The Evolution of the Nisgha Counting System:
A Window on Cultural Change*

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1.0 INTRODUCTION

The Tsimshianic languages all have a complex system of numeration, with different sets of numerals depending on what is being counted. In most cases the forms clearly derive from a basic set used for abstract counting, but the forms of the latter are not immediately analyzable. They do, however, show evidence of being themselves complex forms, especially in Nisgha (N), and Gitksan (G). Many words which are opaque in Coast Tsimshian (CT) have more readily analyzable Nisgha and Gitksan cognates; the numerals are no exception.

The similarities that exist between some of the Nisgha numerals, and between the numerals and other forms in the language, make it possible to reconstruct probable derivations for most of them, especially the set used for abstract counting. The literal meaning of the reconstructed forms throws light on the manner in which the number system must have developed, and on the diverse influences that helped shape it.

2.0 NISGHA NUMERALS AND THEIR MEANINGS

There are four sets of Nisgha numerals; the categories are: objects or abstract counting, animals and fish, people, and canoes, as given in Table I. Boas (1911) gives more categories of numerals, but some of these are actually measures, which are nouns, while numerals have their own syntactic properties, most of which are shared with adjectives and intransitive verbs. Nisgha measures are given in Table II, which is probably not complete.

The four sets of numbers in Table I agree with those in Boas' (1911:396-7), with one major exception: he gives the numerals in column I under the headings 'round objects' and 'long objects',
and the ones in column II under the heading 'flat objects, abstract counting'. No mention is made of animals and fish, even though column II numerals appear in Boas (1902) in connection with words designating animals and fish as well as flat objects such as mats.

It is likely that the numerals in column I were used not so much for living animals as for their skins, an item of trade long before European contact, and by extension objects with similar uses and characteristics, such as mats, blankets, and clothing. The original Nisga distinction was probably between 'animals, skins and equivalents' and 'objects in general', rather than between flat and non-flat objects. Since skins must have been at one time the most frequently counted items, there may have been confusion in some speakers' minds as to whether abstract counting or counting of skins was taking place. 7

One case where the confusion has not been resolved concerns the proper classification of the forms yuxwált and qantó:lt, both meaning 'eight'. In placing yuxwált in column I and qantó:lt in column II, in agreement with Boas and with the CT cognates (Dunn p. 38), I have been guided mostly by my own interpretation of the original meanings of these words. Many Nisga speakers would agree with this placement, while others would place qantó:lt in column I and yuxwált in column II, the order given in the Gitksan Primer.

There are obviously some common elements within the numerals:

- except for 'two', all the 'human' numerals have some similarity to the column I forms; most of them end in -li;
- all forms for 'one' begin with kW-, and so does one of the 'ten' forms;
- all forms for 'three' begin with kWst-;
- the forms for 'five' and 'nine' all begin with kWst-;
- the forms for 'seven' start like one of the 'two' forms and end like those for 'six'.

The following sections examine the numerals in more detail, though not necessarily in order.
<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract counting, Objects</td>
<td>Animals</td>
<td>People</td>
<td>Canoes</td>
</tr>
<tr>
<td>1</td>
<td>kyří</td>
<td>kyé:kw</td>
<td>kyó:l</td>
</tr>
<tr>
<td>2</td>
<td>kyřípil</td>
<td>tipšá:t</td>
<td>paqatříl</td>
</tr>
<tr>
<td>3</td>
<td>kwiláí</td>
<td>kwilán</td>
<td>kwiló:n</td>
</tr>
<tr>
<td>4</td>
<td>tšálpšx</td>
<td>tšalpštó:l</td>
<td>tšálpštkwšs</td>
</tr>
<tr>
<td>5</td>
<td>kwstíns</td>
<td>kwstínsó:l</td>
<td>kwstínskwšs</td>
</tr>
<tr>
<td>6</td>
<td>qó:it</td>
<td>qó:ltó:l</td>
<td>qó:ltkwšs</td>
</tr>
<tr>
<td>7</td>
<td>tipšó:lt</td>
<td>tipšó:ltó:l</td>
<td>tipšó:ltkwšs</td>
</tr>
<tr>
<td>8</td>
<td>yušwáltlt</td>
<td>qantó:lt</td>
<td>yušwáltó:l</td>
</tr>
<tr>
<td>9</td>
<td>kwstimó:s</td>
<td>kwstimo:só:l</td>
<td>kwstimó:skwšs</td>
</tr>
<tr>
<td>10</td>
<td>xpíl</td>
<td>kyá:p</td>
<td>xpó:l</td>
</tr>
</tbody>
</table>

Table 1: Nisgha numerals
<table>
<thead>
<tr>
<th>Fathoms</th>
<th>Spans</th>
<th>Fingerwidths</th>
<th>Periods of Days</th>
<th>Bundles of ten skins (Boas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boas</td>
<td>Aiyansh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>kvilsaqåx</td>
<td>kvilsaqans</td>
<td>kvilisti:</td>
<td>kwis:kyiwa</td>
</tr>
<tr>
<td>2</td>
<td>kvilqlaqåx</td>
<td>kvilpsaqans</td>
<td>kvilpilisti:</td>
<td>kvilpwá</td>
</tr>
<tr>
<td>3</td>
<td>kwilalqún</td>
<td>kwilalqåx</td>
<td>kwilalqis:</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>txalpșalún</td>
<td>txalpșqåx</td>
<td>wașqunkwś</td>
<td>txalpșsá:ta</td>
</tr>
<tr>
<td>5</td>
<td>kwstinsilún</td>
<td>kwstinsqa:x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>qo:itilún</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>tipxő:itilún</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>yuxwta:itilún</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>kwstimo:silún</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>xpaqúnti:</td>
<td>xpaqún</td>
<td></td>
<td>xpisá:ta</td>
</tr>
</tbody>
</table>

*Table II: Nisgha measures (partial list)*
2.1. One

In columns I, II and III all forms begin with kY-:

I  kYf (object)
II  kYe:kW (animal)
III  kYo: (person)

So do a number of other words all having to do with singularity, for instance

kYf: 'to be one-eyed'
kYe:xkW 'to flee (sg)' (the plural is suppletive, hút)
kYe:qan 'to put one animal to flight'
kYo: 'backbone of a fish'
kVo:c 'yesterday (one day before today)'

and the modifiers

kYa: 'most, the most (unique among others)'
kYa?an or kYo?on 'by oneself, separately'
kYaX 'just this once, just for a minute'

It seems clear that the concept of singularity or oneness is expressed by the initial consonant kY, or more probably, by a CV sequence kYa-, since CV is a common prefix shape.

