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A COMPARATIVE INQUIRY INTO THE MANUAL CONCEPT IN CARDINAL NUMERALS

Yoshio Nagano

I

Needless to say, the develpoment of highly logical thinking is attained in close connection with that of numerical concept. Here it is the formation of numeral as a linguistic symbol that makes itself an indispensable prerequisite to the purely mathematical number. Our present task is to give a brief sketch of this rudimental process in terms of linguistic materialization.

Comparative inquiry into the basic numerals shows beyond doubt that the concept of number, as well as of time and space, will seek for its embodiment in the intuitive, concrete and sensuous world --- the surest and safest recourse that man is obliged to have in his first grasp of abstract ideas. Accordingly what must be of extraordinary interest to us is the gradual step toward numerical abstraction, and that the more awkward it is, the more worth while to observe. Abstraction is by no means anything like a thunderbolt from the blue: it is "a process of stripping an idea of its concrete accompaniments"(COD). Etymology clearly reveals that man was not able to calculate without the help of calculus 'a pebble, small stone'(diminutive of calx 'stone'); this Latin word was applied to a counter used in playing draughts, further, to a stone used in reckoning, and hence to a reckoning, calculation in general. Also note that Eng. tally is in use with its original (<Lat. talea

'a slip of wood') and derived ('score or number kept on a piece of wood by notches') senses. "It must be borne in mind," says Boas concerning the numeral systems of primitive languages, "that counting does not become necessary until objects are considered in such generalized form that their individualities are entirely lost sight of"[The Mind of Primitive Man⁸(New York, 1948)pp.218-9. For further interpretation of this process in embryo, see Lucien Lévy-Bruhl, Les Fonctions Mentales dans les Sociétés Inférieures⁹(Paris, 1951)p.204 ff., a celebrated work on the primitive mode of thinking in which many apt illustrations are given from investigation reports on this subject].

Nevertheless pebbles and pieces of wood cannot have an exclusive claim to the counting medium ready to be found at hand by man: at the very outset in the act of counting no greater convenience could have been provided than by fingers, and if necessary by toes. Thus it is not without reason that in the Chukchee language, spoken in the extreme north-east part of Asia, the verbal form ri'lhĭrkĭn 'to count' is obviously a mere variant of rilh- 'finger', and that even in the Indo-European sphere, German rechnen (<OHG rehhanon) and Eng. reckon (<OE (ge-) recenian) should be reducible to the cognate series reichen/recken/rechen and reach/reck/rake, all of which ultimately relate themselves to what is done by means of hand.

The use of fingers (or toes), however, must not be only ascribed to their accessibility as inseparable part of the human body; in reality it involves much more significance: that is, to make part of the body responsive to and so conscious of the act of reckoning. In Andamanese (of the Bay of Bengal) where the numeral proper is

missing, according to Gray, "separate numerals exist only for 'one' and 'two', the digits up to nine being indicated by raising the requisite number of fingers with the word an ka 'and this', and ten being expressed by showing both hands with the exclamation ārdūra 'all'..." [Foundations of Language²(1950)p.389. Also cf. Meillet et Cohen(éds), Les Langues du Monde (nouv. éd., Paris, 1952), Tome I, p.519]. It is understood that such a bodily perception forms the most fundamental starting-point for the ascent toward abstract ideas. Hence no wonder that the concept of hand is of predominant occurrence in the cardinal numerals (from one to ten in particular) of the world's various languages and that it furthermore lays the foundation of numeral systems commonly known as quinary (based on one hand), decimal (on two hands) and even vigesimal (on two hands plus two feet). Evidences of this phenomenon, as it should be noticed, generally turn out manifest in the languages of the so-called inferior or primitive community: simply because they bear witness to the fact that little or no differentiation has been made yet between terms for hand (or foot) and those for number.

II

Here we have arrived at the working stage of our theory that the concept of hand as a counter universally forms part and parcel of the elementary numeral. The illustrations to be given below may be roughly brought under two categories according to the way in which they are formed: (A) the application of the term for the enumerative act by a specified physical part to the numeral, and (B) the application of the term for a specified physical part itself to the same. It should be remarked that

this division is rather for convenience' sake, seeing that in actuality hardly any clear line of demarcation could be drawn between the two. In addition, we cannot afford to be concerned with the possible question which of the two could claim precedence in the psycho-genetic order: we make it the present aim to take a descriptive survey of the available material in justification of what has been stated above.

