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CHRONOSTRATIGRAPHY AND ECOLOGY OF TWO MIDDLE AND UPPER PLEISTOCENE SITES (Jersey, Channel Islands)

by Paul CALLOW *

RESUME

Les sites du paléolithique moyen ancien de La Cotte à la Chèvre et de La Cotte de St Brelade ont été particulièrement sensibles aux changements de l'environnement, du fait de leur position côtière sur ce qui est maintenant une île du plateau continental. Le premier site est une petite grotte marine, creusée lors d'une transgression de 18 m. Les traces de cet événement n'ont pas été retrouvées dans le deuxième site, mais des sédiments d'âge saalien, très riches d'un point de vue archéologique, ont été découpés en falaise durant la transgression de 8 m du sous-stade isotopique 5e des carottes océaniques et sont coiffés de trois sols suivis par des dépôts épais du Weichsélien. Un complexe interglaciaire plus ancien a été daté de 238 000±35 000 ans et appartient donc au stade isotopique 7. La géologie, la flore et la faune se combinent pour documenter une longue séquence de fluctuations dans l'environnement. Des matériaux éoliens ou locaux (principalement des lœss, et des sables provenant de l'altération des granites de la roche mère) furent déposés dans un système de ravins profonds, et y alternent d'une manière très clairement liée aux événements climatiques.

L'occupation de ces deux sites semble avoir pris place durant la même période chronologique. Si l'on émet l'hypothèse de l'occupation par un seul groupe humain, La Cotte à la Chèvre aurait permis d'étendre légèrement un territoire économique centré sur le site plus grand et mieux placé de St Brelade qui, si l'on s'en remet à l'évidence archéologique, fut un foyer d'activité bien plus important.

La présence humaine dans cette région fut contrôlée directement ou indirectement par le climat. Il semble y avoir eu des périodes durant lesquelles le niveau marin permettait l'accès facile de Jersey et où le froid n'était pas d'une sévérité suffisante pour inhiber toute activité. Le paysage semble avoir varié d'une péninsule relativement boisée, rattachée au Cotentin, à un plateau situé dans une plaine côtière à végétation plus ouverte. L'aspect le plus remarquable de Jersey durant le Pléistocène est l'évidence avec laquelle la dépendance mutuelle de composantes diverses est révélée : le climat, la sédimentation et la formation des sols, les changements du niveau marin et l'érosion marine, la géographie physique, la faune et la flore, la présence humaine et l'économie, les sources de matière première pour la fabrication d'outils et les techniques de travail de la pierre.

ABSTRACT

Thanks to their coastal location on what is now an island on the continental shelf, the two early Middle Palaeolithic sites of La Cotte à la Chèvre and La Cotte de St Brelade are especially sensitive to environmental change. The former is a small sea-cave cut during a +18 m marine transgression. At the latter site no traces of this episode have been found, but the archaeologically very rich sediments of Saalian age were sculpted into a cliff during the +8 m transgression of isotope substage 5e, and were capped by a triple soil followed by thick Weichselian deposits ; an earlier interglacial complex is dated to 238±35 ky, and must be attributed to oxygen isotope stage 7. Geology, flora and fauna combine to document a long sequence of environmental change. The deep ravine system is a natural sediment trap in which wind-transported materials - chiefly lœss, and sand formed by decay of the granite bedrock - alternated in a manner clearly linked to climatic change.

The occupation of the two sites appears to cover much the same chronological range. They may be regarded as complementary, in that if they were used by a single human group La Cotte à la Chèvre would have provided a convenient means of slightly extending the catchment of the much larger and better placed St Brelade site, which on archaeological evidence was a far more important focus of activity.

Human presence in the area was controlled directly or indirectly by climate ; there appears to have been a 'window' within which the sea-level was low enough to permit easy access to Jersey while the cold was not severe as to inhibit activity altogether. The landscape would have varied from, at one extreme, a comparatively wooded peninsula attached to the Cotentin, to a tableland set in a broad coastal plain with more open vegetation. Perhaps the most remarkable aspect of Pleistocene Jersey is the clarity with which the close mutual interdependence between different components is revealed - climate, sedimentation and soil formation, sea-level changes and marine erosion, physical geography, fauna and flora, human presence and economy, supplies of raw material for tool-making and stone-working techniques.

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INTRODUCTION :

Jersey is now an island measuring 15 by 10 km, and is no more than 21 km from the coast of France (it is the accidents of history rather than geography which have made it a part of the United Kingdom). It lies in the shallow waters of the continental shelf ; the connection to the Cotentin peninsula is less than 20 m below today's sea-level, and to north and south of the island are the broad submerged palaeovalleys of the rivers Ay and Sienne (fig. 1). Thus the eustatic fall of sea-level during each of the colder phases of the Pleistocene period had a dramatic effect on the landscape of the area. A very moderate increase in the glaciated areas elsewhere in the world sufficed to join Jersey to Normandy, so that what once had been an island became a rocky tableland at the tip of a peninsula, while at the maximum extent of the ice-sheets it stood in a broad plain extending at least 100 km to the west. The consequences for the landscape, and for man, of the dramatic climatic changes that characterised the Pleistocene were amplified here by the peculiarities of topography.