The sequences after kY occur elsewhere. The column I form kYf ends in the suffix -f which generally has the completive meaning of 'bringing something to its natural limit'. The column III form kYo: ends in -0: like most of the other numerals in that column. The sequence -0: does not seem to occur apart from the numerals, where it is restricted to the 'persons' category.

The column II form kYe:kW ends in the derivative suffix -kW which is by far the most common in Nisgha and has a great variety of meanings. Abstracting the suffix leaves kYe: a sequence that is always historically traceable to kYa: 'most, the most', since there is a historical rule *: > 0: after palatals which applies only to stressed vowels, and modifiers are unstressed.
In column IV, ḍámēqet 'one (canoe)' probably has as its initial element the modifier ḍam 'simply, just', which is often used before kyŷ or kyōː (e.g. ḍam kyŷ 'just one'), and the final -t may be the suffix for 'passive of state', but the medial sequence -eʔe is at present unidentifiable.

2.2. Ten

The words are:

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
<th>Column III</th>
<th>Column IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>xpI</td>
<td>kyāp</td>
<td>xpōːl</td>
<td>kyāpκwś</td>
</tr>
</tbody>
</table>

(objects) (animals) (persons) (canoes)

The forms in columns I and III start with the sequence xp- before -I and -ōː respectively. Exchanging xp- for ky-, these formations are exactly the same as those for 'one' (2.1.).

The sequence xp- or xpa- (with vowel quality adjustment depending on the following consonant) also occurs in the measures

xpāʔūn 'ten fathoms' (ūn 'hand, arm, outstretched arms')

and

xpisāːta 'period of ten days' (sāː, alternate form of sā 'day'; -ta collective suffix).

It does not seem to occur in any forms not meaning 'ten'.

It is interesting that the column II form kyāp begins with ky- like most of the 'one' forms. There is no reason to think that ky- has a meaning other than 'one' here: the column II forms are used for animals and fish, which were trade items as well as sources of food and clothing; ten skins or ten fish must have constituted a unit of trade well before the European fur trade, hence the use of a base meaning 'one' is not surprising. The rest of the word is not identifiable at present.
The form $k\nu p$, not $x\mu t$, is the one used for multiples of ten:

\[
\begin{align*}
\text{k\nu\mbox{-}pil} & \quad \text{wil} \quad \text{k\nu p} \quad \text{\textquote{\texttt{\textquote{twenty}}}} \\
\text{\texttt{two}} & \quad \text{CONJ} \quad \text{\texttt{ten}} \\
\text{kwil\acute{\texttt{a}}} & \quad \text{wil} \quad \text{k\nu p} \quad \text{\textquote{\texttt{\textquote{thirty}}}} \\
\text{\texttt{three}}
\end{align*}
\]

These phrases are probably of recent origin. Boas recorded a form for 'twenty', $k\nu i\acute{\texttt{t}}k\nu$, also starting with $k\nu$, and probably meaning 'one man' (that is, all the fingers and toes, as in many languages):

\[
\begin{align*}
\text{k\nu} & \quad \text{-} \quad (k)\nu i\acute{\texttt{t}} \quad \text{-} \quad k\nu w \\
\text{\texttt{one}} & \quad \text{\texttt{man}} \quad \text{\textquote{?}}
\end{align*}
\]

($-i\acute{\texttt{t}}- < k\nu i\acute{\texttt{t}}$, alternate form of $k\nu\acute{\texttt{at}}$ 'man, person').

2.3. Two

The numerals for 'two' are all different:

\[
\begin{align*}
\text{I} & \quad k\nu i\mbox{-}pil \quad \text{(objects)} \\
\text{II} & \quad t\nu p\acute{\texttt{h}}a\acute{\texttt{t}} \quad \text{(animals)} \\
\text{III} & \quad p\nu q\acute{\texttt{at}}\acute{\texttt{f}} \quad \text{(persons)} \\
\text{IV} & \quad q\nu a\mbox{-}l\nu p\acute{\texttt{f}}t\nu k\nu w \quad \text{(canoes)}
\end{align*}
\]

This probably reflects both their extreme importance and the very diverse circumstances under which one might need to refer to two objects, animals or their skins or fish, persons, or canoes.

Only one of these forms can be fully analyzed. In column I, $k\nu i\mbox{-}pil$ ends in the completive suffix $-_19$ like $k\nu i\acute{\texttt{t}}$, which can be abstracted, leaving the stem $k\nu i\mbox{-}p$ also found in $k\nu i\mbox{-}p\nu w$ 'two bundles of ten skins' (Table II). Like a number of Nisg\texttt{a} stems which show a lexical $\acute{1}/\acute{\texttt{a}}$ alternation (cf. analysis of $k\nu i\mbox{-}t\nu k\nu$ above 2.2.), traceable to earlier $*\acute{\texttt{a}}$, $k\nu i\mbox{-}p$ has an alternate form in $\acute{\texttt{a}}$, namely $k\nu a\mbox{-}l\nu p$ 'testicles'; the common meaning must be 'pair'. Both $k\nu i\mbox{-}p$ and $k\nu a\mbox{-}l\nu p$ derive from earlier $*k\nu a\mbox{-}l\nu p$, which is in turn analyzable into a prefix $k\nu e$- and a root $l\nu p$, probably $*l\nu p$; stress usually falls on the
root in present-day Nisg̱a’a, but there is evidence that stress often fell on prefixes at an earlier stage of the language. There are two kYa- prefixes in Nisg̱a’a, one with locative meaning, the other with undetermined meaning, which could be involved here. There is also a root lip, evidenced in lipkʷ 'to sew something', lipis 'to sew': that is, to assemble or join skins or pieces of cloth, two at a time. The form kY[pil then can be reconstructed as

\[
kY \quad lep \quad -I
\]

? assembled COMPL

The meaning 'two' then probably derives from the meaning 'assembled together, paired'.

