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## MAORI NUMERATION.

### THE VIGESIMAL SYSTEM.

BY ELSDON BEST.

IN Volume X., Journal of the Polynesian Society, page 101, is a note by Professor Thomas on the traces of vigesimal methods of numeration noted in S. E. Asia, Polynesia, and Central America. In a later number of that Journal appeared some interesting notes by Mr. J. T. Large, on the mode of numeration formerly employed by the Maori people of Rarotonga. In a preliminary note to the former, the Editors remark that they believe that the term *tekau* was formerly used by the Maori people of New Zealand to express twenty, *ngahuru* standing for ten. Having of late gained some light on the subject of Maori numeration, I here give such items thereof as refer to the vigesimal system.

It is a fact that the Maori was in the habit of counting by twenties, but the method might not, possibly, be termed strictly vigesimal, inasmuch as forty was not 'two twenties' or 'twice twenty,' nor sixty 'three twenties,' and so on. Each twenty was formed in a singular manner, and to these twenties were added units, and one ten and units, until the next twenty was reached. Special terms were used for each twenty up to 180, but for 200 the expression 'one hundred twice told' was employed, and perhaps sometimes 'two hundred, once told.'

The whole matter of vigesimal numeration seems to hinge on the value assigned to the prefix *hoko*. Williams, in his Maori Dictionary, states that this prefix multiplies by ten the subjoined numeral, as *hokorua* = twenty, *hokotoru* = thirty, &c. Among the Tuhoe tribe, however, it seems to multiply the numeral by twenty, as—*hokorua* = forty, *hokotoru* = sixty, and so on. It is probable, however, that *hokorua* = forty should be rendered as 'ten twos doubled,' and *hokotoru* as 'ten threes doubled.' Because it seems to be a fact that these terms were used in both ways, and certain explanatory terms were necessarily used in order to denote which amount was meant, ten times the numeral, or ten times doubled. For *hokorua takitahi* meant 'ten twos singly,' or 'ten twos once told'; while *hokorua topu* was 'ten twos doubled,' or ten twos twice told.' Very often these explanatory terms *takitahi* and

*topu* were not used, they were understood, or supposed to be. Hence, when a person used a term such as *hokowha*—it would sometimes be asked—“*Hokowha aha?*” (*hokowha* what), and he would explain “*Hokowha takitahi*” (ten fours once told), or “*Hokowha topu*” (ten fours doubled), which latter would be eighty.

If the *hoko* system was used in the ‘once told’ manner, it was a decimal method; if used in the ‘twice told,’ then it was vigesimal. As observed, the Tuhoe people seem to have generally used it in the latter way. This would imply that the term *hokotahi* (ten ones doubled, or twice told), should have been used to denote twenty, but this does not appear to have been the case. In its place a specific term was employed for twenty, and for twenty only. It was not doubled to form forty, nor yet trebled to form sixty, and so on. That term was *tekau*. This word was used for twenty, as it was in the Paumotu Group, in Tahiti, Tonga, Marquesas, Mangaia, Mangareva, &c.

Turning to the table we note the names of the digits, which are given without the various prefixes to which they are entitled under different usages. *Ngahurn* was the ancient term for ten, although *tekau* has represented that number since the advent of Europeans, who established the decimal system of numeration in these isles. To ten are added units until nineteen is reached. *Tekau* is the old time term for twenty. The ancient meaning, and correct rendering of this term may have been ‘ten twice told,’ but rather does it seem to me that it was originally two words—*te kau* (the *kau*). *Kau* being an ancient Polynesian word meaning ‘collection, assemblage,’ the term being a relic of the use of the first abacus of primitive man, *i.e.*, a remembrance of the mode of counting by means of using the fingers and toes as counters.

