

of the Azores, it divides, part turning northward and north-eastward and part turning south to the Azores and Canaries, where it divides again, part turning south and part turning northeastward towards Spain. The currents immediately westward of the continental slope between Ireland and Portugal indicate a number of eddies and a more involved system than that previously supposed; however, the northerly drift of highly saline water welling out of the Mediterranean as a warm undercurrent is shown extending certainly so far as the north of Spain. The existence of these calculated currents at the various depths is based upon the assumption that the movement of water at 2000 metres depth is negligible, for which evidence is presented.

There has been evidence for some time pointing to vertical oscillations of the water layers at a depth of fifty metres or more below the surface in various regions of the Atlantic. This expedition has provided further evidence which indicates that the oscillations may be considerable, particularly in the deeper layers. The oscillations show a more or less regular diurnal or semidiurnal period, which suggests that they are sub-surface waves or undulations having some connexion with tidal phenomena; but how the tidal wave, pro-

ducing in the open ocean oscillations of less than three feet at the surface, can produce vertical oscillations of the dimensions observed in the lower strata remains inexplicable. The desirability of further knowledge is manifest since a vertical series of observations cannot be expected always to represent the *average* conditions at any particular station; it is therefore of great importance for the discussion of the general conditions of a sea area to study how far the actual observations at the different stations and different depths may be regarded as representative.

During the course of the 1913 cruise some interesting current measurements at various depths were made from a boat moored on the bank around Rockall, an isolated rock some 200 miles north-west of Ireland. At a depth of two metres a rotary tidal stream was found, continuously varying and completely reversing in direction every six hours, a type of tidal streaming which is characteristic of the sea over isolated banks. A limited number of observations at greater depths suggest a similar variation in direction. During the fifth and sixth hours of observation a breeze sprang up and the observations indicated a wind drift of the uppermost water strata superimposed upon the tidal streaming.

Archæology of the Channel Islands.¹

By Dr. R. R. MARETT.

THOUGH there is nothing very new to be said about the archæology of the Channel Islands, some brief notes are here brought together because well-attested facts relating to such an *angulus terrarum* are apt to escape attention. For example, in recent discussions concerning Depéret's proposed method of classifying the subdivisions of the Quaternary, namely, by giving weight primarily and chiefly to the indications afforded by ancient marine shorelines, I have come across no references to the rather striking data of this type provided by the islands (see, for example, my summary account of them in *Archæologia*, 62, 469-80). Thus, one Jersey cave, La Cotte de St. Ouen, exhibits a Mousterian industry with cordiform 'points,' *i.e.* belonging to a phase that is not the latest, as resting more or less directly on a marine deposit of sand and rolled pebbles forming the floor-bed of a cave at about 20 metres above present mean tide-level. On the other hand, another cave in Jersey, La Cotte de St. Brelade, contained the remains of a copious fauna, mammoth, woolly rhinoceros, reindeer, etc., conjoined with the later of two well-represented phases of the Mousterian industry; from which fact it is fairly safe to argue that Jersey was then freely accessible from more spacious lands.

Here, then, is almost crucial evidence that the later Mousterian culture coincided with a period of land elevation preceded by one of subsidence (to use such terms without prejudice to the question whether sea or land was the active factor responsible for the change of level). This would accord well enough with Depéret's Monastirian stage with its 20-metre shoreline marking the downward movement (from the point of view of a man as contrasted with that of a fish) and a

later oscillation of at least a like extent in the opposite or upward direction; exactly 20-metres in the way of land elevation being at present necessary to render Jersey accessible from the Continent at low tide. Of previous changes of sea-level it must suffice here to say that at Le Cané de la Rivière, on the north coast of Jersey, there is clear evidence that the sea had time to hollow out a cave at the 10-metre level before it rose to 20 metres and plastered the sides and top of the cave in question with beach-pebbles. Still earlier, one may presume, is a solitary deposit of such pebbles at South Hill at a height of about 45 metres. Unfortunately, these various raised beaches contain no shell whereby to correlate them with Depéret's palæontological series.