〔A〕

a) Chinese '5' : *ŋaŋ(Chou)〔>ŋo(Liu-chao)>wu(Pekinese)〕 Etymologically this numeral is derived from the cognate or the word-family, so called by certain Sinologists, that denotes the generic idea 'to cross, to intersect, to clutch' as explicit in *ŋăg(Chou)〔>ŋă(L-C)>ya (Pek)〕'tusk, fang', *ŋïag(Chou)〔>ŋïo(L-C)>yü(Pek)〕'talk, conversation, speech'(its original sense being 'to exchange words') etc. On analysis, it will be seen that the application of the notion 'to cross' to the numeral '5' is in all probability due to the fact that '5' stands for the intersecting point where the act of counting in a given direction(⟶) is turned back in the contrary (⟵) when done by one hand〔cf. A. Tōdō, Kanji-no Gogen Kenkyu(Etymological Studies of Archaic Chinese) (Tokyo, 1963) p.426〕.

b) The Chinese word chiu for '9'〔<kĭəu(L-C)<kĭog (Chou) may be likewise traced back to the general notion of 'bending or yielding before the utmost limit'(cf. chiu 'to go to the end, to run to an extreme' and chüng 'to come to an end, to be driven to extremity'). The employment of this concept for the number '9' will stand to reason if we see that in the act of counting from one up to ten by bending fingers the 9th finger is the last

to be bent before 10, the countable limit set by two hands.

c) Korean '5' : The original sense of dasas〔tasat'〕would have been '(the manual act with which) to close up or complete bending all the fingers of one hand', the only clue to which being possibly evidenced by its cognate Japanese verb tozasu 'to shut, close'.

d) Korean '10' : Since '5' has to do with the closing or bending act of fingers, the term for '10', yər 〔jəl〕, as will be naturally expected, finds ample justification in signifying the reverse act of opening or unbending fingers by which the total (number) is to be brought up.

e) Japanese '10' : To such a Korean way of making up '10' may be opposed the Japanese formation of the same numeral. Old Japanese〔töwŏ〉towo>tō〕, if its connection with the verb tawa-mu 'to bend' is verifiable, would have probably indicated the act of bending the five fingers again after counting five with each one spread.

f) Ainu '5' : The similar motive is to be revealed in the manner that the Ainu language assigns for the numeral '5'. The original sense of ašiknep, with the numeral suffix -nep, can be reduced to the notion of repletion or fullness as clear from šik 'full, round; something round, hence eye', whence šik-ari 'full or round shape, circle' etc.; which undoubtedly, in reference to numeral, points to the notion of 'completing one hand' or 'fulfilling the act of five-finger counting'.

g) So far as the numeral indication by the manual gesticulation is concerned, few languages would be a match for the dialect of Kwamera, one of the Melanesian

linguistic group in the New Hebrides, which employs an elaborate system of pictorial, if so called, periphrasis in the numerals from 6 up to 9: for '6' they have to say ma ke ya nekare ragak eti, literally 'and-move on-to-another-hand mine-one'; for 7 karu '2', for 8 kahar '3' and for 9 kefa '4' each instead of eti at the end of this numeral sentence.

It is reported, what is more remarkable, that this Melanesian dialect makes use of one and the same term kariram for '10' as well as for '5' and '15'. This apparently curious fact will be made clear in terms of the peculiar quinary system in which a special stress is laid not so much on the number itself as on the junction or end where one hand unit (i.e. five fingers) is brought to a close. The distinction between the three different numbers, therefore, is made possible by no other way than either situation or manual indication (see H. Izui, Etudes Comparatives des Langues du Sud (Tokyo-Osaka, 1949) p. 89. Also cf. the similar phenomena in the Eskimo dialect of West Greenland in which an identical form holds good respectively for '2'/'7', '3'/'8' and '4'/'9').

h) No less peculiar would be the case to be found in Sundanese, a member of the Malayo-Polynesian linguistic family in Sunda Islands, where the very concept of completion or termination in five-finger counting is, as it were, set in the farther direction, thus, beyond our expectation, resulting in the formation of not '5' but '6' ganap which is an unmistakable derivative from the verb (měn)gěnap 'to terminate, come to a close'. It is not to be denied that the native psychology here concerns itself with something dynamic or continuous rather than

static or perfective[cf H. Izui, op. cit.,p.83].

i) As already stated, illustrations of our first category may be multiplied with concomitant clearness if a special view is taken of any linguistic system that is more or less symptomatic of the primitive state of mentality. Accordingly, in order to lend final confirmation to what has been hitherto observed, suffice it to quote a passage dealing with some interesting numeral formations as might be duly expected of the American Indian languages: "Im Chipewayan gebraucht man ... 9='ein Finger herabgebeugt'[i.e.ɔĩLágäyagaút'ã 'un doigt courbé' (Meillet et Cohen, op. cit., Tome II, p. 1183)] ... Im Tlingit heisst 5 ke-djín, das zu ke 'auf' und djín 'Hand' gehört, also etwa 'eine Hand hoch' bedeutet. 10 heisst djin-kát, d.h. wohl 'die Hände gekreuzt' oder ähnlich ..."[Heinz-Jürgen Pinnow, Die Nordamerikanischen Indianersprachen (Wiesbaden, 1964) s.86].