The other words for 'two', unfortunately, are not so tractable, and only tentative observations can be made. In column II, lipx̱a:t 'two (animals)' starts with the proclitic lip '(motion) straight down'; the final -t may be the 'passive of state' suffix. The remaining sequence -x̱a:- may be derived historically from q̱aq 'open' (with q > x after p; q̱ regularly derives historically from a sequence q + velar or uvular), thus

\[
lip \quad q̱aq \quad -t
\]

straight down open PASS. STATE

and the whole word may mean 'opened straight down', probably referring to a way of handling two skins (or possibly two fish or even birds) together.

In the derivation of the column III word paqatfíl 'two (persons)', the root fíl may be identified with that in qalaxfíl '(position) across from, facing', fílimxkw 'to answer', and fíltkw 'to revenge oneself', all referring to situations involving two participants; there is also an alternate root in ṯ, tál, found in ṯal 'to have a fight', ṯalq 'to talk to someone', and lu:ṯltkw 'to meet someone', which also describe situations with two participants. It seems likely then that paqatfíl originally had to do with a situation where two persons face each other, whether as partners or as adversaries. The initial sequence paq- may be related to the proclitic paqayt 'in the middle'. A reconstruction *paqayt-tíl 'facing each other in the middle' (of a circle of onlookers perhaps) would seem to make sense as the origin of the word for 'two (persons)'.
As for the column IV word, \textit{galpétkws} 'two (canoes)', it has some recognizable parts, but the root is unidentified at present. The initial sequence \textit{gal-} is a prefix meaning either 'too (much)' or 'empty', or rather, 'capable of being filled'; at the end, -\textit{kws} (preceded by epenthetic -\textit{t-} caused by the preceding resonant), which may be decomposable into -\textit{kw} and -\textit{s}, is a common suffix with various meanings; the preceding -\textit{t} is the same completive suffix also found in \textit{kvl} and \textit{kvlpl}; but the root, \textit{pé-}, probably originally followed by a velar, is unidentified, so that the total meaning cannot be guessed at, any more than for \textit{qame?et} 'one (canoe)'\textsuperscript{20} But judging from the derivation of \textit{kvlpl} 'fully assembled', and the tentative meanings of \textit{tpxá:t} 'opened straight down' and \textit{páat} 'facing each other in the middle', it seems safe to assume that the original meaning of \textit{galpétkws} must also have originally been descriptive.

2.4. Four

All words for 'four' contain the sequence \textit{txálpś}:

- Column I, II: \textit{txálpś} (objects, animals)
- Column III: \textit{txálpśtó:t} (persons)
- Column IV: \textit{txálpśkws} (canoes)

We recognize in column IV the suffix -\textit{kws} already found in other forms for canoes, and in column III the 'human' suffix -\textit{tó:}; the preceding \textit{t} must have been inserted by analogy with the corresponding forms for 'six', 'seven' and 'eight', all of which, as we shall see, end in the sequence -\textit{tó:} as a result of adding -\textit{ó:} to a final suffix -\textit{t}.

In the basic form \textit{txálpś} we recognize the sequence -\textit{lp-} found in \textit{kvlpl}\textsuperscript{21} and traceable to a root *\textit{lep} 'assembled, joined' (2.3.), followed by a suffix or augment -\textit{x} found in a number of words but of yet undetermined meaning. The initial sequence \textit{txá-}, which carries the stress, is probably identifiable as the proclitic \textit{txá-}: 'all, every': shortening of the long vowel would not be surprising in front of the cluster -\textit{lpś}.

Thus we reconstruct \textit{txálpś} as

\begin{align*}
\text{txá:} & \quad \text{lep} \quad \text{x} \\
\text{all assembled} & \quad ?
\end{align*}
a designation which is appropriate for a square or rectangular structure such as a house or a kerfed box.

2.5. Three

All the forms for 'three':

<table>
<thead>
<tr>
<th>Column I</th>
<th>kwíla₂</th>
<th>(objects)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column II</td>
<td>kwílán</td>
<td>(animals)</td>
</tr>
<tr>
<td>Column III</td>
<td>kwílo₂:n</td>
<td>(persons)</td>
</tr>
<tr>
<td>Column IV</td>
<td>kwíla₁tkws</td>
<td>(canoes)</td>
</tr>
</tbody>
</table>

have in common an initial sequence kwíl- followed by what appear to be suffixes.

The column IV form kwíla₁tkws is obviously derived from column I kwíla₁ by addition of the suffix -(t)kw₃s (of undetermined meaning) found in gálpakw₃s (as well as all subsequent 'canoes' forms). The words in the remaining three columns need further analysis.

The initial sequence kwíl- recalls the proclitic kwíl 'fixedly, rigidly' and the word kwá₁kw₃ 'to be dry'. The primary meaning of the alternate roots kwíl/kwá₁ is probably 'stiff, rigid, unchanging', a description which applies to dried substances such as fish, wood and seaweed. This root is also recognizable in the phrase kwá₂tım gôt, literally 'stiffened heart',²³ meaning 'readiness, resoluteness (in front of danger, death, etc.)'.

One may wonder why a root meaning 'stiff, rigid, unchanging' would be used in the formation of words meaning 'three'. The most stable structure is a triangular one, as is well-known to the Nisghas, who construct their oolichan-drying frames with three vertical poles set in a triangular pattern, and held together by sets of three crosspieces, a fact which is not without significance in this discussion.

Turning now to the suffixes, in column III it is probable that the -₁:n of kwílo₂:n 'three (persons)' should be identified with the 'human' suffix -₁:n found in the other column III forms. The change l > n, which is fairly common though sporadic in Nisg̱a,²⁴ may have been triggered or encouraged by the presence of the earlier l of kwíl-.
In column I, kwilál, seems at first sight to end in the same completive suffix -I, as ky{l 'one' and ky{lpi I 'two', but a combination kwíl + -I would yield *kwílki or *kwíl, not kwíl. It seems more probable that kwíl is a former compound of the object-incorporating type, with the second member probably -?ál, thus

\[
\text{kwá} \quad \text{to stiffen} \quad ?
\]

hence kwíl, after loss of glottal stop and unstressed vowel reduction, both common in compounds.

