but the commonest is about as

large as an Exmoor pony. Mammoth and giant deer are rare, being identified on rib bone and fragments of antler. Birds of several species are present, among them owl and this predator is probably responsible for the lemming remains; the association of predator bird and rodent is seen again in bed 12. The fauna of bed 11 is a typically late glacial cold fauna and nothing in it is inconsistent with the suggested Allerød dating given above on the basis of other evidence.

In bed 11 were found two bones which appear to have been worked by man: one is part of the right innominate of horse and the other a fragment from the palmation of giant deer antler. The latter could conceivably be elk: there is no record of elk anywhere on Mendip, but giant deer has been recorded from several localities,

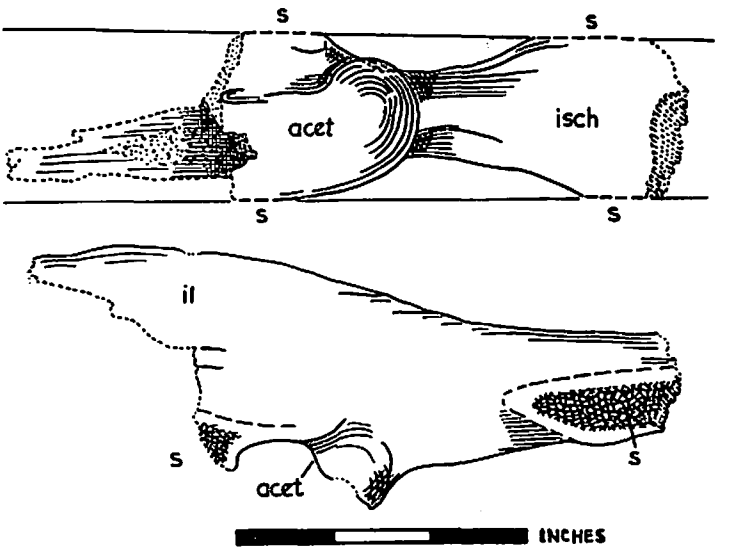

Fig. 33.—Right innominate bone of horse from Brean Down Sand Cliff, layer 11A. Ventral view above, medial view below to show orientation of worked surfaces. One-half natural size. KEY: *acet*=acetabulum; *il*=ilium; *isch*=ischium; *s*=worked surface.

including Bleadon Cave about 3 miles east of Brean. The antler fragment is about 3 in. by 4 in. and the slightly concave side has its margins planed to produce an almost flat surface: the flattening could have been achieved by rubbing or grinding on a flat stone. All edges are broken and provide no further clues as to use. The innominate comprises most of the ischium and acetabulum with a small piece of ilium adjoining the ischium. The ilium and ischium have broken ends, not fresh fractures but, like those on the antler, produced before or soon after burial. The wing of the ischium (ischial tuberosity) and the ischial symphysis are cut or ground off; the planes of levelling, if projected anteriorly, would cross the acetabulum, whose borders have likewise been ground to these levels.* The incompleteness of the bones is a handicap, nevertheless I can think of no natural process which would account for these features and can only suggest they were worked by man, though the purpose of the exercise escapes me. (*Fig.* 33.)

Bed 12 yielded a small fauna; the association of owl and rodent may be noted and the only recorded duck appears in this level.

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* A second fragment of the right innominate of horse has been found which also possesses worked surfaces similar to those described above.

From bed 13 the fauna includes an extinct microtine and small fish bones, neither of which were noted from bed 12. *M. anglicus* is recorded from late Pleistocene stages of the Thames, e.g., Ightham fissure and Lea Valley.

Balch (1947) in his faunal lists of Pleistocene sites in and around the Mendip hills lists only three species from Brean, namely horse, red deer and reindeer; he notes reindeer is abundant, records evidence of Neolithic and later man, and queries the presence of *Microtus ratticeps*. As a result of our digs, during which several hundred bones were collected, no recognizable fragments of red deer were found.