When, on the other hand, we turn to post-Mousterian evidence of change of level, a section taken almost anywhere in the valley-bottom on which the town of St. Helier stands (the level being about 10 metres above O.D.), reveals with remarkable uniformity beneath a few feet of modern alluvium, two peat-beds alternating with two underlying marine layers of sand and shells. In the upper peat-bed a mould for a spear-head has been found, giving it a Bronze Age horizon. From the lower peat have come several rough sherds, one characteristically decorated with punctured dots in rows, that proclaim the horizon Neolithic. Moreover, there can be little doubt that this lower peat-bed is to be correlated with the submerged forest so well in evidence round the islands down to low-tide level and beyond it, as notably at Vazon Bay in Guernsey, whence proof of Neolithic age is also forthcoming. Considerable land-elevation in this region in Neolithic times is thus indicated.

How far these facts have a bearing on the general history of the Channel is hard to say. As for Jersey in particular, its position at the end of a narrow spit of

¹ Substance of three lectures delivered at the Royal Institution on Nov. 18, 25, and Dec. 2.

the Continental shelf running westward between depressions hollowed out by ancient rivers would naturally impart to the island a certain tendency to isostatic movement of a more or less local character. Even so its oscillations are so sharply defined, and can be so closely correlated at several points with the archaeological series, that they deserve more notice than they have got. If experts from England would face certain other oscillations likely to be encountered on the way across channel, they would be met both with a hearty welcome and with much to puzzle over.

As for the Palæolithic record of the islands, nothing of great importance has hitherto come to light apart from the two Mousterian caves already mentioned. The Lower Palæolithic is barely represented by sporadic implements of rather nondescript and doubtful type. Rough flints, in which some see signs of human workmanship, have been recovered from the clay capping certain rocks now disjoined from the land; and there can be little doubt that this clay is an æolian deposit of pleistocene age if only because it is distributed impartially between land surfaces of very various elevation. This loess, however, as it may be termed, affords no precise criterion of the age of the associated artefacts (if such they be) since it must have been forming steadily throughout the Ice Age. It is to be noted, by the way, that it extends some way below the present sea-floor, and must therefore have been in part laid down during a time of land-elevation.

Of the Mousterian caves, and more especially of La Cotte de St. Brelade, with its teeth of Neanderthal man, its fauna amounting to nearly forty species, and its flint implements of more than 5000 well-shaped pieces, with as many more showing signs of use, much might be said. Perhaps the most interesting result obtained from the latter site was the clear proof of two occupations separated by a considerable gap of time; a fact which, so far as it goes, would support the Abbé Breuil's recent attempt (*Man*, Oct. 1926) to establish a very long duration for the Mousterian.

The Lower Mousterian, associated with an elephant certainly not mammoth and provisionally identified by the late Dr. C. Andrews with *E. trogontherii*, occurred in four feet of indurated breccia, and was characterised by heavy coarse flakes and at least one core-implement. I could not on my own responsibility identify it with the horizon of La Micoque, but should welcome further light on the typological question. Above the breccia occurred a uniform layer, about a foot thick, of fine cave dust, and this bed was quite sterile. Evidently the cave was deserted by man for a very appreciable interval—long enough, in fact, for the fauna to have changed. Above it came six feet of loose rock rubbish, mixed with a light loam, and here occurred a large number of highly finished and beautiful implements of Upper Mousterian type associated with mammoth. The whole was sealed by a thick bed of banded lemming (*Dicrostonyx torquatus*), over which lay 30 feet of sterile clay and rock-rubbish of the type known as 'head.' Finally, the Upper Palæolithic is represented if at all by a well-marked industry occurring in several sites (mostly shallow deposits of peaty soil along the cliffs), which shows a predominance of small blade-like tools, in which a typologist might possibly discover Magdalenian affinities. In association with these has

been found a needle which, if made of ivory, as seems to be the case, and not of bone, would decisively fix the horizon as Palæolithic.