Apart from a few isolated finds (Hawkes, 1939 ; Callow, 1986a), only two Old Stone Age sites are known in Jersey. Both were discovered in the 19th century, and both have been the subject of excavations by the University of Cambridge under the direction of the late Professor C.B.M. McBurney : La Cotte à la Chèvre, a cave in the northwest corner of the island, and La Cotte de St. Brelade, a system of ravines in the southwest. Covering a very similar time-range within the late Middle and Upper Pleistocene they contrast markedly in size and location, almost certainly implying important differences in function. In particular it should be noted that a slight fall in sea-level can have little effect on the site exploitation territory (SET) of the former because of the very close proximity, to the north, of a major flooded valley, the Ruau Channel, while dramatically increasing that of La Cotte de St Brelade (fig. 2). A fall of at least 30 m (implying a considerable climatic deterioration) is required to open up the SET of La Cotte à la Chèvre.

LA COTTE A LA CHEVRE :

This is a small marine cave 3 m wide and 9 m deep facing almost due north, cut into granite cliffs by a marine transgression at c. +18 m (Marett, 1912 ; McBurney, 1973 ; Callow and Cornford, 1986, Appendix C). Its walls are smoothed and the lowest stratigraphic unit consists of rounded boulders embedded in sand (fig. 3). Artefacts are recorded from the upper part of the beach, from the white or grey 'earth' which may be no more than its altered surface, and in the loess which caps this. It seems that early excavations at the site, as well as natural processes, so disturbed the deposits that it is impossible to resolve the archaeological sequence with great precision. However, it is clear that the first industry was overwhelmingly dominated by a very high frequency of well-made notches and denticulates, based on non-Levallois technology, while a greater technological and typological range occurred later in the succession.

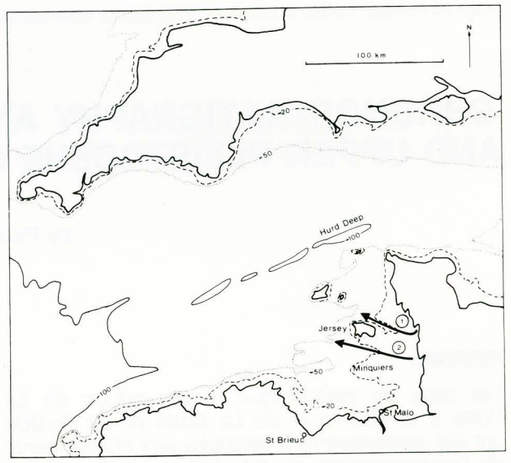

Fig. 1 : The location of Jersey in the Western English Channel, and its relationship to sea-bed contours and the palaeovalleys of the rivers Ay (1) and Sienne (2).

LA COTTE DE ST BRELADE :

Cutting through a granite headland is a T-shaped system of ravines some 60 m deep and with a total length of about 90 m (fig. 4). Today the sea enters the stem of the T at high tide and has removed the Pleistocene deposits from this part of the site. At the time of discovery the sediments in the arms of the T (the north and south ravines) survived to 30 m above high tide.

Extensive deposits of Weichselian age were removed in the course of the late 19th and early 20th centuries (Nicolle and Sinel, 1911 and 1912 ; Keith and Knowles, 1912 ; Marett, 1916), yielding a rich Mousterian industry, fauna and remains of Neanderthal man (two individuals). In the 1950s, investigations at a lower level demonstrated that much older strata were preserved (Burdo, 1960). These were excavated by McBurney from 1961-78, and again by Callow in 1982. Substantial revisions of interpretation have taken place since the appearance of an interim report (McBurney and Callow, 1971). The results have recently been published in full by Callow and Cornford (1986, with numerous collaborators), as well as in shorter papers (Scott, 1980, on the killing and butchery of large mammals ; Callow, 1986b, on the artefact assemblages).

No traces of the +18 m marine transgression identified at La Cotte à la Chèvre are preserved here, though high sea-levels must have been the principal agent in the formation of the ravines themselves. But the earliest artefact assemblage, from layer H (only a few metres above the modern high tide line), is identical to that from at the top of the beach at La Cotte à la Chèvre - higher in the succession, the notched pieces and denticulates lose numerical importance to side-scrapers and there are marked technological developments. Burned flints from above a forest soil developed on granitic sand (fig. 5) have yielded a mean TL date of 238±35 ky (OX-TL 222). Deposition of loess and geliflucted loessic rubble followed, with only intermittent human occupation. Formation of the first of a complex of three forest soils was then accompanied by a marine transgression which partly emptied the site. This left a cornice of ancient sediments some 8 m high, with a pebble storm beach at its foot, some 2 m above the modern storm beach in the west ravine. During this period, the dominant sediment type is again coarse sand derived from the granite. Accumulation of a further 30 m of rubble followed, mainly with a loessic matrix and containing in its lower part the Mousterian industry and Neanderthal remains mentioned above. The uppermost part of the sequence is entirely sterile ; in fact no Upper Palaeolithic material is recorded anywhere in the Channel Islands.

