

rules at all in nature's working so widely as is claimed for it, the other laws above mentioned really doing its work. I think, therefore, members will forgive me for trying in this section of my subject to raise scientific research into the domain of the above laws as a whole, and not to fit nature's working into any one minor law. In chemistry we experiment and discover most curious and startling combinations. Surely we ought to admit the rule of pre-existing laws governing those combinations. And if we admit this in chemistry, surely we ought also to admit the ever-present attendance of the other equally important laws above-named governing vital action. Those laws are always with us, governing us in every direction; and in so far as they show themselves equally in entirely different genera and species, so ought we to consider them common vital laws.

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ART. XVI.—*On Maori Stone Implements.*

By Captain HUTTON, F.R.S.

[*Substance of an Address to the Philosophical Institute of Canterbury on the 4th August, 1897.*]

Plate XIII.

I do not wish you to think for a moment that I am an adept in Maori lore. To be a Maori expert it is necessary to have lived among the Maoris in the North Island, where alone a knowledge of their manners and customs can be obtained. There is, however, one small portion of Maori art which can be better studied in the South than in the North Island, and that is the manufacture of stone implements. Stone implements are far more abundant here than in the North; and while many stone-implement manufactories have been discovered in Nelson, Canterbury, and Otago, I have never heard of any in the North Island. This is no doubt due to the greater variety of suitable stones found in our mountains, especially in the District of Nelson, where also they occur near the sea.

I am also favoured by the fact that our Museum contains an admirable collection from the kitchen-middens and caves of the South Island illustrative of all the processes of manufacture, as well as samples of the finished implements from Mongonui, in the north, to Stewart Island, in the south; and it is from this collection that I have selected a few specimens to illustrate this address.

## THE STONES USED.

Knives and scrapers were made from hard fine-grained stones, such as chert, quartzite, chalcedony, and obsidian. Flint was occasionally used, but they are rare in New Zealand. Net-sinkers and pestles were made out of soft volcanic rocks, such as andesite and trachyte; while for adzes and *meres* any compact, hard, and tough rock was used. The commonest were igneous rocks, such as basalt, dolerite, and aphanite; but many of the rocks are metamorphic, such as hornstone and cherty-slate. Greenstone also comes under this head. Of it there are two varieties—(1) Nephrite, or pounamu, which is a silicate of magnesia and lime; and (2) bowenite, or tangiwai, which is a silicate of magnesia only, but contains a small quantity of water. Bowenite is softer than nephrite, and can be scratched with the point of a knife.

## HOW STONE IMPLEMENTS WERE MADE.

Our knowledge of how the Maoris made their stone implements rests partly on eye-witnesses—for up to quite a late date greenstone was worked by the natives—partly on information derived from old Maoris, who recognised the tools when shown them and described how they were used, and partly on inferences drawn from an examination of the implements themselves. It appears that four different processes—flaking, battering, grinding, and cutting—were employed, either singly or in combination, in making stone implements, all of which were also used in Europe during the Neolithic age.

*Flaking*, or chipping, means the knocking-off of thin flakes of considerable size. There were two objects in flaking—one when the flakes were intended for use, while the core or nucleus from which the flakes had been chipped was generally thrown away; and the other when the core itself had to be chipped into an axe or adze, and the flakes were not intended to be used. Flakes were knocked off with hammer-stones, which were not large, but of such a size as could be easily held in the hand. A tough stone was selected, the green gabbro, found near Nelson, being, as Mr. Lukins informs me, one that was much prized by the Maoris for this purpose. Cores also were often used for hammers. The large flakes often show the mark of the blow which separated them from the core, but the smaller ones rarely do so; indeed, it would be impossible with a stone-hammer to trim up the axes in the way that many of them have been done. This trimming process was accomplished by means of flaking-tools or fabricators, long, narrow, and blunt at each end, which were used as punches, probably being held in the hand and struck with a piece of wood.

*Battering*, or picking, is breaking down or pulverising the stone by means of numerous slight blows of a hammer. The hammers used seem to have been elongated rounded pebbles, with rather a pointed end. This process was chiefly used on the coarser-grained rocks, such as diorite and quartzite, which did not flake well; but we often see marks of both flaking and battering on the same implement. Sometimes large blocks of greenstone, after they had been split, were divided by battering, as in the exhibited specimen which was found on the beach at Wainui, in Golden Bay. It shows two adzes roughly marked out by a groove on each side of the slab, and these grooves have evidently been formed by battering with small hammers.

*Grinding*.—The implements, after having been flaked or bruised, were ground smooth on pieces of sandstone or quartzite called "ho-anga." These rubbing-stones were generally large, 12 in. or more across; but disc-shaped stones, hollowed in the centre, are commonly found in old encampments. They are about 4 in. in diameter, and have evidently been used as rubbers, probably for making net-sinkers. Sharpening-stones are long, narrow, and either rectangular or oval in section. They were no doubt used for sharpening axes and chisels.