Passing on to later times, one may speak comprehensively of the Megalithic period without prejudice to the question whether the monuments with which the islands teem are Neolithic in the sense of belonging to an age when, regionally at all events, polished stone without metal was in use, or are wholly or partly assignable to the Bronze Age. Nay, it may be just worth noticing that one Jersey passage-grave, Mont Ubé, contained specimens of the *pic* and the *tranchet* (figured by me in *Archæologia*, 63, 226), which look like survivals from a previous era, namely, the Campigny period. On the other hand, there are no signs of a local development (such as has been assumed both for the Iberian Peninsula and for Scandinavia) from the true dolmen with a single capstone; but seemingly the full-fledged passage-grave was introduced at the outset. Perhaps the term 'passage-grave' should, however, be reserved for the type of monument consisting in a narrow passage leading into a wider sepulchral chamber, the whole covered by a round tumulus. This, indeed, is the normal structure found in the islands, as also in Brittany and Iberia; but Mr. T. D. Kendrick in "The Axe Age" (Methuen, 1926) has directed attention to two *allées couvertes*, or 'cists,' as he prefers to call them, which he believes to be non-western in character. These are Le Couperon and Ville ès Nouaux in Jersey, both monuments showing the remains of peristaliths which suggest that they were surmounted by long barrows and not by circular mounds.

At Le Couperon occurs a 'port-hole' slab, a fact which affords Mr. Kendrick further reason for suggesting eastern influences, proceeding proximately from the Paris basin. In this connexion he likewise points to the complete resemblance between the statue-menhir of the Câtel, Guernsey, with its necklace and closely juxtaposed breasts carved boldly in the round, and certain wall-carvings adorning the cists of the Seine and Oise valleys. Meanwhile, it should be noted that if Ville ès Nouaux be of eastern type as regards structure, it nevertheless contained grave furniture of markedly western pattern such as bell-beakers—a fact chronologically interesting as proving that the cist culture had arrived before the beaker ceased to be in fashion. Further, as regards ceramic, several Jersey passage-graves have yielded a peculiar type of cup-like vessel with a hollow base and characteristic decoration; and some half a dozen more of these in excellent preservation have been found in the newly opened monument of La Hougue Bie. French archaeologists have sometimes labelled this type 'supports,' as if other round-bottomed vessels had originally been set up upon them; but it is at least equally likely that they were self-sufficing receptacles of food-offerings to the dead. In any case, more important than the question of their function is that of their bearing on the origins of the megalithic culture-complex as met with in the islands. To judge by the distribution of the very few examples hitherto noticed in France, it would seem that this peculiar ceramic marks the track of a culture coming from east-central France down the Loire valley, probably at some time early in the Bronze Age, and thence turning northwards to Brittany and the islands.

Much might be said about the life of this period as deduced not only from the megaliths but also from humbler remains, such as notably the graves, with the associated cairn and midden of the islet of La Motte, Jersey—to which, by the way, the little island of Thinic, to the west of the peninsula of Quiberon, seems to offer a close parallel (see *Archæologia*, 63, 210).

It must be enough, however, in conclusion to direct attention to two megalithic monuments of special interest. One of these intrigued the dilettanti of the eighteenth century; and Horace Walpole's friend, Marshal Conway, actually removed it in 1787, two years after its discovery in Jersey, to Park Place, Henley, where no British archæologist should fail to pay it a visit. It is in several respects unique among island monuments. For one thing, the covered passage leads into an *enceinte* which is perfectly circular, unlike the normal passage-grave, which is shaped more like a

tennis racquet than a jew's-harp. Mr. Reginald Smith (*Proc. Soc. Antiq.*, 1919, 143) compares the shape of a neolithic house with covered passage found at Pléneuf, Côtes-du-Nord. A similar house has recently been discovered at La Sergenté, Jersey. Again, the *enceinte* with its six trilithons, somewhat suggestive of a miniature Stonehenge, may well have been hypæthral as at first designed, though later by design or accident a mound of earth (or blown sand) was superimposed. As for the magnificent passage-grave of La Hougue Bie excavated in 1925, though doubtless its contents were disturbed at some time, it remains in the intact majesty of its structure a very masterpiece of art, unsurpassed whether in size or in the symmetry of its design by any monument of the kind in north-western Europe.²