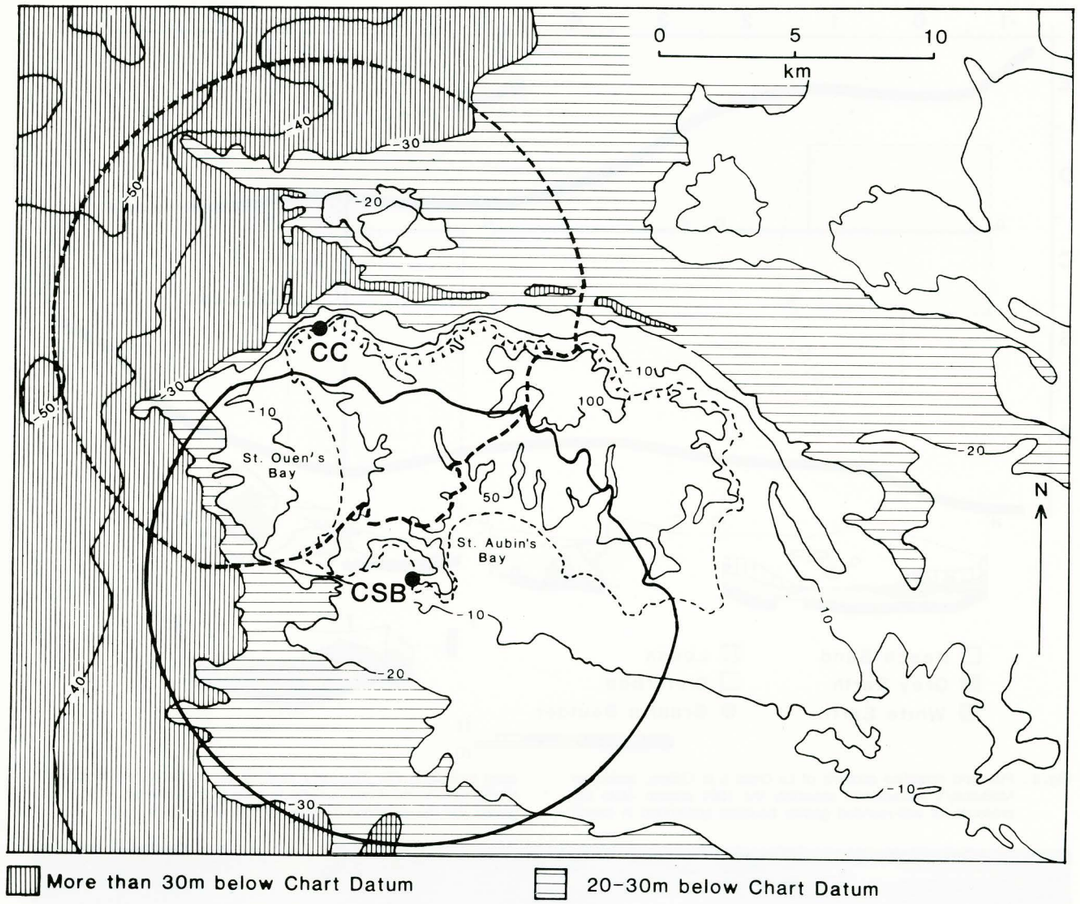

Fig. 2 : The location of La Cotte de St Brelade (CSB) and La Cotte à la Chèvre (CC) in Jersey. The island's present outline is indicated by a broken line. The two overlapping deformed circles show their 2-hour site exploitation territories. Each isobath gives the approximate *low tide line* for a corresponding fall in sea-level, while the isobath above gives the equivalent *high tide line*. The unshaded area is the minimum available for exploitation when Jersey is connected to the Cotentin by a land bridge.

DATING AND UNDERSTANDING THE ENVIRONMENTAL CHANGES :

The cutting of the fossil cliff at La Cotte de St Brelade and the formation of the second forest soil (the first within its complex) are attributed to the Eemian transgression, equivalent to oxygen isotope substage 5e (fig. 6). A comparable beach at La Belle Hougue, on the north coast, has yielded a uranium-series age of 121 ky, on calcite (Keen, Harmon and Andrews, 1981). There is no possibility of accommodating this transgression any later in the sequence at La Cotte de St Brelade. And the TL date confirms the conclusion, reached on stratigraphic grounds, that the previous (first) episode of soil formation must correspond to some point within isotope stage 7, and the intervening loesses broadly to isotope stage 6. The first recorded occupation of the area, after the +18 m transgression, may thus date to stage 8 or even to late stage 9.