The element ?ál postulated as the second member of this compound does not occur by itself, but is reconstructable from such forms as

\[
\begin{align*}
\text{kyá} : & \quad \text{'to be one-eyed' (kv- 'one')} \\
\text{çál} & \quad \text{'eyes, face' (c- 'in')} \\
?álaq & \quad \text{'to be quick-tempered, assertive, determined, brave, as shown by the expression in one's eyes' (-q suffix of undetermined meaning)}
\end{align*}
\]

The literal meaning of kwíl then would be 'stiffening the eye'.

I would suggest that the word ?ál meant not only 'eye', but also, metaphorically, 'triangular pattern'. The meaning of kwíl then is 'stabilizing the triangle', a description which applies to the crosspieces that hold a triangular frame together, and which themselves form a triangle when in place, a set of three before; a phrase such as kwílilt+ canqán, meaning originally 'the pieces of wood that stabilize the triangle' could easily have come to mean only 'the three pieces of wood'.

In the remaining form kwílan27 'three (animals)', in column II, we can assume that there has been dissimilation from earlier *kwíl, just as in kwílo:n from *kwílo:l. In many words ending in glottalized consonants, glottalization seems to have been originally a separate morpheme, and there are some related unglottalized forms. The form ?ál- as a variant of ?ál is evidenced in the proclitic ?alu: 'plainly, visibly' (-u: modifying suffix)
2.6. Five and nine

The forms are:

**Five:**
- Column I, II: \( \text{k\textsuperscript{w}st\textsuperscript{t}sns} \) (objects, animals)
- Column III: \( \text{k\textsuperscript{w}st\textsuperscript{t}sns\textsuperscript{o}:l} \) (persons)
- Column IV: \( \text{k\textsuperscript{w}st\textsuperscript{t}snsk\textsuperscript{w}s} \) (canoes)

**Nine:**
- Column I, II: \( \text{k\textsuperscript{w}stim\textsuperscript{o}:s} \) (objects, animals)
- Column III: \( \text{k\textsuperscript{w}stim\textsuperscript{o}:s\textsuperscript{o}:l} \) (persons)
- Column IV: \( \text{k\textsuperscript{w}stim\textsuperscript{o}:sk\textsuperscript{w}s} \) (canoes)

Again, the suffixes \(-\text{o}:l\) for persons and \(-k\textsuperscript{w}s\) for canoes are added to the basic forms. The latter are obviously related, as they both begin with the sequence \( k\textsuperscript{w}st\textsuperscript{-} \), otherwise found only in the word \( k\textsuperscript{w}sta\textsuperscript{g}s \) 'to leave or abandon something'. This transitive verb is built on the root \(*staq \ 'side\)', evidenced in the proclitic \( sta\text{\textbar{a}} \ : 'on one side\)' preceded by the prefix \( k\textsuperscript{w}- \) of undetermined meaning and followed by the (here) transitive suffix \(-s\). The \( m\textsuperscript{\text{o}}:s \) at the end of \( k\textsuperscript{w}stim\textsuperscript{o}:s \) seems to be the word \( m\textsuperscript{\text{o}}:s \ 'thumb\'). If the upper limit of numeration is the number of fingers, it makes sense for the word for 'nine' to mean 'leaving out one thumb'. The form for 'five', then, most likely means 'leaving out one hand'. It is possible to derive the actual forms \( k\textsuperscript{w}stim\textsuperscript{o}:s \) and \( k\textsuperscript{w}st\textsuperscript{t}sns \) by regular rules, from earlier, transparent forms.

These forms are object-incorporating compounds. Transitive suffixes such as the final \(-s\) of \( k\textsuperscript{w}sta\textsuperscript{g}s \) are not used in object-incorporating compounds,\(^{28}\) thus we reconstruct:

\[
\begin{align*}
\text{k\textsuperscript{w}st\textsuperscript{a}q} & \quad - \quad m\textsuperscript{\text{o}}:s \\
& \text{leave} \quad - \quad \text{thumb}
\end{align*}
\]

A series of historical velar-weakening rules operating before consonant gives regularly

\[
\begin{align*}
k\textsuperscript{w}sta\textsuperscript{xm\textsuperscript{o}}:s \\
k\textsuperscript{w}stahm\textsuperscript{o}:s \\
k\textsuperscript{w}sta:m\textsuperscript{o}:s
\end{align*}
\]

and the long vowel \( \text{a}: \) reduces in unstressed position, thus
kwstemó:s

and eventually the modern

kwstimó:s

Similarly, 'leaving out one hand' is a compound:

kwstáq - ?ún - -s
leave hand

yielding

kwsta:?ún

and later

kwstaúns
kwstúns

But this form has the vowel ù, not i as in kwstíns. Comparison of Nisga' with Gitksan and CT shows that many instances of Nisga' ù derive from earlier ú, by an historical rule ú > ù under certain conditions, thus the present kwstíns.

2.7. Six and seven

The forms are:

Six: Column I, II ḷó:lt
Column III ḷo:ltó:l
Column IV ḷó:ltkws

Seven: Column I, II tipxó:lt
Column III tipxo:ltó:l
Column IV tipxó:ltkws

The column III and IV forms have the suffixes ḷó:l and -tkws regularly added to the column I and II forms. In both cases, these end in the cluster -lt, representing the two suffixes ḷ, 'completive' as in kvíl 'one', kvílpil 'two', qalpéltkw 'two'
(canoes)', and -t 'passive of state'. These two suffixes are often associated, and the meaning of the whole is 'brought to its natural completion, fully completed'.

The first part of go:lt 'six' is probably a derivative of qóq 'to pull on something that is attached at one end (e.g., roots, hair)'; other derivatives are qóq+: 'cedar bark rope', qé:q+ 'to drag something', and probably also qó: 'penis' and qó:m 'to be desirous'. Long vowels generally result from an earlier sequence of short vowel plus a velar or uvular, thus qó:lt can be reconstructed as

\[ \text{'qóq} \quad - \quad -l \quad -t \]

pull, extend \hspace{1cm} \text{COMPL} \hspace{1cm} \text{PASS. STATE}

The word for seven, tipxó:l:, is obviously related to qó:lt. It starts with the proclitic tip '(motion) straight down', and the following x is the reflex of q after the consonant p (cf. tipxá:t above, 2.2.). The meaning is 'extended straight down'.

