

to the present occasion not more than two or three natives had ever attended, but, attracted, no doubt, more by curiosity than by any religious feeling, no less than three hundred, including men, women, and children, were now present, three-fourths of whom were compelled from want of space to remain outside. They appeared to know they ought to be quiet, and some of the eldest seemed to be listening, but the greater part were looking around them and evidently inattentive, apparently taking no interest in the proceedings. The small boys amused themselves by flinging pebbles at one another, making grimaces, or pulling a stray dog's tail, and sometimes the word *koi-koi*, meaning 'lie,' would be heard in reference to something the missionary was saying."

The Motu people express surprise in a curious and interesting way, namely, by drawing in their lower jaw and clicking their upper teeth with the thumb-nail of the right hand, very much the same gesture as the old European "biting of the thumb." They also express surprise by smacking their lips. The women are expert makers of pottery. The clay is worked into shape by hand over an earthenware mould, of course without any wheel appliance. The upper and lower halves of a vessel are made separately and afterwards joined. The pots are baked in an open fire on the sea-beach. They are of a brick-red colour when baked, and are made of three forms—the "ura," or cooking-pot, the "hordu," or water-pitcher, and the "nao," or bowl.

The natives start in every November with large cargoes of this pottery on a trading expedition a distance of two hundred miles up the coast; three or four of the largest canoes are lashed firmly side by side with rattans, and the compound craft thus produced is termed a *lakatois*; some of these *lakatois* are propelled by a dozen square sails and others by a single huge elliptic-shaped sail, which is extremely picturesque in appearance, but the cause of the peculiar form of which seems very uncertain.

In return for the pottery the natives receive sago, yams, taro, sweet potatoes, betel-nuts, and sugar-cane. The record of the undertaking of systematic long voyages, such as these by savages, is a very valuable fact, and helps to account for a rapid spread of cultivated plants, such as tobacco, for example, which doubtless originally reached New Guinea from America through Europeans. Whilst waiting for a start at Anuapata, the crews of the six *lakatois* from the neighbouring villages, composing the trading fleet, held regattas almost every day to while away the time and get into training. A terrible wailing was made by the womenkind on the day of actual departure, and many embraces between husbands and wives took place upon the beach, and there was much rubbing of noses; the women escorted the *lakatois* some distance in single canoes.

The mothers rock their babies by swinging them in a net bag suspended from a beam beneath the verandah, and the babies are often carried in these bags.

We cannot follow the author further in his account of the Motus, nor cite any of his interesting experiences amongst the Koiaris. The book is well illustrated throughout, and at the end is a short Motu dictionary, and shorter tables of eight other Papuan languages. The Motu people have a name for every different plant and bird, and for all the conspicuous stars. Numerals are given up to a million. We should almost be inclined to doubt the Motu conception of so high a number; possibly there may be some mistake in the matter. In the Koitapu language the numerals for eight and nine appear to be formed by subtraction from ten, and to mean (ten) less two and (ten) less one, as in the Admiralty Island language. The personal names for women are amusing indeed, the first two are probably intended as complimentary, but the remaining three can hardly have such a meaning; those cited by the author, when translated, mean "pig," "thief," "hungry," "frightened," and "bad."

A list of birds drawn up from the author's important collection by Mr. Bowdler Sharpe closes the book. The author seems to have little or no knowledge of natural history, since he repeatedly speaks of a Dugong as "a large fish," and further describes it as a "finny monster," and he imagines that the pig was introduced into New Guinea by Capt. Cook. His descriptions of birds, insects, and other animals seen are, however, interesting throughout the book. He gives some valuable information about the pigs. Some are kept tame by the natives, and some of them are very fine and fat; when young they are striped longitudinally, yellow, brown, and black, every other stripe being black; the stripes blend to a general dark brown tint as the animals get older. It is interesting to find that the Papuan pig exhibits the same markings as the European young wild boar so plainly. The natives have an ingenious way of catching the wild boar. When the boar charges, after being slightly wounded with a spear, a net with a very wide mesh set on a hoop-like frame is pushed over his head as he rushes forward. He gets his neck into one of the meshes, and with the large hoop about his throat, is helpless, and then easily killed.