To twenty were added units to twenty-nine, then twenty and ten, then twenty, ten and units up to thirty-nine. Then came *hokorua* for forty. From here a change is noted in the manner of expression. Some few authorities say that forty-one was expressed by *hokorua ma tahi*, forty-two by *hokorua ma rua*, and so on to forty-nine; and the same process carried out for sixty-one to sixty-nine, eighty-one to eighty-nine, and so on, fifty-one being *hokorua, ngahuru ma tahi*, &c.; seventy-one, *hokotoru, ngahuru ma tahi*, &c., and so on. But more native authorities support the system given in the table, *viz.*, the use of the term ‘excess,’ as for forty-one, *hokorua, ko-tahi te tuma* (forty, one the excess), and so on; for eighty-five, *hokowha, e rima te tuma*. I have not heard this term *tuma*, or its equivalents, used after *tekau*, *i.e.*, applied to the numbers twenty-one to thirty-nine, but very probably it was so used. Fifty was ‘forty, ten once told the excess,’ or simply forty, ten once told,’ for, as remarked, the words ‘the excess’ were not always employed.

One hundred was *hokorima* or *kotahi rau* (one *rau*). Strictly speaking

the term *takitahi* should be used after *ko-tahi rau* for one hundred, because it was so often used in its dual sense, *i.e.*, for two hundred. One hundred and one was *hokorima*, *kotahi te tuma* (perhaps also *hokorima ma tahi*—see *ante*), or *kotahi rau*, *kotahi* (one hundred, one). Here the term *te tuma* should be used to explain the excess. In the ancient method of Maori numeration, units were not added to the term ‘one hundred’ (*ko-tahi rau*) to express the numbers one hundred and one to one hundred and nine, by means of the conjunction ‘and,’ as obtains in the modern system. But *ko-tahi rau ma rua* (literally ‘one hundred and two’) was employed to express one hundred and twenty. Also ‘one hundred and three’ meant one hundred and thirty, and so on, as if the word ‘tens’ were understood. But one hundred and twenty could also be expressed as *kotahi rau hokorua takitahi*, and one hundred and thirty as *kotahi rau hokotoru takitahi*, and so on.

In counting persons the *rau* and *hoko* terms were taken as meaning ‘twice told,’ unless the term *takitahi* were added to denote that ‘once told’ was meant. Hence a *hokowhitu* was one hundred and forty persons, and a *rau hokowhitu* was three hundred and forty. In *kotahi rau*, *e rua* for one hundred and two, the term *takitahi* is understood, because that form of adding units to hundreds is not used in any other way, but one hundred and two might be given as *hokorima*, *e rua te tuma*, or perhaps as *hokorima ma rua*. In the binary method of numeration one hundred and two would be given as *hokorima pu*, *kotahi pu* (fifty pairs, one pair).

Each hundred might be expressed in two ways, as the table shows, *i.e.*, two hundred as ‘one hundred twice told,’ or as ‘two hundred once told’ (*takitahi* really means ‘by ones, one at a time,’ the prefix *taki* giving as Williams observes—‘a distributive force to numerals’). The term *mano* was used for ‘thousand,’ which was as far as exact numeration extended among the Tuhoe natives, although the use of the dual system meant that they counted precisely up to two thousand. Above that any number was ‘a multitude,’ &c.

I have given above, and in the accompanying table, some idea of the precise terms used in enumeration by the Maori of yore, but must now state that, perhaps in the majority of cases, precise terms were not used. The Maori loves round numbers, his remarks regarding numerical matters generally hinged on such bases, which were often of a noble magnitude. Observe: He has many terms which imply excess numbers, *i.e.*, excess over a round number. Such are the expressions—*tuma*, *paepae*, *hara*, *hemihemi*, *makere*, *ngahoro*, etc. Numerous are they as the sands of Whakatane. A common expression for any number from eleven to nineteen, inclusive, was *ngahuru makere* (ten onwards), while *hokorua makere* was used for any number from forty-one to fifty-nine, inclusive, the excess not being stated. In like manner *kotahi rau tuma* (one hundred (and an) excess) was often employed, though

the excess might be one or any number up to ninety-nine. In mentioning food supplies odd numbers were not given. If a person had ninety birds preserved in his calabash, he would term it a *hokowha* (eighty). Four hundred, or three hundred, fighting men on the war trail would be spoken of as a *rau hokowhitu* (340).