The present reading of the environmental sequence is based on several different types of evidence (Table 1). Certain of these, such as microfauna, and wood charcoal, make a contribution in relatively few layers ; others, such as pollen, have to be treated with care in interpretation because of unfa-

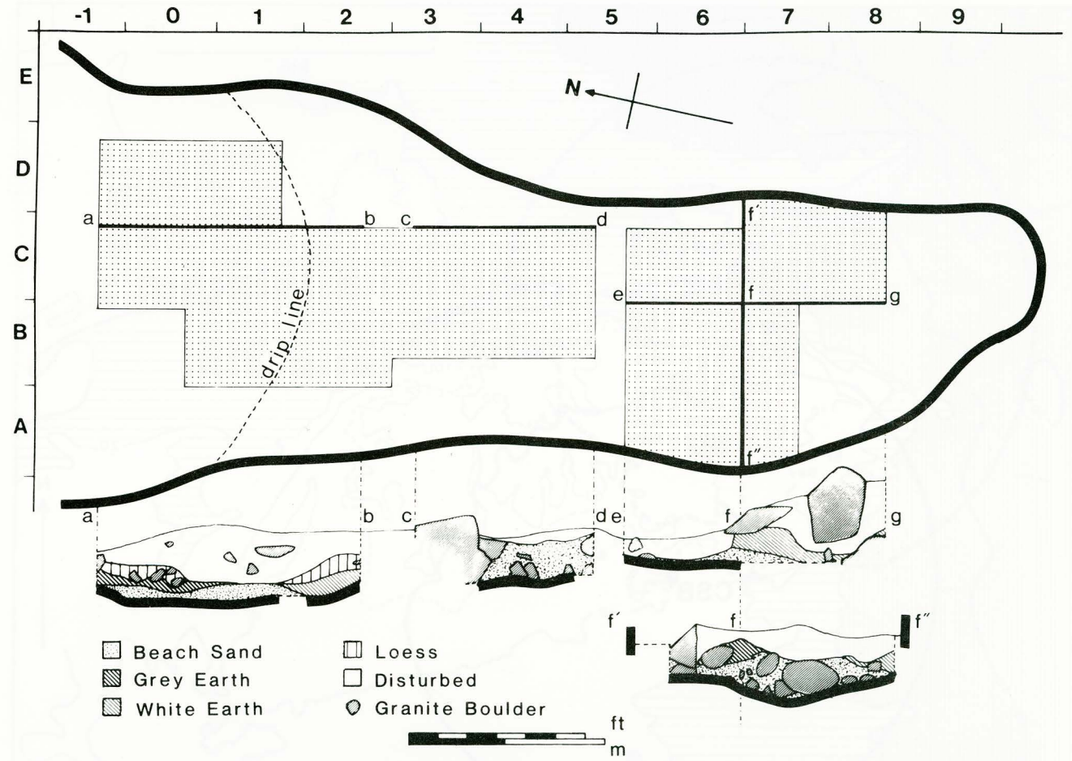

Fig. 3 : Plan and simplified sections of La Cotte à la Chèvre, based on McBurney's excavations, especially the 1964 season. Note the presence of well-rounded granite boulders embedded in beach sand in section *f'f''*. The 'grey' and 'white' earths were difficult to distinguish ; the former seems to have been richer archaeologically and the difference may merely be anthropogenic.

