The numeral system of Purepecha: Historical and typological perspectives

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Abstract

The internal structure of numeral systems can shed light on processes of word formation, language contact and change. In this article I analyse the numeral system of Purepecha, a language isolate spoken in Michoacán (western Mexico), on the basis of historical and contemporary sources. The Purepecha system is unusual both typologically and areally since (i) it possesses monolexemic terms up to six, while seven to nine are compounds with five; and (ii) the forms for the base (20) and next power (400) have clear non-corporeal meanings, related instead to a configuration of objects and the notion of 'living', respectively. These features render the Purepecha system atypical in the Mesoamerican context, even if the vigesimal base is used - perhaps inaccurately - as grounds for its inclusion in the linguistic area. On the basis of Colville (1985) I provide a more nuanced classification of vigesimal counting systems in Mesoamerica, highlighting the importance of regional interaction in West Mexico as a possible alternative to previously proposed unidirectional diffusion scenarios. The language-internal and external findings underline the importance and utility of more detailed historical studies of Purepecha.

Keywords

Purepecha, numeral systems, word formation, Mesoamerican linguistic area, structural borrowing

1 Introduction

Numeral systems occupy a relatively minor role in linguistic research, yet their structures can provide important evidence for central questions regarding the nature of language, its relation to mind and society, as well as the nature of number in general (Hurford, 1987: 1). With the exception of restricted systems, which have little or no internal structure and rely on a cognitive process independent of both linguistic and mathematical knowledge,[2] human languages display a

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[2] This process is known as 'subitising', the fast, seemingly effortless perception of amounts up to and including four. It is claimed to be a pre-attentive mechanism in which number seems to lose its abstract nature, rather becoming a holistic attribute, like colour or shape (Pepperberg, 1994: 36).

variety of numeral systems (e.g. Comrie, 2013). Indeed, these systems are internally complex, showing varying degrees of syntactic and semantic complexity, enabling their speakers to keep track of a given quantity of entities. Many systems display irregularities and idiosyncrasies, which renders the study of the numeral names "a means by which to study 'the psychological process of language generation'" (Colville, 1985: 2, citing Brainerd, 1968: 41).

Purepecha, a language isolate spoken by around 100,000 speakers in the state of Michoacán (Mexico), possesses a vigesimal numeral system with monolexemic terms for twenty (*ékwatsi*) and 400 (*irepita*) (e.g. Chan, 2019; Chamoreau, 2009: 76; Chamoreau, 1998: 713; Foster, 1969: 158). Below twenty, we can observe monolexemic terms for the numerals one to six, but seven to nine are compounds of five-two, five-three and five-four respectively. The term for 'ten' *témpeni* is also monolexemic, and is not related to the lower numerals, nor to twenty, although it does combine with twenty to form the uneven decades, e.g. *ma ekwatsi témpeni* '30' (lit. 'one twenty ten'). The lower numeral forms indicate that the system is not a pure vigesimal one, examples of which are in fact very rare typologically (Comrie, 2013), but rather represents a hybrid quinary-decimal-vigesimal system (De Wolf, 2013: 27; Colville, 1985; see Section 3).

The vigesimal numeral system, along with nominal possession of the type 'his-dog the man', relational nouns, non-verb-final basic word order (which correlates with an absence of switch-reference), and several widespread semantic calques, is a key diagnostic for inclusion in the Mesoamerican linguistic area (Campbell, Kaufman & Smith-Stark, 1986). Along with the Caucasus, Papua New Guinea and West Africa, Mesoamerica has the highest concentration of vigesimal counting systems attested cross-linguistically (Comrie, 2013). While the Mesoamerican languages also share similar means of numeral formation, notably undercounting (Colville, 1985; see Section 4), a more fine-grained analysis highlights various internal structural differences that could call into question the strength of this feature as a diagnostic of long-term language contact for Purepecha.

On the basis of contemporary and historical sources, in this article I present a detailed analysis of the numeral system of Purepecha, which demonstrates that the system possesses specific internal complexity and innovative word formation processes. I consider the lower and the higher numerals, offering tentative etymologies for both where possible. I then offer areal perspectives on the system, taking a critical view of previous diffusionist explanations for the observed patterns. Such a comparative-historical approach is unusual for a study of Purepecha, which to date lacks any internal reconstruction or systematic etymological work, therefore this paper represents an attempt to start filling this void.

2 Background: Numeral systems[3]

A numeral, or counting, system can be defined in terms of five elements: base, extent, dimensionality, internal structure, and regularity of composition (Beller & Bender 2008; see also Stampe, 1976: 601). These elements are common to almost all numeral systems, with the exception of restricted systems that display little or no internal structure (e.g. Comrie, 2013; Ibarra Grasso, 1938).

2.1 Numeral base

The numeral base of a language represents the morphological and semantic endpoint of the prime counting cycle, after which a new counting cycle starts, consisting of the base and the same basic numerals as before (Bender & Beller, 2011). This cycle can be represented notationally as $xn + y$, where x is a numeral, n the base (i.e. multiplier) and y another numeral (Comrie, 2013).[4] However, this notation does not represent non-recursive systems, and is only partially true for truly finite systems, such as the vigesimal system of Chukchi that terminates at 20 times 20 (all numbers beyond this, namely Russian loans, were known as 'limit of knowledge', Diakonoff, 1983: 91).

Various numeral bases are attested cross-linguistically. Base ten, perhaps by virtue of the number of digits possessed by humans, occurs the most frequently (Comrie, 2013). It occurs in all regions of the world, with the notable exception of Australia, and largely also Mesoamerica. Cross-linguistically we also find systems with base two, five, six, eight, twenty, and eighty, as well as hybrid decimal-vigesimal and quinary-vigesimal systems, and those based on body parts (Wassmann & Dasen, 1994: 79). Some languages, such as Warlpiri (e.g. Hale, 1975) possess restricted systems (to three, five or another limit never higher than 20) or arguably, as has been claimed for Pirahã, no counting system at all (e.g. Frank et al., 2008).

As indicated above, there is a geographical bias for non-decimal bases: while Europe is the heartland of base ten systems, Papua New Guinea is home to four systems, three of which are non-decimal (Wassmann & Dasen, 1994: 78-79). Historical examples, such as the base sixty system of the Babylonians, provide further evidence for even greater diachronic diversity that may have since been masked due to language contact, change or death. There is also evidence for two or more systems co-existing simultaneously in the same language: consider the special counting systems particularly prevalent in the Oceanic languages that are often omitted from traditional typologies (Bellamy, 2018a; Bender & Beller, 2007). In such systems, a different base

[3] This section draws heavily on Section 2 of the author's unpublished Master's thesis (Bellamy, 2012).

[4] Comrie (2013) also argues that "the order of elements is irrelevant, as are the particular conventions used in individual languages to indicate multiplication and addition" for analytical purposes (see also Barth et al., 2003).

to that of the generic system, which may also be accompanied by a classifier, is used to count objects of particular cultural significance, such as yams, pandanus mats or various types of fish.

Pure base twenty systems may be less common synchronically (in certain regions, at least) but their prevalence historically, as well as in special counting systems, lends support to the notion that they may possess certain advantages over their smaller-based relatives. Indeed the 'yan tan tethera,[5] system employed by shepherds until the early twentieth century across large parts of England and Wales for counting sheep was also vigesimal (Anderson, 2011: 125).[6] In this system, "it is said that the shepherds, on reaching 20, would transfer a pebble or marble from one pocket to another, so as to keep a tally of the number of scores" (Ralph, 2007). For counting large numbers, such as flocks of sheep, some claim that a base twenty system possesses cognitive advantages to the counter since its representation is more compact. Indeed "the larger the base is, the shorter and more compact are words for higher numbers", which is efficient when counting a large number of items quickly (Bender & Beller, 2011: 6).[7]

2.2 Extent

Extent refers to the highest monomorphemic numeral term attested in a counting system. This may be as low as two or as high as ten to the power ten, as in Mangarevan, a Central-Eastern Oceanic language of French Polynesia (Bender & Beller, 2011: 582). After this point, multiples are necessarily formed recursively according to structural rules. Both cognitively and practically, it makes sense for counting systems to be recursive rather than to possess separate words for every possible numerosity.[8] That said, the finite nature of their formal structure does not preclude their

[5] *Yan*, *tan* and *tethera* are the first three numbers in this counting system. It possesses the unusual feature whereby adjacent numerals tend to rhyme (viz. *yan* 'one' and *tan* 'two'). It could also be considered comparable to the Dutch "*iene, miene, mutte*" count which, in turn, may represent the remnants of a pre-Germanic counting system (Willem Adelaar, personal communication).