APPENDIX II

Report on the Soil Samples

By I. W. Cornwall

Layer 13. *The Lower Breccia*

All were calcareous. Other experimental results were as follows:—

	*p*H	*Humus* per cent	*Acid-insolubles, etc.*
13c	7·4	0·02	Mainly quartz, some round and some carnelian-like red silica grains, probably of Tertiary or Triassic origin, derived.
13b	7·8	0·007	
13a	6·9	0·006	

Thin sections: 13c and b are very alike—limestone and crystalline calcite prominent, quartzes by comparison being few and small. There is much chocolate-brown limonite coating the grains and crumbs and some rounded concretions of this. It looks like colluvial braunerde material—not *in situ*.

13a is redder, containing more ferruginous matter, both limonite (especially in concretions) and obviously derived masses of birefringent braunlehm-like yellow peptized iron hydroxide. Another source, perhaps Tertiary or Triassic deposits, is indicated for this. It is quite clearly not a soil *in situ*.

Layer 12. *Stony Silt*

	*p*H	*Humus* per cent	*Acid-insolubles, etc.*
12c	7·3	0·0015	Clean quartzes of fine grade (no red grains). Clay aggregates. The sand-grains (washed only, not acid-treated) are predominantly calcareous: limestone and crystalline calcite, with round limonite concretions. Much white mica in the finest sand.
12a	7·5	0·004	Quartzes matt but not much rounded.

Thin sections: 12c is completely different from 13 a–c. It contains more quartzes, fragments of shells and other calcareous marine organisms and shows some size-sorting. Iron is small in amount, present in the form of limonite coating grains and aggregates and forming intergranular braces. It may have been wind-sorted by blowing up against the cliff from a nearby beach. A few grains of glauconite also appear to come from the beach, not the cliff.

12a is uniformly fine in grade (silty) with only a few scattered larger angular grains of limestone or calcite. Average grain about 0·04 mm. diameter. The iron cement forms a thin yellow coating on the grains, with a few small brown limonite concretions and derived masses of yellow peptized iron. There is some glauconite.

Mechanical analysis: 12c showed some wind-sorting in the silt grains but the sample is clearly from two distinct sources—fall and wash from the cliff and wind-transported beach-grains. When particles larger than 2·0 mm. are ignored, the curve gives: sand 15 per cent, silt 60 per cent and clay 25 per cent (very like Vink's result for the same layer). The whole sample, carefully quartered, gave: gravel 26 per cent, sand 12 per cent, silt 42 per cent, clay 20 per cent. (*Fig.* 34, curves o and A.)

Vink's curves (Nos. 6, 7) show the upper layers of 12a to be relatively well sorted in the fine sand/coarse silt grades. No. 8 is less well sorted and shows a bump in the middle of the curve with levelling out in the finer half of the fine sand. The material is distinctly coarser above this levelling than those represented by curves

Nos. 6 and 7, and this suggests a sample generally similar to 12a but with additional coarser grains, supporting the visual appearance in section. The source of the larger quartzes seems to be the cliff rather than the beach.

Layer 11. *The Middle Breccia and Bone-bed*

Both were calcareous. Other experimental results:—

	*p*H	*Humus* per cent	*Acid-insolubles, etc.*
11b	7·4	0·004	Many matt and rounded quartzes.
11a	7·7	0·015	Many matt and rounded quartzes.

Thin sections: 11b (the breccia). This has many and larger quartzes, mostly angular, with limestone, calcite, rare glauconite and marine organisms and shell fragments. There are scattered limonite concretions, but most of the iron is peptized and coats the grains, forming braces in a fabric with many voids. There is evidently a component of 12a material but with additional quartzes (av. 0·17 mm. diam.) and more peptized iron.

11a (the supposed weathering of 11). This has a denser fabric with more intergranular cement, which, as before, consists of braunlehm-like peptized iron hydroxides, and more rounded limonite concretions. Calcareous particles are fewer and are clearly etched and rounded by processes of weathering.

In view of the distinctly higher humus in 11a and the denser fabric, it is a fair conclusion that this is a weathering-soil, if an immature one.

