

day, reducing its shelly contents to their present condition, and anything buried in it then would be similarly changed with the other contents.

A palæolithic man graved the shell (note the breadth of the nose in connection with Professor Sollas' suggestion as to the affinities of cave man—a later man would not have made it so broad); it was buried with the owner in a grave dug down into the Crag, all traces of which interment with the perishable human remains would become obliterated in the subsequent ages, or if any were left would be overlooked by the finder, who was not, I believe, a skilled geologist, and who certainly was not expecting the prize that came in his way.

B. B. WOODWARD.

PS. Since writing the above I have re-examined the shell with Mr. A. S. Kennard and others. Mr. Kennard pointed out that the hinge-teeth in one place held a small fragment of matrix unlike that of the Red Crag adhering to other parts of the shell, and strongly resembling humus. This little piece of evidence, if correct, will further support the interment theory. Mr. Kennard further considers that the staining in the cuts, especially the mouth, are unlike Red Crag staining, though not modern. It had previously occurred to me that it looked as if red ochre, as known to the ancient hunters, had been rubbed into the cut.

Another friend has favoured me with an attempt to reproduce the carving from memory on a *Glycimeris* shell from the Red Crag of the locality, but his efforts have only served to emphasize the impossibility of reproducing with modern tools and modern conception of the human face, even in caricature, the quaint but characteristic sculpture on the shell in question.

ON A DISCOVERY OF FOSSILS IN THE WEKA PASS STONE,
NEW ZEALAND.¹

SIR,—While not wishing to defend *in toto* the position taken up by Professor Marshall and Messrs. Speight and Cotton on the Younger Rock Series of New Zealand, which has recently been assailed by Professor Park in this Magazine (December, 1911), I should like to announce a discovery of fossils in the Weka Pass Stone which has considerable historical interest. Professor Park in 1905 (Trans. N.Z. Inst., xxxvii, pp. 545–6) and in the paper mentioned stated that he was unable to find recognizable fossils in this rock, and came to the conclusion that the fossils previously reported by Haast and Hutton were probably derived from fallen blocks of the overlying Mount Brown Beds. Professor Park had not had access to the Geological Survey collections, in which there are undoubtedly Tertiary fossils from this rock, and may be pardoned for not recognizing as from the Weka Pass Stone certain fossils in the Canterbury Museum which are labelled simply 'Weka Pass' or 'Waipara'. He is certainly right in maintaining that fossils are not abundant in the Weka Pass Stone, as stated by Haast, for it is possible to search for hours without success. In a recent visit to the Waipara district, however, Mr. Cotton and myself had the good fortune to stumble across several specimens of *Pecten* (*Camptonectes*) *huttoni* (Park), and a single specimen of a *Cirsotrema* allied to *C. lyrata* (Zittel), two of the most characteristic fossils of the Oamaru Series (Lower Tertiary). This discovery proves that Hector, Hutton, and Haast were right in ascribing a Tertiary age to the Weka Pass Stone, and throws back the position to where it was on Hutton's death, viz. that if the Weka

¹ By permission of the Director of the Geological Survey of New Zealand.

Pass Stone is conformable to the Amuri Limestone, there is a Cretaceous-Tertiary formation in New Zealand, while if it is unconformable, there are distinct Cretaceous and Tertiary formations.

MINES DEPARTMENT,
GEOLOGICAL SURVEY BRANCH,
WELLINGTON, N.Z.
April 26, 1912.

J. ALLAN THOMSON.

TERTIARY FOSSILS IN THE WEKA PASS STONE, NEW ZEALAND.

SIR,—The discovery of Tertiary fossils in the Weka Pass Stone in the Lower Waipara district, as reported in this issue by Dr. J. Allan Thomson, is of special interest in connexion with the Cretaceous-Tertiary controversy now taking place in New Zealand. On four different occasions I had carefully searched for recognizable fossils in this rock in the typical Weka Pass District without result, and in consequence referred the Weka Pass Stone to the Cretaceous Waipara succession. This discovery, it should be noted, does not in any way affect the argument for or against a Cretaceous-Tertiary succession to New Zealand. What it does is to show that the unconformity between the Lower Tertiary and the Cretaceous must be placed, not above the Weka Pass Stone as done by me, but below it as contended by Hutton. By the aid of a sketch-map kindly made for me by Dr. Thomson I had no difficulty in finding the new fossiliferous locality in the Lower Waipara. Although fossils are scarce I succeeded in finding two fine examples of *Pseudamusium huttoni* (Park) and two of *Cirsotrema lyrata* (Zittel), both typical of the Tertiary Oamaru Series. The fossils occur in the lower third of the Weka Pass Stone, and are usually not many feet above the junction of the Amuri Limestone.

Hutton always contended for an unconformity between the Weka Pass Stone and Amuri Limestone. The latter is a hard grey chalky rock without bedding planes. Its upper surface on which the Weka Pass Stone rests, as seen along the escarpment facing Doctor's Creek in the Lower Waipara where the Tertiary fossils were recently found, is undulating and gently corrugated, and in places broken into angular fragments that have been recemented so as to present a rudely brecciated appearance. But the physical break is nowhere great, and since both the Weka Pass Stone and Amuri Limestone are tilted at the same angle and exposed in the same scarps it is frequently difficult to distinguish any trace of stratigraphical discordance. Nevertheless, the discovery of Tertiary fossils in the Weka Pass Stone is a splendid justification of Hutton's contention. Above Hutton's unconformity the fossils are typically Tertiary and below typically Cretaceous.

In North Canterbury the Lower Tertiary (Oamaru) Series rests on the Cretaceous (Waipara) Series, but in South Canterbury and North Otago it rests on older Mesozoic or Palaeozoic rocks. Where the Oamaru Series rests on these older rocks in the south it always begins with a series of terrestrial beds containing seams of brown coal, but where it rests on the Cretaceous rocks in the Waipara district the terrestrial beds are absent. It would thus appear that marine deposition began first in the north and gradually spread southward as the subsidence progressed. The marine Weka Pass Stone in the north is apparently contemporaneous with the terrestrial brown Coal-measures in the south. When subsidence began at the close of the Cretaceous the first areas to be invaded by the sea would naturally be the old Cretaceous basins, which would explain the early appearance in the north of *Pseudamusium huttoni* and *Cirsotrema lyrata*, both of which it should be noted pervade all the marine beds of the Oamaruan in the south.

The correlation of the Weka Pass Stone and the Ototara (Waitaki) Stone in the south, as urged by McKay, is opposed to the palaeontological evidence, for whereas the Pareora fauna underlies the Mt. Brown (Waihao, Waitaki, Duntroon, Ototara) and Kakanui calcareous horizons, it everywhere overlies the Weka Pass Stone.

JAMES PARK.

OTAGO UNIVERSITY, DUNEDIN.
April 30, 1912.