One may wonder why words for 'six' and 'seven' would have the common meaning 'fully extended'. I suggest that this expression refers to the position of the hand that is doing the counting. After counting up to five (by whatever method), the hand would then be extended, probably horizontally, for 'six', and then rotated into a vertical position with thumb up, for 'seven'.

2.8. Eight

The forms are:

| Column I | qantó:lt |
| Column II | yuxwta:lt |
| Column III | yuxwta:ltó:li |
| Column IV | yuxwta:ltkws |

As usual, the column III and IV numerals are formed by suffixation to a more basic form. The column I and II forms do not resemble each other except that they both end in the sequence -l, also found in 'six' and 'seven'. As we saw earlier with 'three', however, the segment l is not always a suffix.
The column I form \textit{qantó:lt} is yet another case where interpretation must remain conjectural. The initial sequence \textit{qan-} might be the proclitic \textit{qan} 'leaning against something' or the prefix \textit{qan-} which forms abstract nouns. The remainder, \textit{tó:lt}, is probably analyzable in the same manner as \textit{qó:lt} 'six', that is, as a root ending in a velar or uvular, followed by the suffixes \textit{-l} 'completive' and \textit{-t} 'passive of state'. The root may be either \textit{tóq} 'to take or grab something plural' or \textit{tóx} 'objects) to lie, to be put, laid'. The derivative \textit{-tó:lt} means then either 'fully taken' or 'fully laid out' (in the plural), both of which are possible semantically, thus \textit{qantó:lt} is reconstructable as

\begin{center}
\begin{tabular}{llll}
\textit{qan} & \textit{tóq/tóx} & \textit{-l} & \textit{-t} \\
\textit{?} & \textit{take/lay} & \textit{COMPL} & \textit{PASS. STATE}
\end{tabular}
\end{center}

If \textit{qantó:lt} was originally used for animals and fish, it may have to do with some practice in connection with the handling of animal skins, or fish. There is a word \textit{lú:kws} meaning 'bundle of forty dried fish'. It is likely that four groups of ten were prepared, then bundled together, and \textit{qantó:lt} would be an appropriate term to use.

In column II, the word \textit{yuxwta:\textit{lt}} has a somewhat unusual shape: unstressed initial syllables rarely begin with glottalized resonants. It could be interpreted as an object-incorporating compound starting with the verb \textit{yuxw} 'to fish with line', but this verb is intransitive, and the rest of the word, \textit{ta:\textit{lt}}, does not have a recognizable meaning. Instead, it is more probable that the phonological sequence \textit{yuxw} is the common contraction of \textit{?i: huxw} 'and again'. Such a phrase would be suitable for the expression of a number considered as an addition to another number. The word \textit{huxw} 'again' is often reinforced by the addition of the particle \textit{ti:} 'indeed, too'; a reduced form of this particle, \textit{tê} (with vowel quality adjustment) is used to form numbers above ten, as in

\begin{center}
\begin{tabular}{ccc}
\textit{xp'\textit{lt}} & \textit{ti} & \textit{ký\textit{l}p\textit{il}} \\
\textit{ten} & \textit{two} & 'twelve'
\end{tabular}
\end{center}

In \textit{yuxwta:\textit{lt}}, the \textit{t} which follows \textit{yuxw} could be the reflex of this particle. There remains the sequence \textit{?d\textit{lt}}, already found in the derivation of \textit{k\textit{wil\textit{al}}} 'three' (2.5.), with the meanings 'eye', 'triangle', and therefore here, 'three'. The contraction \textit{yuxwta:\textit{lt}} represents the original phrase...
The final -t (which is not in the Gitksan Primer form) was probably added by analogy with the ending in čóːt 'six', tipxoːt 'seven' and qantóːt 'eight', once the original meaning of yuxwtaj had been forgotten.

One wonders again why a word for 'eight', coming after words for 'six' and 'seven' indicating hand movements, would mean 'and again three'. Movements of the whole hand are limited, and use must be made of the fingers again at some point: if nine is still indicated by leaving out the thumb, eight will mean also leaving out the adjacent finger, or, in additive rather than subtractive terms, using 'again three' fingers: probably by curling them into the palm, while leaving the hand in the same vertically oriented position as for seven. For nine and ten, the remaining finger and the thumb join the three curled fingers.

3.0 DEVELOPMENT OF THE NUMBER SYSTEM

It is possible to suggest a rough chronology of the development of the Nisga'a number system as well as of the evolution of the method of counting.

Of the ten numerals for abstract counting, only kYI 'one' and xpI 'ten' appear to contain a morpheme with actual numerical meaning. The morpheme kYa- 'one' has especially wide distribution, and is used in the formation of words designating larger units, kYap 'ten (animals)', probably 'a set of ten skins or fish', and kYiytkw 'twenty' or 'one man'. The morpheme xpæ- 'ten' is also used in compounds designating measures. It is likely that kYa- is the most ancient, xpæ- a later formation, but that together they designated the beginning and the end of a counting procedure of keeping track of numbers on the fingers of both hands, without, however, naming the intermediate steps.

The abstract forms for 'two' and 'four' both contain the sequence -lep- from the root *lep meaning 'assembled, joined'. The derivatives kYilpil 'two' (from kYa - lep - l 'fully assembled') and tXalpX 'four' (from tXa - lep - X 'all assembled') then have their origin in the techniques of assembling objects, probably in garment-making and woodworking. The abstract form for 'three', kwIjô (from kwaI-ʔáj 'stabilizing the triangle') also has its origin in a technique, that of
constructing stable triangular frames. What are now numbers were then originally technical terms.

In contrast, the forms for 'five' and 'nine' refer to a manner of keeping track of numbers: if the goal is to assemble a set of tens, or two hands' worth, five and nine represent incomplete sets, readily identifiable on the hands: 'leaving out one hand', 'leaving out one thumb'. At some point, the descriptive words kvi'lil, kwi'lal and tixa'lpax started to be used for abstract counting, bridging the gap between one and five. It is probable that counting was done on the fingers of both hands, repeating the sequence one to five on each hand until all the fingers were used up. Nine was viewed as an incomplete ten, and for a time there was no need of other numerals between five and ten.