[B]

a) Indo-European '5' : It would be best to begin with Indo-European so that we may be given to understand that even this linguistic family with the superior civilization behind it is, in the ultimate analysis, no exception to our rule. It is thanks largely to a conspicuous advancement in the comparative linguistics of this field that historical evidences in favour of our theory can be brought to light.

It is theoretically established that Proto-Germanic *fëmf(e) (>Eng. five, G. fünf, Dan. & Swed. fem etc.), Lat. quinque(> Fr. cinq, Span. cinco, It. cinque etc.), Gk. pénte(Aeol. pémpe), Old Irish coic, Old Slav. pętĭ (>Russ. pjat', Czech pět etc.), Lithuanian penkì, Tokharian (A) pän and Skrt. páñca might be all traced

back to the primitive root form *PENK^{W}E. That this form must have originally signified otherwise, namely not a specified number itself but what has conceptually more or less to do with one, will not cease to be a mere hypothesis until it is carefully weighed against another base form *PəNK^{W}STI- in which Eng. fist, G. faust, Russ. pjast' 'palm'(<OSlav. pęsti) and moreover Eng. & G. finger, Goth. figgrs etc. are acknowledged to have their origin[cf. F. Kluge & W. Mitzka, Etymologisches Wörterbuch der Deutschen Sprache[18] (Berlin, 1960) s.v. finger: "... Am ehesten dürfte fünf verwandt sein. A. Meillet ... verficht Zus.-Hang mit armen. hinger-ord 'der fünfte' und verweist zur Stütze auf den möglichen Zus. -Hang von Hand mit gr. -konta". Also cf. A. Meillet, Introduction à l'Etude Comparative des Langues Indo-Européennes (Paris, 1953) p. 412].

b) Indo-European '10' : Another evidence in support of our view will be afforded by the Indo-European protoplast for the number '10'. As indisputably demonstrated by phonological correspondence between them, such variants as Goth. taíhun(= in later forms Eng. ten, G. zehn etc.), Lat. decem(>Fr. dix. Span. diez, It. dieci etc.), OSlav. desetĭ(>Russ. desjat', Czech deset etc.), Gk. déka, OIr. deichn-, Armen. tasn, Tokhar. (A) śĕk^{ə}, (B) sak^{ə}["mit Fernassimilation von k an d, dann k palatalisiert(in A)" (Etym. Wb. d. Spr.,s.v. zehn)], Skrt. dáša etc. are equally rooted in the form *DEK^{ə}M-(T), which can be further decomposed into two semantic units, *DÉ- = *DWOU '2' + K^{ə}M(T) 'hand'. Thus its ultimate sense proves to have been none other than 'two hands'; and it is worth noticing that the second element is still best preserved in those Greek numerals from 30

up to 90 in the suffix form like triákonta '30', tettrákonta '40' and so forth (cf. id., s.v. hand and zehn), and that it later provided morphological basis for the Indo-European term for '100', *KṂTÓ- with its applied sense '10 multiplied by 10', which came to be differentiated as Skrt. satám, Avestan satəm, OSlav. sŭto, Lith. šimtas, Lat. centum, Gk. he-katón, Goth. hund, Tokh. (A) kant, (B) kante etc. (cf. A. Miellet, op. cit., p. 414).

c) Japanese and Gilyak '5' : It is especially according to a certain version of the Ural-Altaic theory which makes an attempt to assume an affinity between Japanese and Gilyak, one of the Hyperborean languages, that the formative element of the numeral in question might less negatively disclose its identity. The supposition that Japanese i-tu '5' would be a mere variant by mutation of te(older ta) 'hand'(corresponding to Korean son 'hand') is strengthened by the knowledge of a close parallel in which Gilyak to- --- a stem denoting '5' in different forms when referred to various objects as in tooryn '5 men', toor '5 beasts, birds, fishes', toX '5 eyeballs, stones; hairs, pins etc.', tobor '5 nets', toom '5 ships, dishes' and so on --- is a form clearly differentiated from the common element in whatever terms related to hand and its belongings such as tamak 'hand', tukin 'nail', tot 'arm', tun 'finger' etc.