[6] The existence of these systems seems at times almost apocryphal given that no competent users of them have been identified: in 1910, Garnett said even then that the method was almost obsolete and as for the names of the numbers, "but few of the farmers remember them" (Countryside Museum, 2010). Furthermore there are also attestations of the system being used to count items other than sheep, namely children's counting-out games, or counting loops in knitting (Anderson, 2011: 126).

[7] However, as an anonymous reviewer instructively points out, the advantage conferred by a numeral system depends on a number of factors, of which the base is only one. One also needs to take into account the arithmetical process that are used, the number of primitives leading up to the base, as well as the length of morphemes in the primitives. As such, it could be argued that a higher base system may not confer the cognitive advantage advocated for by Bender and Beller (2011).

[8] *Funes el memorioso*, a character in Borges' *Ficciones* devised a counting system in which each numeral was represented by a different word: "The first stimulus to his work, I believe, had been his discontent with the fact that "thirty-three Uruguayans" required two symbols and three words, rather than a single word and a single symbol. Later he applied his extravagant principle to the other numbers. In place of seven thousand thirteen, he would say (for example) *Máximo Perez*; in place of seven thousand fourteen, The Train; other numbers were Luis Melián Lafinur, Olimar, Brimstone, Clubs, The Whale, Gas, The Cauldron, Napoleon, Agustín de Vedia. In lieu of five hundred, he would say nine. Each word had a particular sign, a species of mark; the last were very complicated. I attempted to explain that this rhapsody of unconnected terms was precisely the contrary of a system of enumeration. I said that to say three hundred and sixty-five was to say three hundreds, six tens, five units: an analysis which does not exist in such

ability to represent infinite amounts – i.e. there is no highest possible number. It also follows that a language that possesses more than one counting system may also possess varying extents (see Bender & Beller, 2011; Beller & Bender, 2008 for overviews and specific reference to Polynesian languages).

2.3 Dimensionality

The dimensionality of a counting system is directly related to its extent, namely its highest monomorphemic term. More specifically, dimensionality refers to the amount of recursivity in a given system. Zhang and Norman (1995, cited in Bender & Beller, 2011) distinguish three dimensions: (i) one-dimensional systems possess only distinct lexemes for each number, and thus make no use of combinations formed using processes of addition, subtraction and/or multiplication or recursion (i.e. systems where after the counting cycle has finished, it is necessary to start again to count higher numerals); (ii) two-dimensional systems are recursive, since number words can be composed of integers, bases and/or powers combined using various arithmetic operations, as is found in English; (iii) three-dimensional systems represent an extension of (ii) since they combine the main base of the system with a sub-base and sub-power, such as traditional Welsh, which combines bases ten and five from fifteen upwards.

2.4 Internal structure and regularity of composition

According to Luján (2006: 74), the most important characteristic of a numeral system is its organisation as an ordered system, where the value of each element depends on its relative position in the sequence. While this is incontrovertibly true, there is still much to be said about the internal structure of the world's numeral systems, and each has its own idiosyncrasies. For example, languages that use the same base for their counting system do not necessarily compose their polymorphemic numerals in the same way. Take English and Dutch, for example: both languages possess basic numerals for 1-9, a separate word for the base (10), then monomorphemic terms for both hundred and thousand but all other powers and multiples are composed using multiplication and addition principles. English forms complex numerals in the order base or multiple/power + basic numeral (1-9), e.g. *twenty-four*, whereas Dutch places the basic numeral first, as in *vier en twintig* (recall 'four and twenty blackbirds' in the traditional English rhyme).

However, this internal structure frequently displays irregularities: one need only consider the 'teens' in English – where the unit precedes the ten, unlike in all numerals over 20 - to see

numbers as The Negro Timoteo or The Flesh Blanket. Funes did not understand me, or did not wish to understand me" (Borges, 1962: 113).

how the side-effects of language evolution or the possible remnants of a different system can alter numerical form (Bender & Beller, 2011). Dowker, Bala, and Lloyd (2008) suggest that the regularity of a counting system can explain differences in mathematics performance in children, thus implying that the base ten structure, for example, is easier to grasp if it is more consistently used for the construction of number words (see also Göbel et al., 2011: 556). That perfectly regular counting systems such as Mandarin Chinese can exist, begs the question as to why certain languages develop irregularities in their counting systems. In some cases irregularities may be introduced through by superimposing culturally salient terms, such as the monomorphemic *sorok* 'forty' in Russian, which replaced the regular 4 x 10 pattern common to Slavic languages.[9] In the case of Purepecha, to which we will now turn, the lack of documentation prior to the sixteenth century prevents us from knowing how the observable regularities and idiosyncracies have emerged.

3 Numeral system of Purepecha

3.1 The lower numerals

According to Chamoreau (2000: 85), only the numerals 1-5, 10 and 20 are currently used by speakers of Purepecha, the rest having been replaced by Spanish, a base ten language. Foster (1969: 157) claims, however, that some older people may actively retain more numerals and a fuller numeral sequence than this is known to (many) speakers, having been recorded by various scholars up to at least twenty (e.g. Chamoreau, 1998: 713).[10] The numerals 1-20, as presented in the descriptive linguistic literature on Purepecha, can be observed in Table 1.[11] Note that the higher numerals (20 and above) will be treated in the Section 3.4.

	Foster (1969)	**Chamoreau (2000)[2]**	**Ranta (2007) in Chan (2019)**	**Chamoreau (2009)**	**de Wolf (2013)**	**Olmos (2013)[12]**

[9] I thank an anonymous reviewer for bringing this example back to my attention.

[10] Indeed, during the author's 2019 fieldwork trip, numerals higher than twenty were used to state some dates of recording sessions by a 30-year old native speaker in Carapan, one of the *once pueblos*. Martha Mendoza (pers. comm.) also informed me that numerals above ten are in common usage in the Sierra region of the Purepecha-speaking territory. It is quite possible, therefore, that the vitality of the numeral system varies between regions, with the Lake region (where Chamoreau and Foster collected data) having replaced more of the system with Spanish than the Cañada and Sierra (see Chamoreau, 2000 for an overview of the four Purepecha-speaking regions).

[11] Numerals are presented in various pedagogical works, e.g. Lemus Jiménez & Márquez Trinidad (2016), Medina Pérez (2006), but a morphological analysis of the forms is not provided, therefore they are omitted from the present discussion.

[12] These numbers refer to possible throws in *k'uilichi ch'anakua* and *tembeni iumu*, two autochthonous games of Michoacán, presented in Olmos's (2013) book. The former will be treated in Section 3.1.