We commend Mr. Octavius Stone's book to all classes of readers: there is not a dull page in it.

VERTICAL SHAFTS IN THE CHALK IN KENT

THE deep caves in the chalk in Kent while preserving a general form in a limited area, present certain differences amongst themselves, which enable us to trace something of their history as to time and object.

Those now most easily examined are the latest and best constructed. Though they are not dug at the present day here, there are many old ones that have been worked for chalk. These are distinguished by their irregular shapes and very wide shafts.

But there are fine examples now open of which North Kent has many having these general characters—a deep shaft, penetrating the soils (Woolwich pebble beds, Thanet sands and gravels) above the chalk, then the chalk itself from 2 to 5 feet, and widening out into a cave in the latter, mostly without effort at burrowing laterally, and when doing so keeping the shaft in the middle and the general shape of the cave as it were one area, with a due regard for the permanence of the roof. Some had pillars for this purpose left in the chalk, and there is one with four of them which are elegant in form and rounded. This cave being an excellent example of the kind, may be more particularly described. The shaft is 3 feet 3 inches in diameter (a common average), and passing through sand reaches the chalk at 51 feet; then penetrating it 2 feet widens out into an area of 49 × 38 feet, the sides cut into bays. Two pillars are left, one on each side of the shaft, and in continuation of it, still 3 feet apart, and there are two other pillars in the eastern part. The western part having no pillars has fallen in, and there is a large mound of sand and rubbish in the centre—but the height of the cave is 20 feet, perhaps 22 feet.

In this case the access to the chamber is perfect: the shaft is provided with foot-holes from 6 inches to 20 inches (occasionally) in lateral depth; these pass from the surface to the bottom of the central pillars at about 18 inches apart and opposite to each other, and it was easy a few years ago to descend and ascend without assistance, unless perhaps with that of a stick across the mouth of the shaft. Some of the shafts have foot-holes only to the point where they widen out below, when recourse was had to a pole or rope, of course.

Most of the caves are simpler than this, and the commonest form is a mere beehive sort of widening.

All these open caves appear to have been dug with iron picks.

At Greenhithe one has been lately found containing a

large quantity of Romano-British pottery, but it was dug with metal implements, probably of iron.

There are two caves at Crayford within 3 feet 3 inches of each other; they are exposed in the side of a chalk-pit connected with the brick-fields. One of them measured, from the surface to the chalk, about 18 feet; thence to the floor, 17 feet 6 inches. The floor was of flints, about 6 inches thick, which had been taken up at one part and piled in a heap on the other side of the cave; about a quarter of the area, an irregular oval of 18 feet diameter, had been so treated. From this floor rose an obtuse cone of sandy clay 6 feet high, washed in very slowly and evenly by the rain. In the cone were found flint flakes, and one worked scraper with a rough core, from which flakes had been chipped, but no pottery. Above this, coarser soil and lumps of chalk, with several sorts of broken pottery, very coarse, black, spongy pot, scarcely baked, containing a large quantity of crushed shells not calcined, and a few pieces of pot made with coarsely-pounded chalk—all these either without ornament or only finger-nail marked; then finer pot of Roman moulds, and fine black ware, with a Samian plate. All were accompanied by large quantities of the bones of domestic and food animals for about a foot, then coarse earth and bones to the surface.

From about the period of the Roman deposit until now we know the value, and it would not be excessive to date the commencement of the deposit of mud and the abandonment of the cave perhaps at half that period earlier.

On the walls of this cave there are no marks of the implement by which it was excavated, and the conclusion is that the blocks were prised out.

The cave adjoining this fell in early and was soon obliterated.

Before knowing of these caves flint flakes and two "pot boilers" were found on the surface.

Clusters of these pits are either huddled into small areas sometimes or are spread out into lines, and they are frequent in spots which, from the supply of water, must have been thickly wooded, and so difficult of access, or from the bleakness of the situation unlikely to be noticed.

There is a cluster at Bexley of thirty-five in about three and a half acres, and another of forty-four.