The presence of the peptized iron and indications of decalcification and increased humus content suggest that 11a is an immature *terra fusca*, immature because of only short duration of the conditions favouring such a soil—a moist climate with temperatures distinctly higher than those of the present day.

Layer 8*a–b*. *Buried Soil Formed on* 8*b–c*, *Upper Breccia*

	$CaCO_3$	*p*H	*Humus* per cent
1 (bottom)	+ (much)	7·4	0·006
2	+ (slight)	7·0	0·008
3	+ (slight)	7·1	0·034
4	+ (slight)	7·0	0·046
5 (top)	—	7·6	0·036

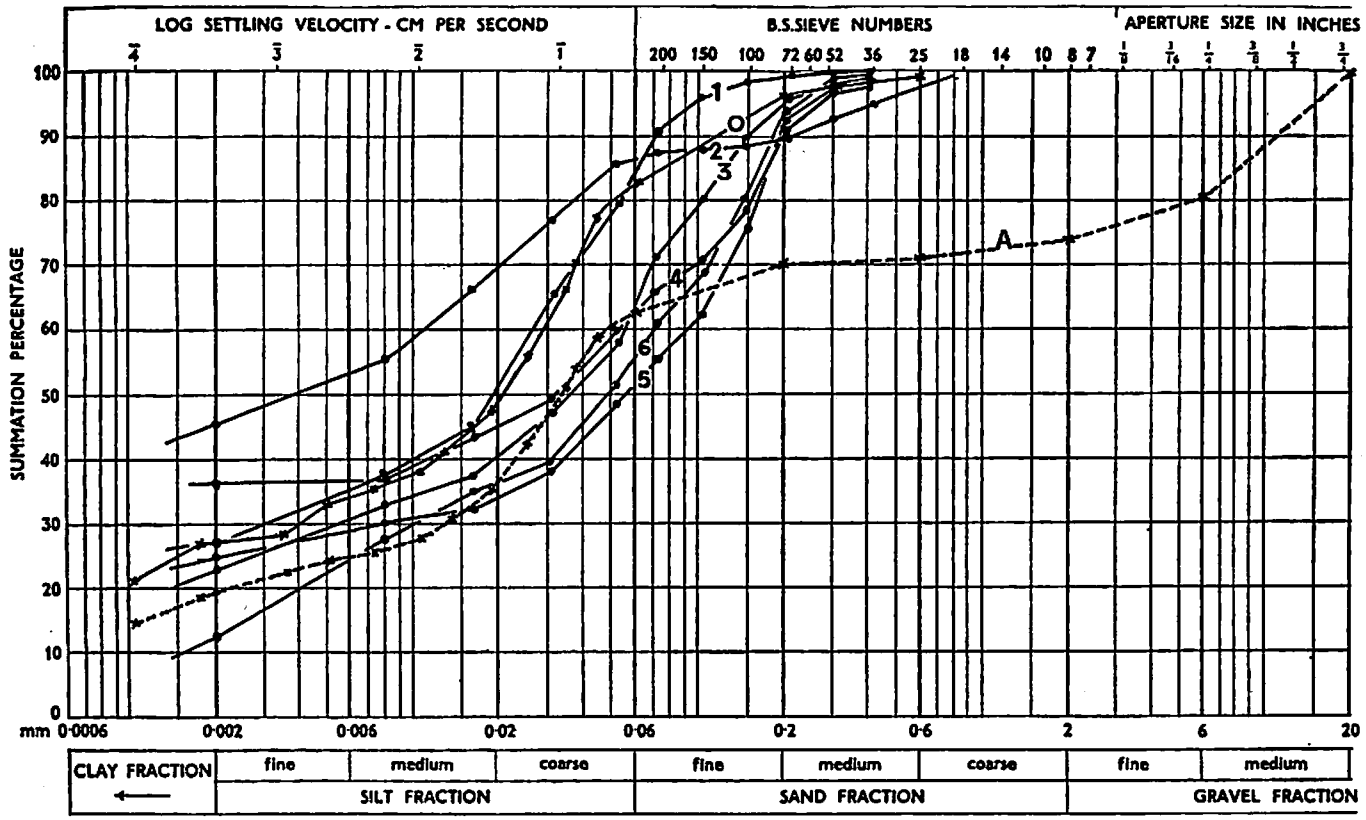
In Nos. 1 and 2, the limestone fragments, though still fairly plentiful, are etched and decayed. Nos. 3 and 4 show progressive decalcification. No limestone can be found in No. 5. The slightly higher *p*H than in 4 may be due to later infiltration from above. The organic matter lower than in 4 may also be due to oxidation soon after the soil became fossil.