The remaining numerals go:lt 'six', tipixo:lt 'seven' and yuxw'tal't or qantó:lt 'eight' bridge the terminological gap between five and nine, just like the originally technical words kvi'lil 'two', kwi'lal 'three' and tixa'lpax 'four'. But these older forms originally had a meaning independent of counting. By contrast, the words for 'six' and 'seven' clearly refer to the act of counting, the specific hand gestures used in a counting procedure that goes beyond five, by extending, then rotating the hand. For 'eight', the meaning of yuxw'tal't 'and again three' only makes sense if the word is part of a set of counting instructions in which numeration starts from one and proceeds by successive additions, not, as for kwstimo:s 'nine = leaving out one thumb' by subtraction from the complete set. The other word for 'eight', qantó:lt, which probably also has a technical origin, 'fully laid out' or 'fully taken up', must have been used in a different context, so that it was not part of the enumerative counting procedure.

These three numerals appear to be recent words, so clearly mnemonic that they suggest that the procedure in question was at one time new and strange, perhaps running counter to established habits. The forms for five and nine show that both hands were originally used in counting; but extending the hand in different directions for six and seven only makes sense if counting is being done on the fingers of one hand rather than two, a shift in procedure requiring new gestures associated with each number if ambiguity is to be avoided: extending and pivoting the hand ensures that six and seven cannot be confused with one and two. And if eight, nine and
ten are not to be confused with three, four and five, the hand position must be different: so the fingers now curl into the palm.

All the fingers are now together, and what is seen of the hand, besides the curled fingers, is the lower half of the palm, as well as the wrist: this area has a specific name in Nisgha, kYf:la?, a derivative of kYf 'one' (with the detransitive suffix -a?); the literal meaning is approximately 'making up "one"'. This probably refers to the fact that a unit of ten has been achieved.

There would be little point in a procedure for counting to ten on one hand only, unless the other hand also played a role: that of keeping track of tens. Once one hand has 'made up a "one"', this 'one' can be transferred to the other hand. In this way, since each number from one to ten is associated with a specific gesture, it is possible to keep track of numbers up to ninety-nine, 37 without confusion.

There are, then, at least three discernible periods in this proposed development of the Nisgha number system:

1. At first, there was only a form for 'one', the base kYe- which was attached to suitable words. 'Ten' and 'twenty' were expressed in terms of complete sets: kYiyftkw 'twenty' was 'one man', kYap 'ten' was 'one set of ten skins or fish'. After a while the complex base xpæ- also came to be associated with the number ten. Intermediate numbers were recognized as incomplete sets, but not named. Counting was done on the fingers of both hands, without specific words.

2. The incomplete sets 'five' and 'nine' started to be recognized formally by phrases indicating subtraction from the upper limit ten. Technical terms indicating typical patterns of two, three and four parts filled the gap between one and five. Counting to ten was still done on the fingers of both hands, probably by repeating the one to five sequence on both hands.

3. At a later date, a method was discovered or learned for counting to ten with just one hand, leaving the other hand free to count tens. In the absence of specific names for the intermediate numbers between five and nine,
the gestures of this procedure were described, at first simply as an aid to its correct execution. Later, the meaning of the words were forgotten, and they acquired the purely numerical meanings they have today.

The shift in counting procedure can perhaps be roughly dated. It must have arisen in response to a need to count large numbers, and to name intermediate numbers rather than completing sets of ten, which must have been the ancient practice. These new conditions must have been those of the European fur trade, which created an economic situation in which much larger amounts of goods than before were changing hands; exchange rates were fluctuating according to supply and demand, and were often set by the Indians themselves.

It is impossible to establish on linguistic evidence alone whether the counting method evidenced by the Nisgha numerals, and their cognates in the other Tsimshianic languages, was developed independently in the Tsimshianic area, learned from some other group, or whether it is a case of stimulus diffusion: the idea of such a method may have been diffused, though not the actual details. It is remarkable that the new numbers were not borrowed from some other language: perhaps this type of counting was observed being done silently.35 Areal research would be profitable in this connection.

Whatever the origin of the new counting procedure, its adoption must have given great impetus to counting and measurement, and to the formation of new words. Phrases were coined for numbers beyond ten, so that any number up to ninety-nine could be indicated. Paradigms such as those for persons and canoes, which only had a few entries, for one, two and perhaps ten, were filled in by the creation of new forms, derived by adding suffixes, or what appeared to be suffixes, to the abstract stems, or what appeared to be stems (e.g., -oːl ('human' suffix) added to kwíːl- considered as the stem of kwíːl ̂ː̂ 'three', -təːl added to təːl pə 'four' on the analogy of koːl təːl ̂ː̂ 'six (persons)'). The abstract numbers themselves were used as prefixes to suitable words (e.g., kwíːl qəːx 'one fathom' from kwíːl ̂ː̂ 'one' + qəːx 'wing, wingspan, armspan').38

4.0 CONCLUDING REMARKS

The morphological clarity of the Nisgha language gives us a rare window on the past life of the people and makes forgotten
aspects of a culture come alive. The Nisgha number system embodies a record of ancient cultural patterns and of cultural change precipitated by outside factors. It touches upon all aspects of life: it makes reference to crucial techniques, to social relations, to trading practices and their evolution; it preserves the beautiful metaphor of the eye for the triangle.

From a more general point of view, the evolution of the Nisgha number system may give clues to what probably happened in other parts of the world, where it is unlikely that decimal systems sprang up full-blown, and where unanalyzable numbers probably have a long but forgotten history of non-numerical meanings. 39

NOTES

*The Nisgha (nisqaʔ, [nisqəʔə]) language is spoken in the Nass Valley of British Columbia. It is the 'Nass dialect' of Boas' (1902) Tsimshian Texts and of his 1911 Tsimshian.

The data presented here represent the speech of New Aiyansh, present home of the Gitlakdamix (kYílx̱álamiks) band. They were collected during the course of my employment with the Nisgha Bilingual/Bicultural Centre of B.C. School District no. 92 (Nisgha), in 1977-80 and again in the summer of 1982, during which times I resided on the reserve at New Aiyansh.

