England) should be initiated as early as possible. The perfectly wonderful results achieved in England at a comparatively small cost is a sufficient guarantee of the usefulness of these classes. The Science Directory issued by the Council gives every particular of the work of their organization.

Observations on Captain Hutton's paper "On the Maori Cooking-places at the Mouth of the Shag River" (Trans. N.Z. Inst., VIII., p. 103). By JULIUS VON HAAST, Ph.D., F.R.S.

[*Read before the Philosophical Institute of Canterbury, 15th December*, 1876.]

IT was not my intention to enter at present any further into the controversy concerning the age and time of extinction of the different *Dinornis* species, but on a perusal of Captain Hutton's paper "On the Kitchen-middens at Shag River Point," I feel obliged to say a few words in reply, as my silence might otherwise be taken for my agreeing with all his statements and deductions, of which several, as I shall show, are utterly at variance with the observations I made in that locality. Although my own excavations were on a more limited scale than those made by and for Captain Hutton, all the principal facts were nevertheless ascertained by me, and no further excavations, even had they all been made under his eyes, could alter them in the least.

And as Captain Hutton bases his deductions principally upon the excavations made by other persons, it is very probable that the position and sequence of the beds were imperfectly understood by them, and that therefore these deductions, based upon partly erroneous interpretations, can in many instances also not be accepted.

In order to show that I do not speak at random, I wish only to give one instance, which is conclusive. In my paper I stated that—

"In their vicinity (shell-beds), and below high-water mark, a small flat stretches towards the river channel, which is in many localities literally paved with Moa bones. The excavation which we undertook on this piece of ground proved that the lowest bed of human origin, consisting of boulders, once forming the cooking-ovens, had been arranged at least two feet below the surface of the flat. Here and there a chipped stone implement, embedded amongst the bones and of exactly the same character, proved that the same people who feasted on and near the summit of the sand-hills, camped here on the flat, which must then have been high and dry, and, as before observed, situated about theee feet above high-water mark, as the fires with which the Moa-hunters heated their boulders at the bottom of these ovens could not otherwise have burnt."

Upon this Captain Hutton remarks :—

"Dr. Haast has stated that the land has sunk about three feet since the date of the first ovens; but a careful examination of the ground failed to corroborate his observations. No ovens were found as high as low-water mark, although scattered stones that had been used for cooking were found on the river side of the spit below high-water mark, but none below low-water mark. These stones had no doubt been washed out of the sand by the undercutting of the river."

From these observations it almost appears that Captain Hutton never examined the flat in question, or he would, without doubt, have corroborated my observations.

Not only were excavations made by me in several spots on this mud-flat, partly covered with salt-marsh plants, and which grow generally in those localities which are only covered occasionally by high tides, but similar holes were sunk by my servant in 1872, and the results were always the same. We both passed through about a foot of sandy mud, after which we reached a great number of Moa bones, often closely lying together; below them cooking-ovens were found, with the stones composing them, in their original position, now at least two feet below high-water mark. Consequently, they cannot have been washed out of the sand by the undermining of the river, which never had its bed there since this deposit was found, and which everywhere is *in situ*.

What Captain Hutton means by ovens as high as low-water mark is beyond my conception.

However, the ovens and kitchen-middens, two feet at least below high-water mark, are there, and prove that the ground beneath the ovens must have been at least above spring tides when the ovens were excavated on the flat, as no fire could burn in such a spot, and the ovens and kitchen-middens would have been destroyed or washed away by every high spring tide. We can therefore only account for their present position and preservation, by assuming that the Moa ovens and kitchen-middens have been covered by newer beds deposited over them, by which they were afterwards protected when the land sank.

Concerning my statement that many of the limb bones were not broken for the extraction of the marrow, I must have been remarkably fortunate, as I obtained during a short day's work several entire tibiæ, three of which I brought with me to Christchurch, whilst I could have filled a large case with unbroken femora and metatarsi, from which I selected 22 for comparison and which are now in the Canterbury Museum. Besides this small quantity a large number of bones were collected during several years past by inhabitants of the district or by visitors.

Concerning the mixing up of shell-beds with the kitchen-middens of the Moa-hunters, there is no reason why the latter should not have been shell-eaters also; but all the undisturbed layers with Moa bones, seal bones, and ashes, which I examined carefully at different levels, never contained any shells, and the undisturbed shell-beds did not contain any Moa bones. However, in many localities, owing to the shifting nature of the sands, I observed that the contents of the older and newer beds had very often become mixed. This was exhibited very clearly in one spot, where a small hillock, with a layer of ashes, stones, and Moa bones, had partly become destroyed, the contents of the layer rolling down and covering a bed of shells lying in the hollow between the sand-hills.

As such a destruction and mixing of beds belonging to different periods have been going on for a long time, it is evident that if, as in this case, the re-arranged beds have been mistaken for original ones, it simply proves that the excavators possessed insufficient experience to distinguish between them.

On a new Fire-grate for economising the Combustion of Coals and Lignites, and increasing the Radiation of Heat. By H. Skey.

[*Read before the Otago Institute, 4th July*, 1876.]

In a former paper read before this Institute, a method was described by which coal and lignite could be consumed without wasting the heat contained in the column of air which ordinarily passes up the shaft of the furnace of the steam-engine, and in the discussion which arose thereon the desirability was suggested of devising some method by which the combustion of brown coal and lignite could be rendered more perfect in open fires and sitting-room grates. The use of a blast for this purpose would be scarcely applicable, as it would require special machinery for each fire-place.

Experiments were, however, undertaken last year, on the combustion of these fuels in an open grate, the final result of which is exhibited in action, as I have been kindly allowed to substitute one of these grates in the fire-place of this room for the evening. The fuel used is from the Green Island mines. It is well known that stirring these fuels makes them burn worse, also that a great vertical thickness is injurious to their combustion, as the superincumbent weight crushes the fuel, so that scarcely enough heat is generated to sufficiently warm the chimney to ensure the passage of the liberated smoke and gases up the flue. For these reasons, the attempts to burn them in grates specially constructed for hard and bituminous coals, leads to anything but a cheerful result.