The whole range, then, looks like soil-material, though 5, with its darker colour and difference in structure and consistency, looks like something different again.

The whole series is dark red-brown in colour (5 YR 3/5 Munsell), full of shrinkage-cracks, root- and worm-holes. Save for No. 5 (and, to a lesser extent, No. 4), it breaks typically into large crumbs. In the hand, under a lens, Nos. 1–4 consist of small angular quartzes embedded firmly in red waxy-looking material of very fine grade, typically braunlehm in appearance—a *terra fusca*. No. 5 is more crumbly—less waxy and more earthy in appearance.

Thin sections were made of Nos. 3 and 5. No. 3 was selected because No. 4 was of a transitional character and it was thought that any differences between 5 and the rest of the series would be represented more clearly by No. 3.

No. 3 looked like a typical rotlehm under low power (2 in. obj.) but under higher power and in the thinnest parts of the section was seen to consist of angular quartzes (and practically nothing else) in a matrix of peptized iron hydroxide and clay minerals. The fabric is typically dense and fissured, without intergranular voids but with numerous worm- and root-holes of smooth oval or circular outline. It appears to be a mature *terra fusca* (B)-horizon, the whole series being some 18 in. in thickness. Such a soil requires a moist climate, rather warmer than is general at the present day. The exposure at Brean Down, open to the S. and W. and sheltered from the N. and E., would favour such a micro-climate, even if conditions generally were not favourable to the formation of a *terra fusca*.


LOG SETTLING VELOCITY - CM PER SECOND
B.S.SIEVE NUMBERS
APERTURE SIZE IN INCHES
SUMMATION PERCENTAGE
mm 0·0006
0·002
0·006
0·02
0·06
0·2
0·6
2
6
20
CLAY FRACTION
fine
medium
coarse
SILT FRACTION
SAND FRACTION
GRAVEL FRACTION
A
O
1
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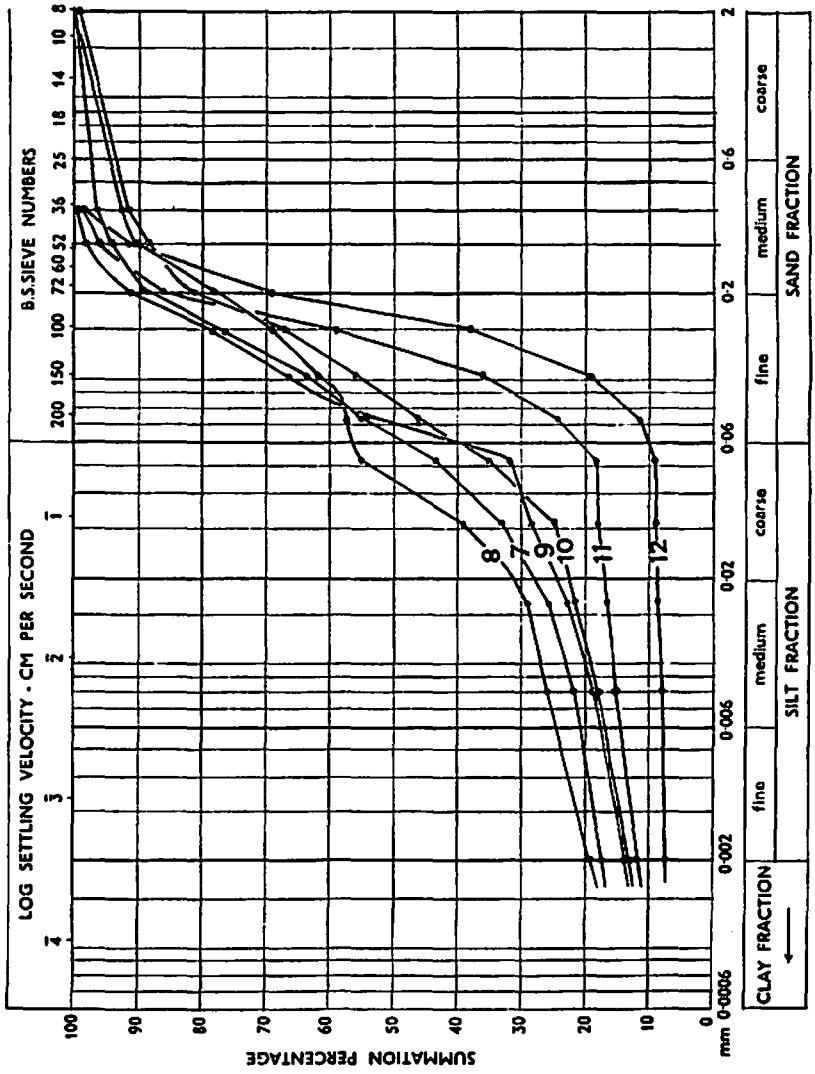
6
7