1	má	‘ma	ma	ma	má	ma, sikï,[13] “seco”
2	ci-ma=ni	ɸi’mani	tsimani	tsimani	tsi-má-ni[4]	tsimani, tsimama
3	tani=mu	ta’nimu	tanimu	tanimu	taní-mu[4]	tanimu
4	t’a=mu	‘t^{h}amu	t^{h}ámu	t'ámu	thá-mu	t'amu
5	yu=mu	‘iumu	iumu	yúmu	yú-mu	cinco, k'uilichi,[14] iumu
6	k’wi=mu		kuimu	kwímu	khuí-mu	seis, kuimu
7	yu=mu ci-ma=ni		iumu tsimani	yúmu tsimani	yúm(u)-tsimáni	
8	yu=mu tani=mu		iumu tanimu	yúmu tanimu	yúm(u)-tanímu	
9	yu=mu t’a=mu		iumu t^{h}ámu	yúmu t'ámu	yúm(u)-thámu	
10	te=mpe-ni	‘teNpini	témbini	témpini	té-mpi-ni	diez, jera'patse,[15] tembeni
11	te=mp-ni káa má		témbeni ma	témpini ma	témpeni ka má	
12			témbini tsimani	témpini tsimani		
13			témbini tanimu	témpini tanimu		
14			témbini t^{h}ámu	témpini t'ámu		
15			témbini iumu	témpini yúmu		quinze, tembeni iumu
16			témbeni kuimu	témpini kwímu		
17			témbeni iumu tsimani	témpini yúmu tsimani		
18			témbeni iumu tanimu	témpini yúmu tanimu	témpeni ka yúm(u)-tanímu	
19	te=mpe-ni ká yu=mu t’a=mu		témbeni iumu t^{h}ámu	témpini yúmu t'ámu		
20	e-kwa=ce	e’kuaɸi	ma ekuatsi	ekwatsi	e-kuá-tse[4] , má ekuátse	veinte, e(l)kuasï, k'atari

Table 1: Numerals 1-20 in Purepecha

The first key observation is that, some orthographic conventions and morphological divisions aside, the five sources strongly agree as to the form of the numerals, even if many of them have fallen into desuetude in some varieties. One to six are clearly monolexemic, with seven, eight, and

[13] Note that Beals and Carrasco, in their much earlier (1944) presentation of the same game, give the variant *sïki*, (see Section 3.1).

[14] Beals and Carrasco (1944) give the alternative *koliɸʌ*. These variants will be treated later in Section 3.

[15] Beals and Carrasco (1944) give the variant *jerápajti*. I am unable to find a suitable analysis for either term, since no roots with the form *je-* or *jera-* can be identified. I will therefore not consider this term any further.

nine being transparent compounds of five plus two, three and four respectively. Ten and twenty are also monolexemic, whereas 11 to 19 are compounds composed of ten plus the lower numerals (1-9). The fact that we only observe monolexemic forms to six, and thereafter compounds, indicates that the numeral system is not a pure vigesimal one (which would imply monolexemic, underived forms from 1-20, a structure that is very rare cross-linguistically), but rather a hybrid one (see also De Wolf, 2013: 27). The monolexemic nature of six is unexpected, since there is no indication elsewhere, such as in the form for 12 or 36, that base six ever formed part of the Purepecha numeral system. I will discuss the possible etymologies of this, and other numeral terms, in Section 3.1. The alternative forms provided by Olmos (2013), in relation to two autochthonous games of Michoacán, are mostly difficult to account for, both language-internally or in terms of contact, but will be discussed where possible.

3.2 One to five

The term for 'one' *ma*, the only monosyllabic numeral in the counting sequence, also functions as the indefinite article 'a, one'. Singularity, according to Stampe (1976: 597), "is born of cardinality." He states that the indefinite article (the form that the grammatical singular takes) is commonly derived historically from the number one, as in English and many other Indo-European languages. The meaning and position of *ma* in contemporary Purepecha are the result of a multi-stage evolution, whereby the numeral has fully grammaticalised to also become a generalised indefinite article, passing through the stages of presentative marker, specific-indefinite marker, and non-specific indefinite marker (see Chamoreau, 2012a for an extensive discussion; see also Bellamy, Parafita Couto and Stadthagen-Gonzalez, 2018). Traditionally, *ma* is found pre-nominally, but in some villages it occurs, innovatively, post-nominally, sometimes in semantic opposition to pre-nominal *ma* (again, see Chamoreau, 2012a).

A suffix with the same form, *-ma*, combines with two deictic stems: firstly it attaches to *i-* 'this' to form the distal (and not visible) demonstrative pronoun *ima* 'that', which is also used as the third person singular personal pronoun 'he, she, it' (see also Foster, 1969: 172).[16] Combined with the demonstrative stem, definite semantics are suggested, in a similar vein to the specific-indefinite and cliticised specifying functions mentioned above.[17] Secondly, *ma* also combines with

[16] Note, however, that Gilberti (2018 [1558]: 237) states that *yma*, his rendering of *ima*, means 'aquesse' (that [one], i.e. a distal demonstrative but without any reference to the visibility of the referent) and *hinde* (from the root *ji-* plus the suffix *-nti*) has the function of the distal, non-visible demonstrative. The modern-day distal *inte* has taken the place of *hinde,* while *ima* has shifted to encompass also the non-visible semantics. In other words, the singular demonstrative pronoun system has collapsed from a four-way differentiation to a three-way one, where the feature [± visibility] has been retained over the combined features of [±distance] and [± visibility].

[17] Note that Friedrich (unpubl.) also gives the alternative form *a-má* 'over there (adv.), that (modifier)', but I believe this to be a dialectal variant of *ima* rather than an additional form.

tsï-, the stem for third person plural pronoun to form *tsïma* 'they', which also has a demonstrative function. Gilberti (2018 [1558]: 237) defines *thsima* as 'aquellos que estan un poco lexos' (those that are a bit far away; all translations from the Spanish are by the author), again indicating the definite nature of the referents. Note the formal similarity between *thsima* 'those' and the numeral *tsimani* 'two', which may not be coincidental.[18] One may wish to analyse the first two numerals as 'this one' (i.e. one), followed by 'those, those ones' (two); moreover, the connection of the first two numerals as a semantically related pair could also find its parallel in three and four (see below).

The alternative form *sikï* 'one' (or s*ʌkɨ*, according to Beals & Carrasco, 1944, where the central and front vowels are inverted) is found in Olmos (2013).One might wish to connect this form with the Nahuatl *se* 'one' (Sischo, 2015: 113), where the vowel is raised to [i], a feature of many Purepecha varieties (Chamoreau, 2009). The speculative nature of this connection is compounded by the fact that a plausible explanation for the suffix *-ki* or *-kï* is not forthcoming. As such, I will not pursue this form any further.

Moving on to *tsimani* 'two', we find support for the tentative 'those ones' etymology proposed above in Foster (1969: 157-159), who presents this numeral as the three-morpheme form *ci-ma=ni*. However, she gives no translation or analysis for any of these morphemes, claiming only that "numeral stems are formed by compounding numeral stems to other stems some of which are found as independent verbal stems" (Foster, 1969: 157). I take this to mean that the stem *ci-* is compounded with the stem *ma-*, and is then substantivized with the suffix *-ni*, one of three such terminal suffixes but the only one for which Foster provides no analysis.[19] Indeed, this suffix occurs again only in *tempeni* 'ten', which she analyses as *te=mpe-ni*.[20] Friedrich (unpublished), however, offers no meaning for the root *tsi-* alone, only in combination with locative space suffixes (e.g. *tsi-NaRi-* 'to awaken') or in reduplicated forms (e.g. *tsi-tsi-mu-* 'to eat with pleasure', here combined with the 'oral' locative space suffix *-mu*). As such, this analysis remains tentative.

Tanimu 'three' (from the root *tani-*) and *t'amu* 'four' (from the root *t'a-*) may be related by phonetic analogy, more specifically by alliteration and rhyme, a common means for coining

[18] In some contemporary varieties of Purepecha, we find a merger of /ï/ and /i/, although it is unclear how recent this phenomenon is (see Friedrich, 1971b: 174).

[19] A discussion of these so-called substantivisor or nominal suffixes can be found in, for example, Bellamy (2018), Capistrán Garza (2015), and Chamoreau (2003).