*Cutting*, or sawing, was done by a blunt stone instrument called "mania," either fastened into a piece of stick or held in the hand, and used either with or without fine wet sand. The stone to be cut was first ground down to its proper thickness, a deep cut was made on each side, and the implement was then broken out along the thin place. This method was usually employed for nephrite implements only, but the Museum possesses two pieces of basalt in the process of being cut. There are in the collection cutting-implements made of obsidian, nephrite, and sandstone, all of which have been worn, as well as a chert-cutter, mounted in a wooden handle, which was made by a Maori for Sir Julius von Haast.

#### WHAT STONE IMPLEMENTS WERE USED FOR.

The principal use of stone implements was working wood. Flakes were used for making holes, for sharpening the points of fish-spears, and as saws in wood-carving. The perforators or drills were sometimes simple flakes that happened to have a sharp point, but most of them have been subsequently trimmed. These have been mistaken for spear-heads\*, or arrow-heads.† For sharpening spears a hollow was knocked out on one side, making what are called "notched" or "hol-

\* Trans. N.Z. Inst., vol. xii., p. 152.

† Trans. N.Z. Inst., vol. xiii., p. 436.

lowed" flakes. The saws are serrated by blows generally delivered on one side only, and the Maori never attained to such a high state of art as the neolithic European. These saws were probably used for cutting bone as well as wood; Rubbers of sandstone and pumice were used for smoothing down the marks of the adze. Polishers of fine-grained hard stone were used for burnishing spears and other wooden weapons. They are long in shape, and either circular or semi-circular in section. Wood-carvers are flakes ground to a sharp edge. Chisels were also used for carving; they are long in shape, and with a sharp-ground edge. The small nephrite chisels were mounted in a straight handle, and used with a wooden mallet.

The most important implements are those called axes or adzes, but all of them were hafted as adzes. Most of the so-called axes are elliptical, with flat sides, in section; but some are simply elliptical, and a good many are rectangular in transverse section; none are meniscoid or lens-shaped in cross-section, such as commonly occurs in Melanesian stone adzes. The smaller axes are called *panahe*, the moderate-sized ones *toki*, and the larger ones *kapu*. It is these that the Europeans generally call adzes. They are straight or curved longitudinally, and often have a kind of handle worked on them by battering, for the lashing. Three different kinds may be distinguished: (1) Broad adzes, which are rectangular in cross-section, broader than thick, and the cutting-edge long and straight; (2) narrow adzes, which are triangular in section, thicker than broad, and the cutting-edge less than the thickness; (3) curved adzes, which are generally round in cross-section, or round with flat sides, and the cutting-edge is curved like a gouge. The second kind of adze is an essentially Maori production, but the third somewhat resembles adzes from the Solomon Islands. Wedges were used for splitting wood. No doubt the *tokis* were often so used, but some of them, with flat butts and the edge equally ground on both sides, may be safely distinguished as wedges.

*Hammers*.—Probably pieces of wood were generally used, but there is in the Museum an implement on which a handle for lashing has been worked, but the opposite end has been ground flat. It was found with a Maori skeleton in the sand-hills on the Sumner Road.

The stone implements used in warfare were the *mere* and the *patu*, both of which are well known. They are distinguished by having a small hole through the handle end. This hole was formed by a drill armed with a quartz crystal, and the process has been described by Mr. F. Chapman.\* The

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\* Trans. N.Z. Inst., vol. xxiv., p. 497, &c.

flax which was intended to form the mats called *kotowai* was prepared by pounding with short thick stone pestles, while a long narrow stone pestle was used for pounding hinau-berries in a wooden mortar. Scrapers for cleaning kumaras and knives for cutting flax, large fish, &c., were simple flakes, not trimmed in any way. Obsidian flakes were used for cutting their own flesh when mourning, and also for cutting the hair. For the latter process another stone was necessary to cut against; these are either cylindrical or flat. Stone sinkers were used for nets, and occasionally pumice was employed for floats. Canoe-anchors were large stones, with a groove round them for the rope.

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#### EXPLANATION OF PLATE XIII.

1. Hammer-stone, from Nelson.
  2. Flaking-tool, from Purakanui, Otago.
  3. Hollow scraper for sharpening eel-spears, Nelson.
  4. Borer for wood, from the mouth of the Rakaia, Canterbury.
  5. Saw for cutting bone and wood, from the mouth of the Rakaia, Canterbury.
  6. Sharpening-stone for axes, from Nelson.
- All the figures are reduced about one-half.
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