Among the numerous Nisgha speakers who helped me learn their language over the years, I am especially indebted to Mrs. Nita Morven, Mrs. Rose Robinson, and Mrs. Verna Williams, who were my first teachers of Nisgha, and whose patience and friendliness never failed; to the Rev. Hubert McMillan, a Nisgha hereditary chief of the Wolf tribe and priest of St. Peter's Anglican Church, New Aiyansh, as well as to Mr. Harold Wright, a hereditary chief of the Eagle tribe and Cultural Researcher for the Gitlakdamix band. Mr. Bert McKay, hereditary chief of the Frog/Raven tribe and Coordinator of the Nisgha Bilingual/Bicultural Centre, arranged for me to have access to these and other resource persons.

Bruce Rigsby provided me with a copy of the Gitksan Primer as well as many Gitksan data.

Neil Gallaiford made valuable suggestions about the counting procedure from eight to ten.

The reconstructions and interpretations presented here are my own, and I alone am responsible for any errors.
I am coining this term on the analogy of German: Germanic. German is one of the Germanic, not German, languages. Similarly Tsimshian (čim 'in' + sán 'Skeena River'), now known among linguists as Coast Tsimshian, is only one of the Tsimshianic languages, which also comprise Southern Tsimshian, and in the interior, Nisga and Gitksan. The latter two have been referred to as Nass-Gitksan (cf. Rigsby 1975, which gives Gitksan data).


The relationship of CT to Nisga and Gitksan can be compared to that of French to Spanish and Portuguese or Catalan: CT has a much more complex vocalism than the other languages, and there has been more extensive loss or change of consonants. Nisga is on the whole the most conservative of the three. Little is known about Southern Tsimshian.

The same categories, with almost identical forms, are given in the Gitksan Primer. CT also has a category for 'long objects', including a suffix -qan or -xan, probably from qan 'tree, log' (Boas 1911:396, Dunn 1970:39). The bases for 'one', 'two', and 'three' in this category do not seem to be related to other numerals, and I will not attempt to analyze them.

The transcription is phonological. Nonglottalized stops are voiced prevocally. The symbols e: and o: stand for long lower mid vowels.

e.g., there is a difference between the noun-phrase

\[ t\text{a}l\text{p}x\text{s}â \quad 'four days' (\dagger \text{ connective}) \]

and the noun

\[ t\text{a}l\text{p}x\text{s}â:\text{ta} \quad 'a four-day period' (sâ: alternate form of sâ 'day'; -\text{ta} old (see note 15) collective suffix) \]

Except in some phonological details. Boas' transcription, done before contrastive techniques were established, and based on limited data, is not always consistent, in particular in the differentiation of long and short vowels, and of glottalized and nonglottalized stops. He also fails to indicate the glottalization of resonants. For these reasons, my transcription may differ slightly from his.
I was told on several occasions that Boas' informants were poor speakers of Nisgha. Boas himself thought that the tales he collected were 'only moderately well told' (1902). Boas collected his Nisgha data in 1894 in the then newly-formed Christian community of Kincolith, where his interest in 'pagan' customs was not particularly welcome, so that the only persons who would work with him were those on the fringes of society, some of whom were allegedly not native Nisgha speakers.

8a. Columns headed 'Boas' have not been verified. For unity of presentation and for comparability I transcribe Boas' and Dunn's forms phonologically.

b. In the first column (fathoms, from Boas), the -ti: on the last word is an intensive particle which is sometimes used after a measure.

c. Under the column 'fingertip lengths', the term wax'únkws does not literally mean 'four fingertip lengths', but its equivalent, 'one handwidth'. The root is ?ún 'hand or arm', also used for 'fathom'.

Cf. also in Table II in the last column, kwi:skyiwá 'one bundle of ten skins'. The initial sequence is probably the prefix kwi:s- used in a number of words designating garments:

- kwi:smála? 'button blanket' (mála? 'to fasten', garnmála? 'button')
- kwi:shaláyt 'Chilkat blanket' (haláyt 'shaman, shaman's dance')
- kwi:shatiks 'swimsuit' (hatiks 'to swim')

The form kwi:skyiwá then seems to mean 'garment made of ten skins' or perhaps 'ten skins, enough for a garment'.

Like English up in drink up, sum up, etc.

This -ó: is different from the sequence -ó:It found in the forms for 'six' and 'seven', analyzed in 2.6. below. Since -ó: carries the stress in all cases, it is unlikely that it is a true suffix, as the overwhelming majority of true suffixes are unstressed. It is more likely to have been originally a noun, as is, for instance, gá:x 'wing, armspan' used as a suffix in the formation of measures for 'fathoms' (Table II). It might be a form of ?úl 'bear', a form which in Nisgha has been replaced in most of its uses by smáx 'black bear', originally 'meat', also 'body, corpse', probably a borrowing from the Salish *samey- (hence also CT sámi 'meat'). Identification of bears with people is common in most Northwest cultures.
12 e.g., Passive, transitive, reflexive, 'like', 'having', etc.
In many cases it seems that the only purpose of the suffix 
\(-k\) is to differentiate the word it is added to from the original word.

13 Justification for all rules used in these derivations is found in my unpublished paper Nisgha plural-formation: an analysis of the morphophonemics, which presents both synchronic and diachronic rules.

14 The Gitksan Primer gives hixp’i, hixp’o:1, which seem to involve a form of reduplication.

15 This suffix, productive in Gitksan, is restricted in Nisgha to a few frozen forms.

16 (But there is the word xpa:w 'jaws' which may ultimately provide a clue.) The sequence x- should probably be further analyzed into a prefix x, otherwise attested but of undetermined meaning, and a base or root starting with p-, also undetermined. The original meaning of the xp- forms, then, was probably not numerical, although it must have become so fairly early, otherwise one would expect 'ten fathoms' to have been xpil?ún, not xpa?ún (cf. kYilgá:x from kYi + gá:x).

17 cf. Table II, last column, 'bundles of ten skins'.

18 Boas (1911:398), observing the obvious relationship between the 'one' forms starting with kY, suggested that xp’i, kYáp and xp’o:1 were similarly derived from a common root: evidently he saw in xp, which corresponds to CT kp, a reduced form of kYáp. This is most unlikely, for the following reasons:

- initial preconsonantal x derives historically from unglottalized kY, not glottalized kY; the few instances of spirantization of glottalized velars and uvulars (as in t’ipXó:lt, 2.6.) occur post-consonantally;
- the suffix -1, like most Nisgha suffixes, never changes the stress pattern of a word; a form kYáp + 1 would be kYápil;
- even if by some exception the stress moved to the suffix, glottalization would be transferred to the final stop of kYáp and the result would be something like kYip’i, or granting an unlikely spirantization of kY, xp’i, with glottalized p and unglottalized 1, not the opposite as in xp’i.