[20] Note that Foster (1969: 157) contradicts herself in the forms provided for the two numerals terminating in *-ni*. For 'two', she presents the final morpheme as a clitic (*=ni*) but in 'ten' it is a suffix (*-ni*). This contrast is most likely unintentional, since there is no principled reason to assume that the final morpheme represents the (optional) pronominal clitic *=ni*, when *-ni* also occurs as a terminating suffix in nouns, adverbs, cardinals, interrogatives and coordinators (Chamoreau, 2000: 315), all of which Foster (1969: 40) considers to be substantives (see Chamoreau (2014) for an overview of clitics in Purepecha).

especially adjacent numeral words cross-linguistically (Stampe, 1976: 256; Schapper & Klamer, 2017: 91 and references therein). One need only think of the 'yan tan tethera' sheep counting systems for a parallel, whereby consecutive numbers rhyme in pairs, as presented in Section 2. Consider also the Persian teen numerals, which are replete with examples of analogy: "Cl[assical] Pers[ian] *dawāzdah* '12' and *nawāzdah* '19' have their *-z-* from *sēzdah* '13' and *pānzdah* '15', and possibly from *yāzdah* '11'. *Šānzdah* '16' and various dialectal variants such as *sīnzdah* '13' have their *-n-* from (var.) *yānzdah* '11', *pānzdah*; Iranian Persian *hivdah* '17' and *hižđah* '18' have their vowel from (Ir[anian] Pers[ian]) *sizdah* '13'" (Bernard, 2019: fn 10).

Despite the stress on the second syllable (which indicates the root should be disyllabic since primary stress always falls on the root), it is possible that *tanimu* could derive historically from the root *ta-* 'to gather, collect', to which are also related the forms *támu* 'apart, separate, esp. living separately, keeping different accounts',[21] *táchan* 'each, each one' (see Section 3.3) and *ta-NguRi-* 'to join together, as in common law marriage, or for political meeting'. An alternative analysis could link *t'amu* 'four' (rather than 'three') with *tamu* 'apart', since the presence or absence of aspiration is not always clear to native speakers, let alone to the outside analyst (e.g. Velásquez Gallardo, 1978). One could therefore envisage a semantic scenario in which the numeral three, based on a root related to separating or joining follows the first two, definiteness-based, numerals to give the third and fourth steps in the counting sequence.

In many systems, the fingers are used both symbolically and practically for counting, and so may also occur as the numerical values for the lower numerals (Ibarra Grasso, 1958: 276).[22] Five, which becomes the end-point of the quinary counting sequence and therefore the base, is then often labelled 'hand', 'full hand' or 'fist' (Diakonoff, 1983). Take, for example, the Classical Nahuatl numeral *mācuīlli* 'five', which is derived from the noun *māitl* 'hand' (Sullivan, 2014). One hypothesis for the etymology of the lower numerals in Purepecha is that it was rooted in the iconic and symbolic use of fingers and hands to form number words. However, there is no evidence for such a development, in either synchronic or historical sources: the terms *jajki* 'hand', *k'erhutakwa* 'thumb', *kitsïk'ukua* 'fist', *kok'ukua* 'wrist' and *juntsïk'utarakwa* 'index finger' display no similarities with the lower numerals, for example (see also León, 1888). Indeed, the term for

[21] There are numerous examples of roots whose semantics are vague, and when combined with different formative suffixes, the resulting derived forms have opposing meanings. Take, for example, the root *mi-* to which I can ascribe no definite meaning further than 'related to opening/closing', which gives the derived forms *mi-ka-* 'to close' and *mi-ta-* 'to open' (but see Capistrán, 2015: 13-14). It appears that the root *ta-* displays similar behaviour.

[22] In Yurok (Algic, extinct), however, "the words for 7, 8, and 9 are the names of the three middle fingers of the hand. *Tserucek*, 7, means pointer, the index finger, from *tserwerc*, to point; *knewetek*, 8, means long one, the middle finger" (Dixon & Kroeber, 1907: 684).

'five', *iúmu*, composed of the otherwise unattested root *iu-* and the suffix *-mu* (as also observed in the terms for three and four), resists further analysis or etymology.

The second attested word for 'five' - *k'uilichi* - is found only in the name of a traditional game still played in the community of Angahuan, in the highland western part of the Purepecha-speaking region of Michoacán, known as the *Sierra* or *Meseta*, namely *k'uilichi ch'anakua*.[24] The term *ch'anakua* has perfectly transparent semantics, from the root *ch'ana-* 'play' plus the nominaliser *-kwa*, meaning simply 'game'. However, the first element, the one which interests us here, is much more opaque. Neither *k'uilichi* nor *kuilichi* are attested as a numeral in any contemporary or historical source, other than in presentations of this game (see notably. Olmos, 2013; Cabrera Torres & Pulido Méndez, 2005; Beals & Carrasco, 1944). A turn in this game begins by throwing four notched stick dice which, when they fall in a certain combination, are also termed *k'uilichi* or *kuilichi* 'five'. The game is generally translated into Spanish as the "onomatopoeic" 'game of the little sticks that make sound', but the component terms have no semantic connection with this name (Olmos, 2013: 23). Indeed, the Purepecha who play the game associate the word *k'uilichi* with the throw worth five points, leading Olmos (idem.), in somewhat circular fashion, to translate the name as 'game of five'. Some older players of the game, however, associate the word with the phrase *kurhi kuiritani*, tentatively translated as 'burn (imperative) - get hurt over there',[25] the name given to the movement or swing employed before throwing the stick dice. This translation may seem unusual, but makes more sense when we take into account part of the rules: "If a piece comes to rest on the points marked B, it is said to be burned and must be started again at A, but until it is put in play again it must rest at point C, *kurínɬkua* or bonfire" (Beals & Carrasco, 1944: 419).

This connection with fire and burning may also help us to understand an alternative name for the game, *kolíɬa atárakua*, where the first word is also used to refer to the throw worth five (cf. *kuilichi* above), and the second literally meaning 'make throw thing' (< *ata-* 'throw, hit', *-ra* CAUS, *-kwa* NMZR; Beals & Carrasco, 1944: 519-520). The first word is claimed to be a loan, since it contains the phoneme /l/ "otherwise absent from the language", of unknown origin (Beals & Carrasco, 1944: 519). Yet *koli-ɬa* could potentially be accounted for in language-internal terms, given its surface similarities to *kurhi-* 'burn, set alight'.[26] Two phonetic alternations support this link: first, [l] is found as a variant of [ɾ] in several Purepecha varieties, including some in the

[24] Beals and Carrasco (1944: 519) claim that the Purepecha game "is a version of *quince* or patolli", a pre-Columbian game played by a variety of Mesoamerican cultures. Olmos (2013), however, mentions no such connection.
[25] The Diccionario Grande gives the form *Qʰuirihtani* 'lastimarse alli (get hurt over there)', on which this translation is based.
[26] According to Fátima Gregorio (pers. comm.), *kurhini* can also mean 'join, bring (something) together', but I think this meaning is less relevant given the connection with fire in the game. I thank her for her input here.

Sierra (Chamoreau, 2009: 270) and second, [o] > [u] raising is also common in many Purepecha varieties (Villavicencio, 2004: 31-32; Friedrich, 1984: 57). However, no chronologically plausible set of phonetic developments can account for both forms.[27]

Alternatively, due to the observable orthographic variability, we may wish to assume that the initial velar stop in *kuilichi* lacks aspiration and thus is related to *kwimu* 'six', deriving from the same root (*kwi-*, meaning unclear, see below). However, the addition of the locative space suffix *-rhi* (pronounced [li] in this variety), referring to the body, and the nominaliser *-chi*, of unspecified meaning, is hard to reconcile with a numeral meaning. The final possibility is that the term *kuilichi* represents a borrowing from the Nahuatl word for 'five' *macuili* (Michoacán Nahuatl; Sischo, 2015: 64). It could be that the element *-cuili*, given its Purepecha-like form, was borrowed during the pre-Hispanic period, when contact between Nahuatl-speaking and Purepecha-speaking peoples was more intense than it is now. The Nahuatl term could have been reinterpreted as *ma kuili* 'one five', following Purepecha *ma* 'one', although the choice of nominaliser suffix (*-chi*) remains harder to explain. While I am inclined to prefer the first language-internal explanation, I think the borrowing account is not without merit. Nonetheless it should be emphasised that the etymology of this word remains somewhat perplexing.