d) Malayo-Polynesian '5' : The term for '5' in this linguistic group extending over a wide area took its origin from the prototype *lima denoting 'hand', which has since been taken over intact in some members or else subjected to characteristic phonological changes in others, thus resulting in Malay, Samoan and Hawaiian lima, Ponapé límau, Marshall la-lim, Tahitian rima, Truk

nim and the like.

e) Chukchee and Koryak '5' : The same turns out also true of the term for '5' in the languages of Chukchee and Koryak, both belonging to the Hyperborean group, in which mítlinen(Ch.) and míllinen(K.) are respectively nothing but slight modifications of the form for 'hand' (cf. Miellet & Cohen, op. cit., Tome I, p.423).

f) The dialect of Lifu, a Malayo-Polynesian branch spoken in Loyalty Island, is reported to have a peculiar quinary system of its own from 6 up to 9 consisting of 5 and surplus numbers: ča-ŋemen '6'(=1 + 5), lue-ŋemen '7'(=2 + 5), koni-ŋemen '8'(=3 + 5) and eke-ŋemen '9' (=4 + 5). Here the suffix -ŋemen, which seems to have lost the final chance of independence, may be etymologically considered to stand for ŋe 'and' + -imen 'hand', a measure for 5(see H. Izui, op. cit., p. 88).

g) Ainu '10' : The Ainu numeral wan for '10' , often in use with the suffix -pe denoting things, may be analyzed into u-an, literally 'both(hands) -to be', obviously pointing to the existence of two hands. On this score, it would be possible to say that Ainu and Indo-European, as seen above, stand on the same footing.

h) Finally under this head, mention must be made of those cases in which two feet, i.e. ten toes are to be included in the count when required. Since hardly any evidence is known to show that in the act of counting preference is given to feet over hands, the use of the former ought to be supplementary at all events. Where the abstract concept of number has scarcely been attained, it is usual for us to meet with not a few makeshift appellations for the numbers over 11 up to 20 that are based on this line. Hence little wonder that such

a long-winded expression of 20 as, for example, 'two hands and two feet' should be most frequently substituted by the simple term for 'a man' as representing the total of all such.

Curious illustrations of this may be found in:

(1) the above-mentioned tongue of Kwamera in the South Seas that apparently contents itself with such roundabout expressions as ma ke ya nekare nesuk eti for '11', literally 'and-move on-to another-foot mine-one' and em iwan ya nari eti, 'one-end-to-man-one' for '20', that is, the count by two hands and two feet is at an end in one man(cf. H. Izui, op. cit.,p. 89). (2) a certain dialect of the Papuan languages which rests satisfied with saying mete etke so kieo ditne veku 'deux mains et, au pied, un doigt' for '11' or nei mane korop 'un homme entier' for '20' (cf. Meillet & Cohen, op. cit., Tome I, p. 728). (3) one of the North Australian aboriginal dialects dependent on the primitive expression mad'an yenak 'hand-two-foot-one' for '15' or nanyilk veren mad'an veren 'hand-two-foot-two' for '20' (cf. L. Gray, op. cit., p. 389 f.). (4) the dialect of Iai, of the Malayo-Polynesian group, well managing with Xača at 'one man' or at ae beXŏt 'man one complete' for '20'(cf. H.Izui, op. cit., p. 88). (5) an Eskimo dialect in South Greenland in which "pour les autres(numéraux), jusqu'a 20, on utilise des formes diverses indiquant qu'on prend l'autre main, le premier pied, le second pied" and "le nombre 20 se dit inuk naablugu 'en finissant une personne' ou agbagsaniq tatlimat 'sur l'autre pied, cinq' (Meillet & Cohen, op. cit., Tome II, pp. 1175-6). (6) Tlingit, one of the North American Indian languages, with its own passable substitute

tłe-qa(< tłeX' 'one' + qá 'man') for '20'(H-J. Pinnow, op. cit., s. 86) etc. We have no lack of evidences, above all, in the languages of those aboriginal races in Africa, the Americas, Australia, the South Seas and geographically isolated regions of Asia.

It would be virtually not only impossible but of little use to exhaust the list of illustrations. In a word, we may conclude by repeating that phenomena of this kind will force themselves into our attention with the more explicitness the farther we recede from the full light of civilization.

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