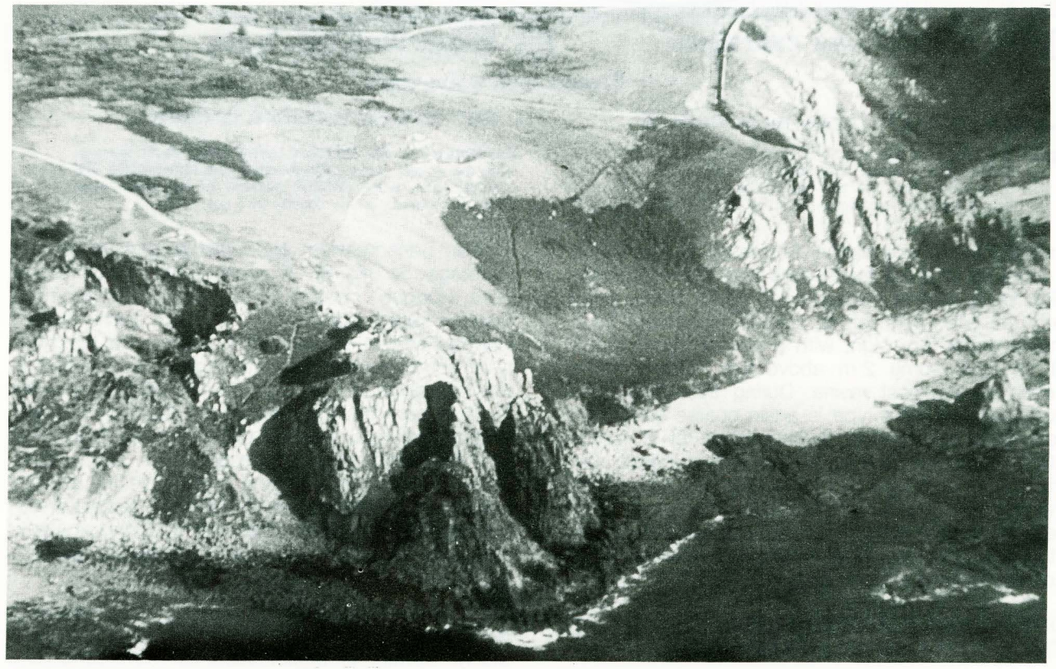

Fig. 4 : Aerial view of La Cotte Point from the northwest. The north and west entrances to La Cotte de St Brelade are visible as shadows to left and right of the North Pinnacle. Note the break of slope marking the line of the dead cliff in the bay beyond, in which the mantle of Weichselian 'head' is being eroded by the modern sea -- a similar phenomenon to that observed for the Eemian in the site itself (Photo J.T. Renouf).

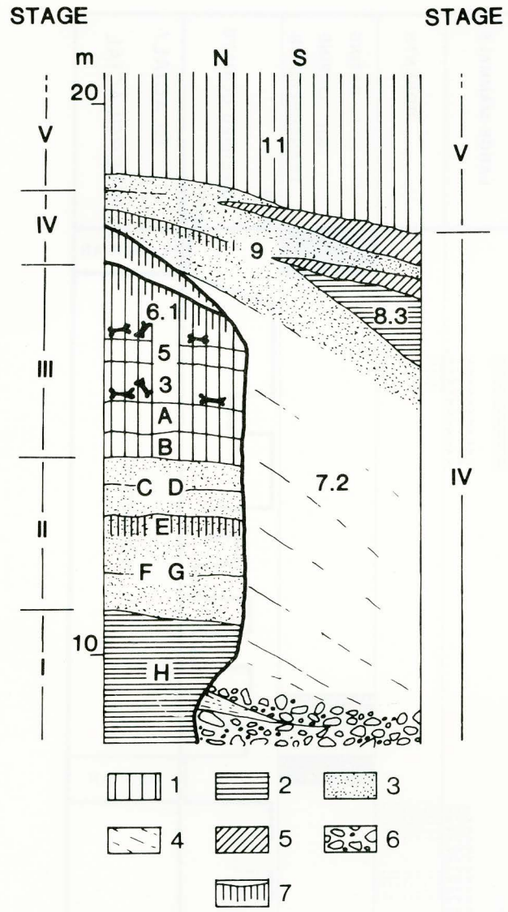

Fig. 5 : La Cotte de St Brelade : simplified north-south section through the lower part of the deposits in the North Ravine (not to scale). Key : 1 Loessic head ; 2 water-laid silt ; 3 granitic sand ; 4 talus resulting from collapse of fossil cliff ; 5 humiferous deposits (ranker soils) ; 6 marine gravel ; 7 truncated forest soil.

vourable conditions. Nevertheless, important cyclical regularities are apparent (fig. 7). Interglacial periods tended to be marked at La Cotte by accumulation and reworking of sand formed by disaggregation of the granite, while periglacial conditions favoured deposition and redeposition of loess (in this case, silt picked up from the Channel bed or its estuaries). The effects of climatic change on sedimentation were not always immediate, nevertheless. Apparently the presence of a reservoir of sediment at high levels within the ravines, and on the summit of the headland, permitted continuing redeposition of this at the onset of a new phase, and whenever there was a severe disturbance of equilibrium - as when the Eemian sea undercut and made available the existing loessic material.

The environmental fluctuations undergone by the area in the course of the Middle and Upper Pleistocene were extreme. One end of the scale is represented by conditions like those of the Flandrian at the arrival of man, with isolated islands covered by deciduous woodland, and alder carr in the low lying and poorly drained areas. Indeed, during the Eemian, finds from La Belle Hougue indicate that Jersey's red deer population, cut off from breeding with animals on the mainland, suffered severe dwarfing. At the other is a steppe-tundra extending across much of what is now the Western Approaches, as evidenced by the pollen and by the presence of Arctic rodents such as *Dicrostonyx torquatus* and *Microtus gregalis*. To judge from the present topography of the sea bed, the inter-tidal zone must have been immensely wide. There is no evidence that human occupation took place during the Pleistocene under either of these sets of conditions, however. Though the possibility of a visit to La Cotte de St Brelade between two episodes of storm beach is hinted at by a lens containing wood charcoal, there is already evidence of contemporary gelifluction. And the whole area seems to have been abandoned by man under conditions of extreme cold, within isotope stage 6 and, even more strikingly in view of the depth of sediment at this site, during the Upper Palaeolithic. The apparent absence of any Old Stone Age material on the other Channel Islands suggests that a fall of sea-level to perhaps −40 m was accompanied by a sufficient climatic deterioration to render the area unattractive.