3.3 Six to twenty

Generally in base five systems, the next monolexemic numeral is ten (Sidwell, 1999: 255). In Purepecha, however, *kwimu* 'six' is also monolexemic, comprising two morphemes, the root *kwi-* (also, importantly, written *cui-*) and the suffix *-mu*.[28] A highly dubious etymology for the numeral is provided by Basalenque (1886: 48), who states that *cu* refers to 'hand'. The noun for hand, *jajki*, bears no formal resemblance to the numeral six, and no other terms for 'hand' (or 'arm') with a similar form to *kwimu* can be encountered in any synchronic or historical sources. However, the suffix of locative space *-(j)ku*[29] displays the form to which Basalenque refers; its referents are the hand, wrist and finger, and its overall more abstract meaning 'manual' (Friedrich, 1971a). Yet on its own, *-(j)ku* cannot refer to 'hand', rather it must combine with a root, and optionally another locative space suffix, to indicate the location of an event or action, namely on or with the hand (note that the same misinterpretation is made by Andersen (1978) in her cross-linguistic study of bodypart terms). Moreover, its form is [(^{h})ku-] rather than the [k^{w}i-] found in the numeral; it seems that Basalenque has confounded *cu-* with *cui-*, perhaps due to orthographic similarities, or

[27] One might attempt the following development: *koli+tsi* (analogy with *ekuatsi* '20') > *kulitsi* (with raising of o > u as outlined in Friedrich 1971b) > *kulichi* (palatalisation triggered by [u]) > *kuilichi* (source of labialisation unclear), but this is highly doubtful to put it mildly.

[28] Note also the forms *cuichehcura* 'man with six fingers' and *cuichendura* 'man with six toes' attested in the *Diccionario Grande*, both derived from the root *cui-*.

[29] The (j) indicates the possibility of the suffix occurring with pre-aspiration, aspiration being indicated with /j/.

considers *cu-* to be separate either from *-i* and *-mu*, or from *-imu*, yet neither is a feasible analysis of the Purepecha word.

Thomas (1901: 874) provides a more semantically convincing account, stating that the numeral derives from the root *cu-* 'to join or mix one thing with another', a meaning supported by, for example, Friedrich (unpublished; see also *kúndantani* 'to join, link', Velasquez Gallardo, 1978: 59). In base five systems based on finger-counting, it is common cross-linguistically for the numeral six to refer to crossing over from one hand to the other, and so may etymologically be related to words such as 'cross over' (Schapper & Klamer, 2017: 293). An interpretation relating to joining, whereby six joins the full hand of five, would be tempting if Thomas hadn't made the same orthographic error as Basalenque, using *ku-* instead of *kwi-* as the basis for the analysis.

An alternative analysis is proposed by Foster (1969), who gives not *kuimu* but *k'uimu*, with an aspirated labialised velar stop as opposed to a non-aspirated one (recall the discussion of *kuilichi* 'five' above). This version of the numeral would derive from a root *k'ui-* 'to sleep, to have sexual intercourse; to whistle softly, to whisper'. Given the unrelated semantics, it is highly unlikely that Foster's phonetic analysis is correct. In Friedrich's (unpublished) Purepecha root dictionary, he translates the root *kui-* as 'carry (combined with a locative space suffix relating to a body part to indicate where the action of carrying occurs); to be seated crouched or bunched up'. The same root, *kuí-*, is also found in the noun *kuíni* 'bird, penis', representing a possible semantic connection I am currently unable to establish.[30] Velasquez Gallardo (1978: 151), however, brings us back to the notion of joining (see Thomas above), citing *kuínkuish* 'shoulder' and *kuinkúsh* 'elbow', body part terms that form a meeting point of two other parts (arm and body for the former, and forearm and upper arm for the latter), as well as *kuínskua* 'sister-in-law' (a woman joined to the family by marriage). An analysis of *kuimu* as related to joining, and perhaps as also the first in a third pair of numerals with six, therefore forming part of a derivational set in *kui-*, is tempting, although the semantic content of the suffixes remains opaque.

That six is monolexemic, and thus seemingly out of step with the rest of the numerals up to ten, may not come as such a surprise when we consider it from a typological perspective. In some languages the numeral from which counting starts again is not the highest consecutive simple number (Stampe, 1976: 600). Take English, for example: the numeral 'thirteen' is composed of 'three' plus 'ten' rather than of the unanalysable highest number, and its immediate predecessor, twelve. Moving to Mesoamerica, Mayo (Uto-Aztecan) possesses underived terms for

[30] The only vaguely feasible explanation for this connection could be that 'penis' here refers to a man or full man. Typologically, it is common for the terms 'man' and '20' to be synonymous or closely related (Luján, 2006: 82, see also discussion below). However, the connection to five rather than twenty severely weakens this hypothesis to the point where it should be discarded.

one to five *seenu, huepu'ulai* 'one', *guooyi* 'two', *baji* 'three', *naíqui* 'four', *mamni* 'five', with five seemingly functioning as a lower group numeral. *Busani* 'six' seems to have the sense 'one more than five', while *guoibusani* '7' has two prefixed to six, which could be understood as a 'second six' (I thank an anonymous reviewer for this suggestion), *guojnaiqui* '8' is formed of two prefixed to four, *bátani* '9' nine is not readily analysable, and *guojmamni* '10' is derived from two times five (see Colville, 1985: 288-290).In the same vein, Purepecha makes use of the more iconic five as the base for seven, eight and nine, although ten is monolexemic. Ibarra Grasso (1958: 280) refers to this development as "primitive decimalisation". It has been claimed that "the number sequence did not spring into existence fully formed, but rather it evolved stepwise from one numerical boundary to the next" (Menninger, 1992: 3). However, since we do not possess ancient enough sources for Purepecha, such a stepwise emergence has no empirical basis even if the hypothesis is tempting.

The numerals seven, eight and nine require little discussion, since they constitute transparent compounds of five plus two, three and four respectively (see Table 1). As such, let us pass directly to *témbini* or *témpini* 'ten'.[32] Both Foster (1969) and De Wolf (2013) explicitly analyse this numeral as comprising three morphemes: a root *te-*, whose meaning is unclear, a clitic or suffix *=mpe/-mpi* (more presently), and a nominaliser suffix *-ni* (called a 'substantive completing suffix' by Foster, 1969: 172).[33] The meaning of *-mpi/e*, as with many Purepecha suffixes, is hard to determine. It is found in the forms *ꞔi-ma=nta-mpe-ri* 'two times' and *t'a=nta-mpe-ri* 'four times', where it is claimed to be a classifier that combines with two other classifiers, *-nta* and *-ri,* to refer to 'times' (see *xampéri* 'time, interval'; Foster, 1969: 158).[34] Where *-mpi/e* occurs contrastively with another suffix, which is relatively rarely, Foster (1969: 132) notes that "the meaning seems to involve intrinsicality, association, reciprocity, or fiction, a semantic group from which it has proved impossible to extract any common denominator of meaning." The same suffix is also found in *ampe* 'something, what, that, why', where it functions as a "secondary stem morpheme" or "secondary demonstrative stem suffix" (Foster, 1969: 172), although the meaning of the root *a-* (as well as that of the suffix) remains unclear (cf. *amá* 'over there', which Friedrich (unpublished) claims is related).

[32] The orthographic differences constitute competing phonological vs. phonetic approaches to representing the language. Unvoiced stops, such as /p/, are voiced when they occur immediately following a nasal, giving [mb]. The vowel phonemes [e] and [i] have been merging in some varieties since the sixteenth century, and their distribution continues to be mixed across varieties, hence the different representations of the same word (e.g. Friedrich, 1971b).
[33] Foster (1969: 86) defines *-ni* as follows: "Words of all substantive subclasses terminate with {ni} with undetermined meaning. Themes underlying such constructions are often bound forms, occurring in no other construction." Such a statement can be made for many of the 56 identified substantive suffixes (see, e.g., Bellamy, 2018: ch. 6).
[34] Note that *-nta* alone can suffix to a numeral root in a claimed classificatory role, to give, for example, *t'a-nta* 'in four', *yu-nta* 'in five' (Foster, 1969: 159, examples slightly adapted).