Figs. 34 *and* 35.—Particle size distribution of samples from the Sand Cliff, layers 9 to 12. Curves 0–12 are those of the fines (less than 2·00 mm.) only. Curve A was obtained from a carefully quartered entire part of the same sample as that used for curve 0. This sample contained nothing larger than 20·0 mm. Analysis No. 0 is by Dr. Cornwall, Nos. 1–12 by Dr. A. P. A. Vink (Sample Nos. 12881–6, 12989–94). The location of the samples is shown on sheet VI (*Fig.* 16).

No. 5, though basically the same material as No. 3, has an earthy crumb-structure with numerous youthful limonite concretions and more voids. The typical plastosol (*terra fusca*) seems to have been changed superficially into a soil of the eutrophic braunerde type and this must be due to cooler summers, in view of the specially favourable exposure to warmth.

APPENDIX III

Carbon-14 Age Determinations

Carbon-14 age determinations which form the basis of the dating of the "Solutrean Amelioration" suggested on p. 108 are:—

North America: *Iowa, Cook Quarry*: Oxidized sand and gravel beneath Cary till (C 664): 12090±1000 (Flint and Rubin, 1955).
Iowa, Clear Creek: Silt and loess beneath Cary till (W 153): 12750±400 (Flint and Rubin, 1955).
Iowa, Mitchelville: Loess with yew, spruce, hemlock, beneath Cary till (W 126): 14770±600 (early in this context) (Flint and Rubin, 1955).
Ohio, Edon: Organic bed in pro-glacial lake (W 150): 12350±450 (Flint and Rubin, 1955).
Washington, Washington Lake: Basal peat above clay (L 330): 12050±900; (L 346A): 11700±550 (Broecker and Kulp, 1957).
Alaska, Eagle River near Anchorage: Peat beneath late Wisconsin till (La 101b): 12350±600 (Kulp *et al.*, 1951).
Europe, France: *Dordogne, Lascaux*: *Abies* charcoal (Barghoon and Movius, 1951) (C 406): 13566±900 (Arnold and Libby, 1951).
Germany: *Württemberg, Schlussenquelle*: Basal peat layer, "Middle Magdalenian" (GRO 468): 12520±385 (Gross, 1958).

All dates are B.C.

PLATE II

Brean Down Sand Cliff (site A). Projected section. The rectangles indicate the incidence of larger-scale sections, sheets I–III, V, VI. (*Figs.* 16–21.) The lower margin corresponds to Ordnance Datum.

BREAN DOWN SAND CLIFF