² On the whole subject see three papers by the lecturer in *Archæologia*, vols. 62, 63, 67, and for full details the *Bulletins de la Société Jerseyaise* and *Proceedings of the Guernsey Soc. of Nat. Hist.*, later *La Société Guernesaise*.

News and Views.

WITH this issue we begin the publication of a weekly "Calendar of Discovery and Invention," in which, so far as possible, each day will be used to recall some event of importance in the history of science and its application. The notes are being compiled by Engineer Capt. Edgar C. Smith, of the Science Museum, South Kensington, who some years ago contributed to our columns the Calendars of Scientific and Industrial Pioneers. It is not to be expected that every event of importance in the history of science will be referred to; such would be clearly impossible within the limits of a weekly column in a year's issue of NATURE. It is also obvious, from the nature of the records available, that the physical sciences and engineering are likely to figure in the column more than the biological sciences, medicine, and similar subjects, in which it is often difficult to assign the announcement of a discovery to a particular day. Suggestions regarding events suitable for inclusion in the column will be welcomed.

By invitation of the French Government, a meeting of the executive council of the International Institute of African Languages and Culture was held in Paris on Monday, December 13, instead of in London, as had been previously arranged. It was thus the first to be held outside England, and with it the work of the Institute, which was founded a little over a year ago, may be considered to be fairly launched. The initial difficulty of raising funds, it may be hoped, is well on the way to solution, especially as it was announced at this meeting that the Government of the Gold Coast has promised a donation of £500 a year for the next two years. It is to be hoped that this subsidy will be renewed at the end of that period, and that the example of the Gold Coast will be followed by other African dependencies, as well as by organisations and individuals interested in Africa and African studies. The programme already mapped out by the Institute covers most important fields of research, and its work of co-ordination in the study

of African linguistics and ethnology will be especially valuable in promoting the development and education of the African native.

THE meeting was attended by representatives of Great Britain, France, Germany, Austria, and other countries. Among those present were Dr. Westermann, the distinguished German authority on African languages; Sir Frederick Lugard; Major H. Vischer of the British Colonial Office, to whose efforts the foundation of the Institute are largely due; and the Rev. E. W. Smith. Prof. Seligman, who represents the Royal Anthropological Institute in the Institute of African Languages and Culture, was unfortunately unable to attend. M. Labouret of the French Colonial Office was appointed joint Director of the Institute in succession to M. Delafosse, the announcement of whose death was received with much regret. A deputation of the delegates was received by M. Perrier, French Minister for the Colonies, who expressed great interest in the work of the Institute.

At a meeting of the Newcomen Society on December 15, papers were read on two famous Swedish engineers. The first paper, by Mr. J. G. A. Rhodin, was on Kristofer Polhämmer, better known as Polhem, the name he took on being ennobled. Polhem was born in 1661 and died in 1751. Starting as a clerk on an estate, he was enabled to study science at Upsala, and became a mining engineer at Stora Kopparberget, where he built his famous "Machina Nova," a large water-driven headgear for handling the ore. His inventions relating to mining and metal working were numerous. He also made the dock gates for the dry docks at Carlskrona, then the largest in the world, and built the lock at Stockholm uniting the Malar Lake with the Baltic. He also began a system of locks to make the Trolhättan falls passable, but the work was discontinued on account of the death of Charles XII. Mr. Rhodin described Polhem as "one of the first engineers in this world with a thorough theoretical training, yet practical to a degree in spite of his bringing up at *Alma Mater Upsaliensis*."