A strong argument for a bimorphemic analysis of *tempeni* comes from the extensive presentation of numerals in the first published grammar of Purepecha, Maturino Gilberti's (2018 [1558]) *Arte de le lengua de Michuacan* (see also Chamoreau, 2009; Friedrich, unpublished). Here, various cardinal, ordinal and quantificational meanings are provided, such as (1), which indicate that the root for 'ten' is indeed *tempe-*, since it is only after this that the suffixes (here *-oro*, *-nda* and *-nde* plus *-ro*) occur.

(1) *temboro* 'ten'
tembenda 'ten times'
tembendero 'ten more'
(Gilberti, 2018 [1558]: 371; 374; 380)

Returning to the possible etymology of *témpeni*, I think it is important to note the formal similarity with *témba* 'dame, wife, woman, lady', *tembúni* 'to marry' (Velasquez Gallardo, 1978: 197; note that Friedrich (unpublished) also gives *tembú-* as a variant for the numeral root) and *tembuchakua* 'wedding, marriage' (Lathrop, 2007: 14). It could be suggested that *tempeni* 'ten' forms part of this derivational set and has a meaning related to joining, bringing together, or becoming a pair (as in a pair of hands, or fives). This is, of course, highly speculative, particularly as there is no obvious reference to hand for the number five. The teen numerals are compounds of ten plus the lower numerals, exactly as they appear below ten. They will therefore not be discussed further. I will now proceed to the numerals twenty and above.

3.4 Twenty and above

The forms for the numerals twenty and above can be observed in Table 2. Note that *ekwatsi* 'twenty' (and variant spellings) is monolexemic, having no connection to the terms for 'five' or 'ten' (or any other numeral, for that matter). Some authors present the numeral preceded by *ma* 'one', i.e. 'one twenty', but the presence or absence of this numeral is insignificant for the analysis that follows. Note that loanwords from Spanish are indicated by (L).

	Foster (1969)	**Ranta (2007) in Chan (2019)**	**Chamoreau (2009)**[35]	**de Wolf (2013)**
20[36]	e-kwa=ce	ma ekuatsi	ekwatsi	e-kuá-tse[4], má ekuátse

[35] Chamoreau (2000: 85) gives only *e'kuaɛ̈i* 'twenty' in the higher numerals therefore her contribution is not included in the table.
[36] Olmos (2013: 20) provides the following forms for 'twenty': *veinte* (clearly a loan from Spanish), *e(l)kuasï* (a variant of *ekuatsi*), and *k'atari*. The latter two forms are discussed in detail in this section. He also offers *treinte y cinco*

21	má e-kwa=ce	ma ekuatsi ma	ma ekwatsi ka ma	
22	ci-ma=ni e-kwa=ce	ma ekuatsi tsimani		
23	tani=mu e-kwa=ce	ma ekuatsi tanimu		
30	te=mpe-ni e-kwa=ce	ma ekuatsi témbini		má ekuátse ka témpeni
40		tsimani ekuatsi	tsimani ekwatsi	tsimán(i)-ekuátse
50		tsimani ekuatsi témbini		tsimani ekuátse ka témpeni
60		tanimu ekuatsi		tanímu ekuátse
65			tanimu ekwatsi yumu	
70		tanimu ekuatsi témbini		tanímu ekuátse ka témpeni
80		tʰámu ekuatsi		thámu ekuátse
90		tʰámu ekuatsi témbini		thámu ekuátse ka témpeni
100		iumu ekuatsi	syentu (L)	yúm(u)-ekuátse
200		témbini ekuatsi		témpeni ekuátse
300				témpeni ekuátse ka yúm(u)ekuátse
400		ireta	irepita	má irépita, irépita, katárhi
500				má irépita ka yúm(u)-ekuátse
600				má irépita ka témpen(i)-ekuátse
800				tsimán(i)-irépita
1000		tsimani ireta témbini ekuatsi	mili (L)	tsimán(i) irépita ka témpeni-ekuátse
2000		iumu ireta		

Table 2: Higher numerals in contemporary Purepecha

Twenty is used as the base for forming higher numerals, where the multiplier and the base are simply concatenated, such as *tsimani ekwatsi* 'forty' (lit. 'two twenty'), *tanimu ekwatsi* 'sixty' (lit. 'three twenty'), *tanimu ekwatsi témpini* 'seventy' (lit. 'three twenty ten'), up to *tempini ekwatsi* 'two hundred' (lit. 'ten twenty').[37] However, in example (2), we can observe a base ten formation for the numeral 'seventy' in a document from 1553. Since this is the only example in this text (as well

(borrowed directly from the Spanish) and *ma ekuatsi tembeni iumu o ikuasi* 'thirty-five' (lit. 'one twenty ten five'), where the second term (*ikuasi*) may be a local, shortened variant of *ekuatsi*, particular to this game. Note that the *o* separating the two forms is simply the Spanish 'or'.

[37] Note that De Wolf (2013) provides forms where the multiple of the base is connected to the additional element with *ka* 'and', viz. *tanímu ekuátse ka témpeni* '70' (literally 'three twenty and ten').

as more generally) of ten being used as a base to form a higher multiple – the rest all display the vigesimal construction just presented – it is assumed to be an aberrant form, possibly written by an individual not fully familiar with the Purepecha numeral system, or who was more familiar with the Spanish one.

(2) *mayamuni thanthzicata yuntziman tenpen pesos*

maiámu-ni	t'ants'í-kata	iúmu-tsimáni	témpini<u>pesos</u>	
pay-NF	signal-PTCP	five-two	ten	<u>pesos</u>

'I will pay the aforementioned 70 *pesos*.'
(adapted from Villavicencio, 2004: 51)

The most common, and only contemporary, way to refer to 'twenty' in everyday speech in Purepecha is *ekwatsi* or *ma ekwatsi* (lit. 'one twenty'). Only Foster (1969: 157) analyses the form as tri-morphemic (see also Section 3.1), namely as *e-kwa=ce*, with all other analyses explicitly or implicitly assuming a bimorphemic form *ekwa-tsi*. The latter analysis is far more likely, since *e-* is not attested as a root, whereas *ekua-* is meaning 'to line up or pile up, of *icha* class'[38] (Friedrich, unpublished; see also Friedrich, 1970), and as one of five configurational classificatory roots, referring to 'long objects piled up or a collection of them in parallel; bunch' (Capistrán, 2002: 332), see example (3).

(3) *pósti-icha* *ekwá-nu-s-ø-ti=ksi*

post-PL	long.object-SP.LOC.patio-PRF-PRS-ASS.3.S=S.3.PL

'The posts are on the patio one on top of the other or in parallel' (horizontal/vertical)
(Capistrán, 2002: 332)

Note additionally the associated derivative *ekwa-rhu* 'patio' (lit. 'the place where *icha* class objects (namely wood for the fire) are piled up'), where *-rhu* is a locative marker. One may therefore wish to connect *ekwa-tsi* 'twenty' with this classificatory root, as a term that brings together 20 objects of the *icha* class. However, Friedrich (unpublished) also states that *ekwatsi* (in the form *e-kua-ts,* for which he provides no analytical justification, viz Foster, 1969) can mean 'penis', as well as 'twenty'. It may be tempting to connect the meaning 'penis' with that of 'man', since the word for

[38] Friedrich (1970) identifies three numeral classifiers in Purepecha: *irha*, *icha*, and *ichu*, and refers to the grouping of objects into them as classes. The *icha* class accompanies long, one-dimensional objects (e.g. tree names), the *ichu* class, flat, two-dimensional objects (e.g. tortillas), and the *irha* class round, three-dimensional objects (e.g. pots; see Chamoreau, 1999: 150).