Some pits which are mostly filled up now, in the woods, are part of a system and are connected by banks and ditches, and the same banks with earthworks which are of a late stone age, and also with clusters of hut circles, and there is great probability that they served two uses—retreat and storage, and as pitfalls, as to the last with an ingenious contrivance in one instance for driving animals down a deep covered way, either past a pit or, by an arrangement of a simple barrier, shunting them into it for the use of the camp.

F. C. SPURRELL

PROF. GEIKIE ON THE GEOLOGY OF THE FAR WEST

ON Monday the 10th inst. Prof. Geikie reopened the class of geology in the University of Edinburgh by giving an account of his recent exploration of the western territories of North America. There was a large attendance of students and others.

The Professor, in the outset, reminded his students that last session he pointed out the remarkable lessons to be learned from the geology of the western regions of North America, more particularly in reference to the changes which had taken place on the surface of the earth from ordinary atmospheric causes. It was with special reference to those changes that he took a journey to the West. Had geology begun in those western territories, instead of among the old broken, gnarled, and contorted rocks of Europe and the east of America, its progress, at all events in some departments, would have

been far more rapid than it had been. He had three objects in the expedition:—(1) To study the effects of atmospheric and river erosion upon the surface of the land; there being no region where these lessons could be learned with more wonderful impressiveness than in those great plateaux and table lands. (2) To mark the relation which the structure of the rocks underneath bore to the form of the surface. In this country and in Europe generally one was continually brought face to face with evidence of dislocations, protrusion of igneous rocks, contortions, and other complicated forms of geological structure which, save to experts in the subject, made it often difficult to realise how much of the present irregularity of the surface should be attributed to unequal waste by ordinary atmospheric causes, and how much to the direct effects of underground movements. The Western States and Territories of North America over which the strata, for thousands of square miles, retained their original horizontality, presented remarkable facilities for the investigation of this subject, and had already, in the hands of King, Hayden, Powell, Dutton, and others, furnished ample materials for satisfactory discussion. (3) To watch with his own eyes some of the last phases of volcanic action. He had been familiar with the phenomena of active volcanic vents as displayed in Italy and the Lipari Isles; but he was anxious to see some of those marvellous evidences of the gradual decay of a vast volcanic area so well displayed in the famous region of the Yellowstone. The Professor went on to give a brief account of his journey. He stated that he was accompanied throughout by a former student of the class, Mr. Henry Drummond, F.G.S., whose constant hearty co-operation had been one main element in the success of the expedition. His route first lay westwards by railway into Colorado. In crossing the prairies towards the Rocky Mountains he noted, in the few sections that occurred, soft grey cretaceous or tertiary clays and marls. Getting down at some of the stations, and looking at the ant-hills and burrows of the prairie dog, he found that the surface of the prairies was veneered with a thin coating of a pinkish, fine-grained sand, sometimes approaching to gravel, its colour being due to the presence of a great many small pieces of fresh felspar. It was clear that this mineral, as well as the quartz and occasional fragments of topaz, which he saw, did not belong to the strata on which they lay. In going west, the grains of sand, getting coarser, assumed the form of distinct pebbles, till, when he reached the mountains, they became huge blocks and boulders, evidently derived from the heights beyond. The cause of this wide diffusion of sand and gravel over the prairies was constantly present to his mind during the rest of the journey, and he took occasion on returning eastward to halt and make a more detailed examination of the subject.

The term "Rocky Mountains," he remarked, was a singularly unfortunate designation, under which had been included a great many independent and totally distinct mountain ranges. On most maps of North America a continuous line of lofty ridge was inserted down the axis of the continent and marked "Rocky Mountains." But no such ridge existed. The great plateau had been wrinkled by innumerable meridional folds which, dying out, were replaced by others. Some of these folds formed notable ranges of mountains with wide basins or plateaux between them. It was thus possible to cross the axis of the continent without traversing any mountains, rocky or otherwise. The line of the Union Pacific Railroad followed one of these natural routes. At its highest point (upwards of 8,000 feet), so little did the landscape suggest the altitude, that it had been found desirable to erect there a wooden placard with the title "Summit of the Rocky Mountains."

Crossing the Missouri River at Kansas City, and striking westwards to Denver, the Professor said he halted for