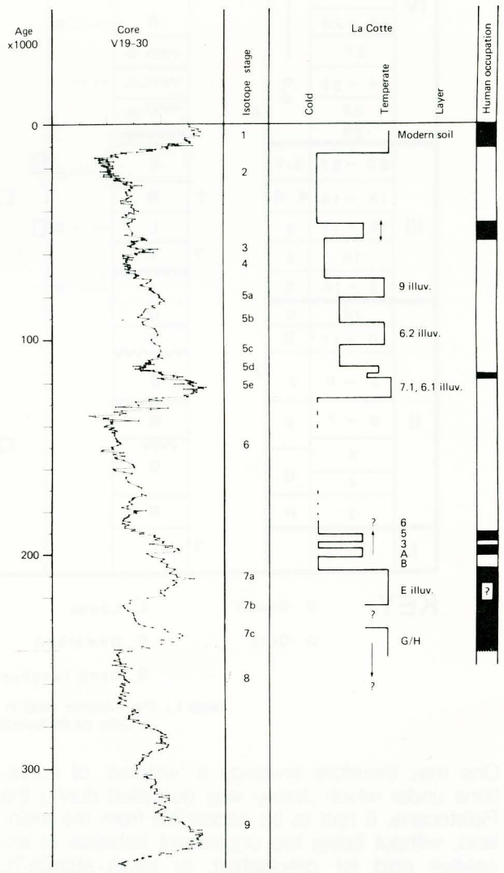

Fig. 6 : Comparison of La Cotte sequence with the oxygen isotope record of core V19-30 (courtesy of N.J. Shackleton).