'twenty' is often the same or derived from the term for 'man', or 'full man' (where all the fingers and toes have been counted; Luján, 2006: 82 and references therein).[39] Nevertheless, I am more convinced by a classificatory account, given the not insignificant number of roots with semantics referring specifically to one of the three numeral classifier groups.[40]

Another form for twenty *-k'atari* - is attested in various early sources of Purepecha: *ma catari* (lit. 'one twenty'; Gilberti, 2018 [1558]), *ma katarhi* (de Lagunas, 2002 [1574]), *macatari* ('onetwenty'; Warren (ed.), 1991), and *makatari* (also 'onetwenty', de la Grasserie and León, 1896).[41] This term is also found as a form for 'twenty', referring to a throw of stick dice that is worth this amount, in the traditional game of *k'uilichi ch'anakua*, played in Angahuan in the *Sierra* (see Section 3.1). While the form is easily divisible into a root *k'ata-* or *kata-* (meaning unknown) and a suffix *-ri* (often used as an agentive nominaliser) or *-rhi* (also a nominalising suffix, but with unknown meaning; Foster, 1969: 87), no convincing etymology can be provided.

Gilberti (2018 [1558]) and de Lagunas (1574) both indicate that the two forms of twenty were used to count different objects. They claim that *equatze* was used to count coins, loaves of bread, tortillas, books, mats, needles, sticks, stones, apples, or round things (Gilberti, 2018 [1558]: 370; de Lagunas, 2002 [1574]: 211-212). Moreover, in early historical sources of Purepecha, namely court records from 1565 (from the village of Tarecuato) and 1602 (from the village of Uruapan), *ma equatze* can be found as a modifier for dates (4a-b) and ages (4c-d) respectively. Note that loans from Spanish are underlined.

(4) a. *[m]a equatze yun huriatequa cutsi* <u>*enero*</u>[42]
one twenty five day month January
'25th January'
(Monzón, 2018: 68; 88)

(4) b. *ychutu huriaqua cutsi himbo ma equatze yun tziman*
today day month POST one twenty five two
'Today, day 27 of the month'
(Monzón, 2018: 96)

[39] I would like to thank Chams Bernard for his input on this point.
[40] See, for example, *karú-* 'to break, tear, ref. ichu class', *katsï-* to break, be broken, of icha class, *t'achú-* 'to flatten, of iRa [i.e. ihra] class' (Friedrich, unpublished).
[41] De Wolf (2013: 26) also mentions *katárhi*, but as a third variant for '400' (after *má irépeta* and *irépita*). This is assumed to be an error.
[42] The alternative *[m]a equatze yum huriatequa cutsi enero*, where *yum* 'five' terminates in the expected *-m* rather than *-n* (as in (1a)) is also attested (Monzón, 2018: 88). The difference in nasal consonant is likely due to assimilation, or scribal inconsistency, or both.

(4) c. *tziman equatze yum vexurin*
two twenty five year
'45 years [of age]'
(Monzón, 2018: 73; 76)

(4) d. *ca hihtuni yya ma equatze ca tempen vexurin*
and I.too already one twenty and ten year
'And me too already 30 years ago'
(Monzón, 2018: 128)

In contrast, as a general rule *ma katari* (or *catari*) was used to count animates, clothes, footwear, fields, rivers, [water] springs, lakes, villages, beams, planks, and things for embroidery such as string. It is the only term for twenty attested in a second set of numerals, where the roots for the numerals 1-19 are suffixed with *-(po-)ro)*.[43] These numerals were used to count heaped loads or things, shoes, sandals, sources, rivers, fields, savannahs, villages, words, articles, commandments, virtues, etc. "In this counting sequence pairs, parts, languages, things like trees, etc. also figured, and one could say one pair, two pairs, etc., a part, two parts, a language, two languages, one type of tree, two types, and so on" (Gilberti, 2018 [1558]: 370), see (5).

(5)

maro	'one'	*temboro maro*	'eleven'
tzimoro	'two'	*temboro tzimoro*	'twelve'
taniporo	'three'	*temboro taniporo*	'thirteen'
thaporo	'four'	*temboro thaporo*	'fourteen'
yuporo	'five'	*temboro yuporo*	'fifteen'
cuiporo	'six'	*temboro yuporo*	'sixteen'
yun tzimoro	'seven'	*temboro yun tzimoro*	'seventeen'
yun taniporo	'eight'	*temboro yun taniporo*	'eighteen'
yun thaporo	'nine'	*temboro yun thaporo*	'nineteen'
temboro	'ten'	*ma catari*	'twenty'

(Gilberti, 2018 [1558]: 370-371)

[43] The suffix *-poro* is not limited to numeral stems, but can refer to 'types, ways' with other roots: *vaporo* 'many ways, many types, many deals' (Xa), *yaporo* 'all types, all ways' (Xb), and *xaporo* 'so/that much/many [things] (Warren (ed.), 1991).

In the late sixteenth century *Diccionario Grande* (Warren, 1991) we find further examples of these forms, whose translations notably emphasise the 'type, kind' element of the description provided by Gilberti above: *tzimoro* 'in two ways, two manners'; *taniporo* 'three things, three ways', *temboro* 'ten things, ten ways, ten shops/deals (*negocios*)'. Similarly, the question word *namuporo* 'how many things? how many ways, types, styles?', contained the same suffix (citation form: *namuni*), and also required an answer containing it, such as *máro eti* 'it is one thing; it is one', *tzimoro eti* 'they are two [things]' (Gilberti (2018 [1558]): 372).[44] Many other suffixes, and suffix combinations, can attach to the numeral stems to give a variety of quantificational-like meanings, but they are too numerous and their analysis too complex to pursue further here (see Foster, 1969: 158-159; Gilberti, 2018[1558]: 369-384).

In sum, it appears that *katari* was used to count animates, objects that are generally long, sometimes also thin, as well as things that occurred in pairs or parts, whereas *equatze* applied primarily to two- or three-dimensional round objects, but also to some flat and long objects, as well as dates and ages. We might expect *equatze* to refer to long, thin objects, given that its root (*ekwa-*) refers directly to such objects, yet *k'atari* is used to refer to the particular combination of stick dice (long, thin objects) in the traditional game of Michoacán *k'uilichi ch'anakua*.[46]

The next power, twenty times twenty (i.e. 400), is also the next monolexemic term: the clearly non-numeral word *irepita*. It is used to form multiples higher than itself, such as *tsimáni irépita* '800' (lit. 'two 400') and constitutes the highest monolexemic numeral in the language.[47] This numeral is also particularly noteworthy: the term derives from the semantically transparent root *ire-* 'to live, related to living', from which we also find the nouns *irecha* 'king, leader' and *ireta* 'town, community'.[48] The first suffix, *-pi-*, may well constitute the locative space suffix referring to 'ground' (e.g. Capistrán, 2015: 196, 208; Friedrich, 1971a: 72-73), giving a rough compositional

[44] This contrasts with *namuchex?* 'how many living things? how many beings? to which the answer is, e.g., *tanichetix* 'they are three beings' (Gilberti, 2018 [1558]: 372).

[46] The presence of different terms for 'twenty' also recalls the system present in many Mayan languages, which generally have two basic terms (*winik* and *cal*), as well as few special terms that vary between languages (Colville, 1985: 776). For example, some Western Mayan languages use *tab/tob* for the independent form, and *winik* for the multiplicand functions, while Kanjobal and Jacaltec (also Western Mayan) use *cal* for the independent form of 20 and the odd multiples, reserving *winik* for the even multiples. A comprehensive overview of these score counts can be found in Colville (1985: 778).

[47] León (1888: 6) also mentions the higher monolexmic term *zutupu* '8000', also meaning 'bag', which he had been given by his informant Moxó. However, he also notes that he had never heard it elsewhere, nor encountered it in any work or manuscript. It appears that Moxó has provided the Purepecha translation of the Nahuatl term for 8000, *cenxiquipilli* 'one bag', also found as *sutupu* (Velásquez Gallardo, 1978: 186).