Boas' hypothesis is therefore not tenable.
Glottalization is transferred to the stem-final stop, and a vowel is inserted.

Boas (1911:397) compares the sequence qa:p- in qa:pe:ltkws (older qa:pe:ltkws) and its CT cognate qa:pe:ltk to the CT form for 'two (long objects)' qu:psxan. There are many cases where a sequence vl, before consonant, in N and G corresponds to a long vowel in CT, e.g., N, G w'lp 'house', CT w'p, but if this were the case here one would expect the stressed vowel of qu:psxan to be ó:, not ó:. Also, one would expect the stress pattern to be the same in N and in CT.

The initial glottalization in qu:psxan is not an unsurmountable difficulty, as there are a number of cases where CT appears to have glottalized initial consonants, e.g., N, G kw'líl, CT kw'lif: 'three'; N, G qantó:lt, CT qandó:lt 'eight'. But it is more probably that the CT forms for 'canoes' and 'long objects' are unrelated, and that the 'two' root of the 'long objects' category represents yet another aspect of the experience of twoness.

The glottal element is transferred to p from the suffix -l, (cf. above 2.3. and note 19).

cf. CT t'xa:lpx, Dunn p. 38. Usually Nisga' ltc = CT V:C (see note 20). That the l is preserved in CT shows that the long vowel must be original.

cf. English 'to steel oneself'. The t in kw'ltim is the 'passive of state' suffix (-m attributive suffix).

In general, these changes place n at the end of a word or closed syllable, l intervocally, as in cf'n 'to enter', cilim (proclitic) 'entering' (cf'n + -m attributive).

There is no attested sequence l + l that I know of in Nisga: the closest parallel is

\[ l'nx + \rightarrow *l'inn > l'n \]

(trees) to fall CAUS to cause (trees) to fall (naturally, e.g., storm)

See also discussion of yux'wtxlt below 2.7.

The replacement of qaI 'eye' by caI 'eye(s), face' may have occurred as a result of a shift of meaning from 'eye' to 'triangle' or 'three'. The two forms qaI and caI may have coexisted for a while, cf. in present-day Nisga' qaI and cimó:q, both meaning 'mouth' (cim 'in', from c- 'in' (old base) and -m attributive).
Both Boas and the Gitksan Primer give kwíllánt; the final t is probably the passive of state suffix, which is often added to intransitive stems such as the object-incorporating compound kwíl-ʔaʔ or ?aʔ.

cf. k'á+k'w 'to pierce, stab, gaff something' but k'á+hó:n 'to gaff (k'á+-) fish (hó:n)'. The suffixes -k'w and -ʔ are allomorphs.

Note that the suffix -ʔ may have been part of the derivation of kwístmó:s as well, where it would have been assimilated to the final s. Perhaps the meaning is reflexive or possessive (leaving out one's own hand, not someone else's). (cf. yó'=oks- wé:n+k'w 'to brush one's teeth': yó'=oks 'to wash something'; wé:n 'teeth'; -k'w REFL)

e.g., N qált's, G qált'st 'to let go of something'; N k'íp, G kúp 'to eat something; N kwíst'ns, G xwíst'ns, CT kstú:ns 'five'.

As in yáns'al (month of) May' literally 'fully-leaved' (yáns 'leaf').

Although the numerals give no clue as to the original method of counting to five on the fingers, there may be other evidence: words related to counting are l'íc'k 'to count, to read something', l'íc'k'k'w 'to count, to read', l'ícîl 'to keep track of something, l'íc'k'k'w 'to keep track of things', l'íc'k'k'šm-kú:la 'to keep track of money'. The root l'íc , may be the original plural of yác 'to hit, strike something (e.g., a drum)'. The word l'íc'k'w designates a type of grouse that makes a loud drumming sound. It is likely that l'íc meant originally 'to strike or beat rhythmically'. The use of this form to refer to counting suggests that each finger was struck in turn against some support.

It is not clear in what way the hand is extended. It is probably not outstretched into a span, as a morpheme meaning 'span' is part of the measures k'vílságans 'one span', etc.; ság'an is a transitive verb meaning 'to lengthen, to extend something'. Perhaps qú:š't refers to a position in which the hand is held out horizontally with all the fingers straight together.
The Gitksan Primer gives 'giukdal', which probably represents Kyuxwał; Kyux is a contraction of Ky: hux, where Ky: is the more formal variant of ?i: (as also in Nisga). Note the lack of -t at the end.

I owe this suggestion to Neil Gallaiford.

If the numbers from eight to ten are counted by curling the fingers back into the palm, one wonders why six and seven are not also indicated in this way, rather than by extending the hand in two different orientations. It could be because it is almost impossible to curl in the little finger without also curling in the fourth finger, and it is also difficult to curl in those two fingers without moving the middle finger. Thus there could easily be confusion between the gestures for six and seven, and perhaps even eight. But if six and seven are indicated in a different way, there is no ambiguity in the gesture for eight.

Ninety-nine: Kwstim:s wil Kyap ti Kwstim:s
         nine      ten      nine

There are also words referring to 'persons in canoes or boats', e.g., Nisga Kwita:t 'to be fishing alone in a boat', Txa:pxta:t 'to be four in a canoe or boat'. This is another case where a sequence has been taken as a suffix but has a different origin. The ending -a:t is probably the word ?a:t 'fishnet, to fish with a net'. In the word Kwita:t the initial sequence Kwit- is probably the same as that in the modifier Kwitu: 'alone, by oneself', and it is probably the reduced form of *Kwot 'lost'. Where the modifier Kyo:lu: 'alone', built on Ky: 'one (person)' emphasizes singleness, Kwitu: and Kwita:t emphasize the danger of being alone in a difficult environment.

The sequence Ta:t was later taken as a separate morpheme and added to numerals (CT has a complete series, Dunn p. 39).

I would appreciate receiving information from readers who may know of this and similar counting procedures.

REFERENCES