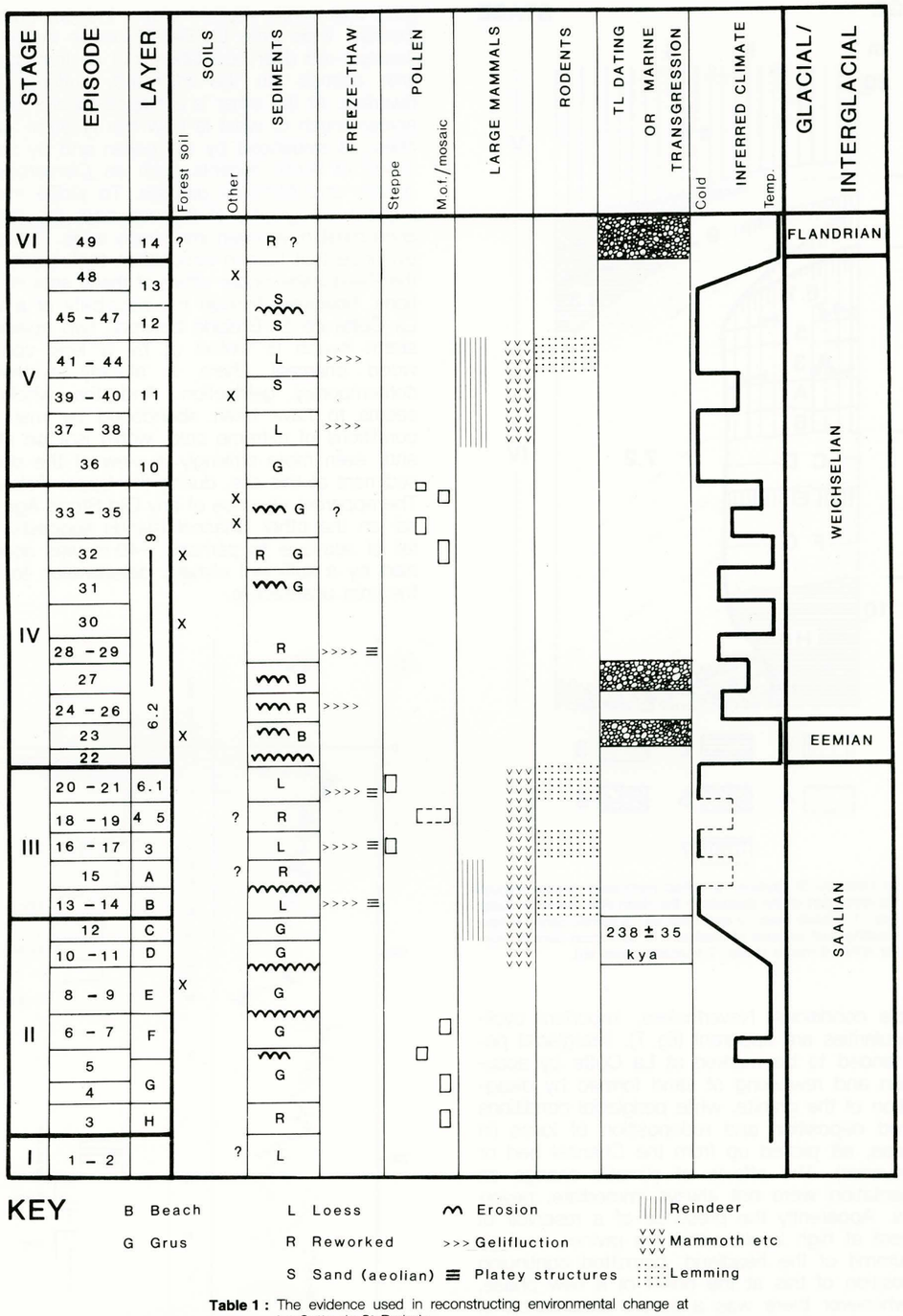

Table 1 : The evidence used in reconstructing environmental change at La Cotte de St Brelade.

One may therefore envisage a 'window' of conditions under which Jersey was occupied during the Pleistocene. It had to be accessible from the mainland, without being too unpleasant because of excessive cold (or precipation, or loess storms ?). There is hardly any information available about the fauna exploited at the temperate end of this range because the chemistry of the sediments laid down under such conditions does not favour the preservation of bone, but it is probably safe to suppose that it would have included a high proportion of woodland species. As the sea-bed for tens of km around Jersey became grassland, however, there was a very rich fauna of steppe herbivores, including mammoth and woolly rhinoceros. And the territory available for exploitation for other resources was greatly increased. Even within the confines of this 'window', therefore, there was scope for radically different economic strategies.

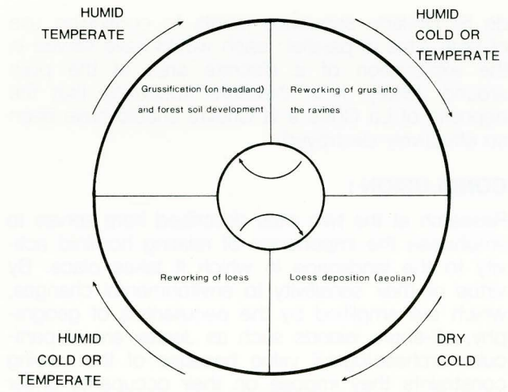

Fig. 7 : Simplified model of sedimentation at La Cotte de St Brelade, showing the basic cycle and the most common subcycles.

SOME ECONOMIC RESPONSES TO CHANGE :

It is possible to identify some of the respects in which the changing character of the Channel Islands area in the course of the climatic fluctuations of the Pleistocene obliged the hominids to adapt their way of life.

1. Flint is not native to Jersey, but was chiefly obtained in the form of pebbles. At the maximum sea-level compatible with occupation, the sea-shore was about 1 km from La Cotte de St Brelade, providing a source of flint. One of the consequences of falling sea-level was a distancing of this resource from the site, as the sea retreated and abandoned beaches were covered by colluvium, loess or soliflucted rubble. In the course of late isotope stage 7 and 6 there was a marked decline in the proportion of flint used, even though it was clearly the preferred material for small tools. Factor analysis of flint technological data shows a succession of three factors through time (fig. 8) ; each of these may be interpreted as linked to a particular approach to the procurement or use of lithic material.

Leaving aside the first factor, which may be summarised as 'advances in a Middle Palaeolithic style of primary debitage', the other two, combined, reflect very well the shift in raw material abundances. Factor 2 is in effect a response in the direction of strict economy, making the flint go further by working the cores harder, resharpening and modifying tools, etc. Factor 3, which succeeds it, is an alternative, and more extreme, response. In these final visits to the site before it was abandoned to the climatic extreme of isotope stage 6, recourse was had to a curated technology. High quality tools were generally made elsewhere and carried around ; whereas at one time even the preliminary decortication of flint pebbles had been carried out at La Cotte de St Brelade, now much of the primary knapping was confined to quartz. Only a quarter of the lithic material, by weight, was flint - the active marine beaches must have been at least 10 km away by then. It is interesting to note, too, that greater reliance on a curated technology would be in keeping with higher mobility associated with a more open landscape than before. On the other hand, the range of activities occurring at La Cotte at this time was apparently greater than occurred at the late Upper Palaeolithic site of La Riera, Spain, where some comparable technological and raw material relationships have been remarked (Straus, Clark, Suarez and Esbert, 1986).