I send this note forward simply to give some idea of the manipulation of the vigesimal scheme of numeration by the Maori in former days, hence I have not included any description of the binary system, the most complete and straightforward method employed by the neolithic Maori.

For the balance of my notes on Maori numeration, the days that lie before shall answer.

MAORI NUMERATION.

- 1—tahi
- 2—rua
- 3—toru
- 4—wha
- 5—rima
- 6—ono
- 7—whitu
- 8—waru
- 9—iwa
- 10—ngahuru
- 11—ngahuru ma tahi (ten and one)
- 12— " " rua ( " " two)
- 13— " " toru ( " " three)
- 14— " " wha ( " " four)
- 15— " " rima ( " " five)
- 16— " " ono ( " " six)
- 17— " " whitu ( " " seven)
- 18— " " waru ( " " eight)
- 19— " " iwa ( " " nine)
- 20—tekau
- 21—tekau ma tahi (twenty and one)
- 22— " " rua ( " " two)
- 23— " " toru ( " " three)
- 24— " " wha ( " " four)
- 25— " " rima ( " " five)
- 26— " " ono ( " " six)
- 27— " " whitu ( " " seven)
- 28— " " waru ( " " eight)
- 29— " " iwa ( " " nine)
- 30—tekau maha ngahuru (twenty and ten)

- 31—tekau ngahuru ma tahi (twenty, ten, and one)  
 32— „ „ „ rua ( „ „ „ two)  
 33— „ „ „ toru ( „ „ „ three)  
 34— „ „ „ wha ( „ „ „ four)  
 35— „ „ „ rima ( „ „ „ five)  
 36— „ „ „ ono ( „ „ „ six)  
 37— „ „ „ whitu ( „ „ „ seven)  
 38— „ „ „ waru ( „ „ „ eight)  
 39— „ „ „ iwa ( „ „ „ nine)  
 40—hokorua (*topu* understood)  
 41—hokorua, kotahi te tuma (forty, one the excess)  
 42— „ e rua „ „ ( „ two „ „ )  
 43— „ e toru „ „ ( „ three „ „ )  
 44— „ e wha „ „ ( „ four „ „ )  
 45— „ e rima „ „ ( „ five „ „ )  
 50—hokorua, ngahuru takitahi (forty, ten once told)  
 or,  
 50—hokorua, ngahuru takitahi te tuma  
 51—hokorua, ngahuru ma tahi; or, hokorua, ngahuru ma tahi te  
 tuma (forty, ten and one the excess)  
 60—hokotoru (*topu* understood)  
 61—hokotoru, kotahi te tuma (sixty, one the excess)  
 70—hokotoru, ngahuru takitahi te tuma  
 75—hokotoru, ngahuru ma rima te tuma  
 80—hokowha (*topu* understood)  
 90— „ ngahuru takitahi te tuma  
 100—hokorima; or, kotahi rau (takitahi)  
 101—hokorima, kotahi te tuma; or, kotahi rau, kotahi (*te tuma*  
 apparently understood)  
 102—hokorima, e rua te tuma; or, kotahi rau, e rua  
 120—hokoono (*topu* understood); or, kotahi rau ma rua  
 140—hokowhitu  
 160—hokowaru  
 180—hokoiwa  
 200—kotahi rau topu; or, e rua rau takitahi  
 220—e rua rau, ma rua (takitahi)  
 250—e rua rau ma rima (takitahi)  
 300—e toru rau takitahi; or, kotahi rau ma rima topu  
 400—e wha rau takitahi; or, e rua rau topu  
 500—e rima rau takitahi; or, e rua rau ma rima topu  
 1000—kotahi mano takitahi; or, e rima rau topu.