2 Whatever the opportunities for hunting during more temperate conditions, the opening of the landscape to giant herbivores provided the hominids with a magnificent bonus, on account of the character of La Cotte Point. At several places in

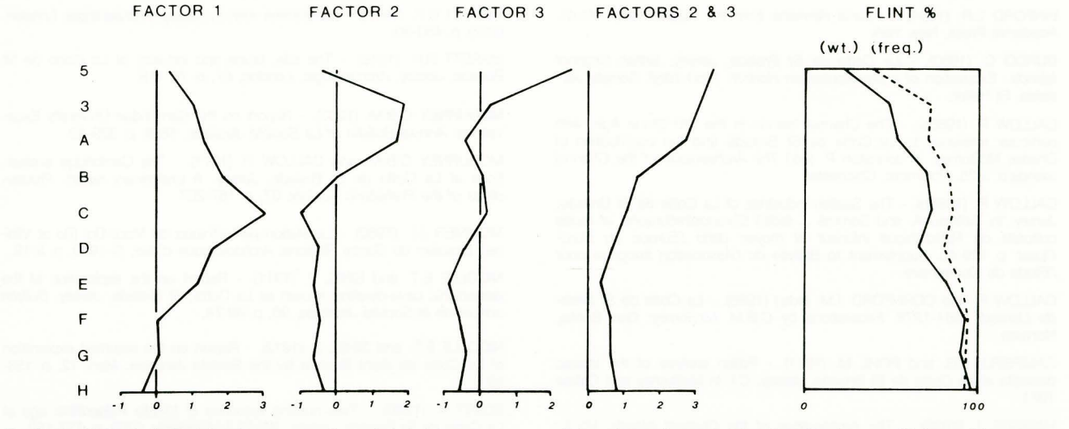

Fig. 8 : La Cotte de St Brelade : factor scores for technical data compared with the percentage of flint in each lithic assemblage. The combined score for factors 2 and 3 is computed as $[(x_2 - \min x_2)^2 + (x_3 - \min x_3)^2]^{1/2}$.

Factor 1 : classic 'Middle Palaeolithic primary technology (discoidal and Levallois). *Factor 2 :* intensive exploitation of the available flint : resharpening and elaboration of tools ; use of flakes or flake-tools as cores ; smaller blanks acceptable for tool-making. *Factor 3 :* importation of finished tools : increased size, excessively high % of retouched tools ; contrasting technologies for imported and locally-made artefacts.

the succession, the very onset of a period of abandonment of the site is marked by a large pile of mammoth and woolly rhinoceros bones. These bear cut marks and show signs of deliberate arrangement ; hominids were at least responsible for butchering the animals. (It would have been easiest to clean up the debris after leaving it to decay for a while, so preservation would depend on non-return of the human group). Moreover, such accumulations seem not to have occurred at times when there was no human occupation at all. This appears to rule out the scavenging of animals which had fallen into the ravines by accident, as such accidents should have occurred independent of human presence, resulting in a continuing supply of carcases. In fact the form of the headland is such that it would have been fairly safe for all but stampeding animals, but these would be very much at risk. The distribution of the heaps through time suggests human agency. La Cotte de St Brelade, at around 150-200 kya, therefore appears to contradict the views of workers such as Binford (1984) who believe that it was only very much later that hunting, as opposed to scavenging, of giant herbivores became possible. It is of some interest that in Brittany (immediately opposite La Cotte) there may have been a similar 'mammoth jump site' at Mont-Dol (Monnier, 1980), during the early Weichselian.

3. When sea-level was relatively high, the area of the SET of La Cotte à la Chèvre which was not overlapped by that of the bigger and richer site would have been small. As the sea retreated, however, the role of the former must eventually have changed, as the area of land visible from the cliffs of the north coast expanded and the hominid economy adapted to the changes. The presence of at least one of the highly characteristic scraper resharpening flakes which occur late in the La Cotte de St Brelade sequence points to continuing use of both sites in parallel ; each would have served in the exploitation of a discrete area of the plain around Jersey. It is therefore frustrating that the deposits of La Cotte à la Chèvre should have been so effectively destroyed.

CONCLUSION :

Research at the two sites described here serves to emphasise the importance of relating hominid activity to the landscape in which it takes place. By virtue of their sensitivity to environmental changes, which are amplified by the peculiarities of geography, off-shore islands such as Jersey are of particular archaeological value because of the varying constraints they impose on their occupants under different conditions.

Perhaps one should also stress another implication of the work carried out by practitioners of many disciplines who contributed to the project. Expansion of the investigations over the years ultimately led to an appreciation of hominid behaviour which is very different from that acquired when the input from non-archaeological personnel was smaller. It is no longer possible to contemplate the investigation of sites of such complexity without a very high level of participation and cooperation by a wide range of experts at all stages of the work.

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