[48] Bellamy (2018b: ch. 6) notes that roots have varying degrees of semantic transparency, whereby some, like *ire-*, can be assigned a clear meaning whereas others, such as *kuru-* cannot really be assigned any meaning since they form the basis of semantically unrelated forms (see also Capistrán, 2015).

meaning of 'living area place/thing'.[49] This would make sense given that 400 here could relate to the approximate number of inhabitants of a regular-sized community, distributed over a certain area.[50] Gorenstein and Pollard (1983: 63) define five settlement types in the proto-historic period (1450-1520 CE) in the Pátzcuaro basin, location of the former capital of the Purepecha or Tarascan State. Their fourth type contains between 100 and 500 inhabitants (mean = 300), and is the most common. While there is no documentary evidence of such a link, since the word surely predates the first attestations of written Purepecha, it nonetheless seems reasonable to connect *irepita* with this frequently occurring settlement type of a similar number of inhabitants.

Multiples of 400 are formed analogously to multiples of twenty, that is concatenating a unit numeral with *irepita*, such as *tsimani irepita* '800' (lit. 2 400), *iumu irepita* '2000' (lit. 5 4000), *tempeni irepita* '4000' (lit. 10 400). Note that here too there is no explicit multiplier to connect the two numerals. Similarly, numerals that are not precise multiples are formed in the same way, with the addition of an amount formed by multiples of twenty, as in *iumu tsimani irepita ka tempeni ekuatsi* '3000' (lit. '7 400 and 10 20', where a multiplier function is assumed between each concatenation of two numerals, but *ka* 'and' is explicit and represents addition).[52]

From 200,000 upwards, we can observe the combination of *equatze* '20' and *katarhi* '20', since this is the only way to form a large enough multiplier for 400 in the first part of the numeral, as in examples (6a-c).

(6)	a	*makatarhiequatze*	*yrepeta*	*cacuim*	*equatze*	*yrepeta*
		one.20.20	400	and.six	twenty	400
		'200,000' (literally [(1x20)x20]x400+[(6x20)x400] = 208,000)				
		de Lagunas (1574: 120-125)				

(6)	b.	*makatarhi*	*equatze*	*catemben*	*yuntham*	*equatze*	*yrepeta*
		one.20	20	and.ten	five.four	twenty	400
		'300,000' (literally [(1x20)x20]+[(10+9)x20]x400 = 152,400)					
		de Lagunas (1574: 120-125)					

[49] Note, however, that León (1888: 5) considers *irepita* to come from *Ireri* or *Irecha* 'Señor', meaning 'the larger number or one higher than all others'.

[50] In an alternative analysis, *-pi* may represent the 'qualifying' (Chamoreau, 2003: 131), 'attributional' (Foster, 1969: 107), or 'property concept formative' (Capistrán, 2015: 147) which, when followed by *-ti*, forms what are commonly referred to as adjectives (see also Capistrán, 2013). Foster (1969: 108-109) also states that "[n]umeral stems with {pe} have the meaning 'to be of that number'", as in *tani=pe-ni* 'to be three'.

[52] I thank an anonymous reviewer for encouraging a more detailed treatment of the higher numerals.

(6) c. *tziman katarhi equatze, cayuntanim equatze yrepeta*
two 20 20 and.five.three 20 400
'400,000' (literally [(2x20)x20)]+[(5+3)x20]x400 = 64,800)
de Lagunas (1574: 120-125)

In all examples, we observe that *(ma)ekuatsi* '20', *(ma)katarhi* '20' and *irepita* '400' only ever occur singly - where 20 times 20 is required, for example, both forms for 'twenty' are combined, never the same one twice. However, we also note that none of the forms presented in (6a-c) gives the numeral they should. In (6a), this is likely due to a miscalculation or a transcription error concerning the incorrect *cuimu* 'six' for the correct *yumu* 'five' in the second part of the calculation. Moreover, it may be possible to account for the seemingly huge calculation error in examples (6b-c) if we assume the systematic omission of *irepita* '400' after the concatenation of the two 'twenties' (see also the forms in Appendix 1). If we assume that this is indeed the case, then the result of (6b) would be 312,000 and (6c) 384,000. While these figures are still 12,000 and 16,000 out respectively (which could be expected given that mental calculations of such amounts are more complicated in a vigesimal than a decimal system), they are much closer than the unomitted versions, and also show a strong degree of conventionalisation. That said, the possibility remains that these higher numerals were constructed for the purposes of presenting the system rather than as a reflection of standard usage. Furthermore, only de Lagunas (1574) provides a list of these higher numerals, so the (in)accuracy of their forms cannot readily be verified. Note finally that Colville (1985: 369) suggests that the lack of higher numerals may be due to Spanish influence, or it may simply be that such large amounts did not need to be enumerated in daily life.

4. Areal discussion

4.1 Mesoamerica as a linguistic area

As indicated in the introduction, the presence of a vigesimal numeral system is one of the five core diagnostics for the inclusion of a language in the Mesoamerican linguistic area (LA). On the basis of this, and the alleged presence of seven other features, Purepecha is considered part of the Mesoamerican linguistic area (Campbell et al., 1986: 556; cf. Chamoreau, in press, who states that only the vigesimal numeral system is present). Indeed Campbell et al. (1986: 546) claim that the vigesimal system is pan-Mesoamerican, occurring in almost every language, as well as in several languages considered beyond the conventional borders of the linguistic area, to both the north and south. Their claim is very strong: "We may conclude that this is also a true MA areal trait which was sufficiently strong to reach slightly beyond the conventional boundaries" (idem.). They

present the counting system of Tequistlatec as a representative example: this language seemingly possesses monolexemic terms from one to ten, but the teen numerals are omitted. Other sources indicate that they are formed by concatenating ten and the numerals one to nine, e.g. *imbama hnuli* '11' (10 1; Turner, 1967: 237). The term for twenty *anušans* is easily analysable as *anu-* 'one' plus *šans* 'man', serving as the base for multiples, such as *oge? hnušans gimbáma?* 'fifty' (2 x 20 + 10; idem.), as well as the higher power *anušans anušans* '400' (lit. 20 20)[53] and its multiple *oge? nusans anušans* '800' (lit. 4 20 20; Campbell et al., 1986: 546-547). Note that the term for 400 is a numeral compound, whereas in Purepecha *irepita* derives from the root *ire-* 'live, related to living'. Tequistlatec therefore displays a hybrid 10-20 system with no quinary component, a base synonymous with the term for 'man', and a simple arithmetic form for 400, none of which are found in Purepecha. Such internal differences suggest, therefore, that a more detailed scrutiny of these vigesimal systems is required.

To this end, the question arises: what does it mean for a language of the Mesoamerican LA to have a vigesimal system? If this feature is said to have diffused through many languages, belonging to multiple language families, how much variation should we expect (and also accept) between the systems? Comrie (2013), Yasugi (1995) and Colville (1985) all note variation in Mesoamerican languages regarding the formation of numerals below twenty. For example, in Classical Nahuatl the numerals one to five are monolexemic (with *macuilli* 'five' derived from *maitl* 'hand'), while six to nine are compounds of five plus one to four. *Matlactli* 'ten' also derives from the words for 'hand' and *tlactli* 'bust, torso of man' (i.e. the two hands), and forms the base for 11 to 14, which are compounded with the corresponding lower numerals (Sullivan, 2014: 189; Thomas, 1900: 866). The importance of five resurfaces in the monolexemic *caxtolli* '15', which then forms the base for the numerals 16-19. As expected in a vigesimal system, *cempoalli* 'twenty' (from *ce* 'one' and *poa* 'to count', lit. 'one count') is not a derivation of lower numerals, forming the base for higher multiples, e.g. *ompoalli* '40' (lit. 2 x 20). The next power, *centzontli* '400' transparently derives from *ce,* 'uno' and *tzontli,* 'hairs', another corporeal reference (recall the link between five, ten and hand and torso). Unlike Purepecha, Classical Nahuatl also possesses a term for the higher power 8000 (20 x 400), namely *cenxiquipilli* (from *ce* 'one' and *xiquipilli* 'bag'), suggesting counting to this extent was necessary, and therefore used by the speakers (Sullivan, 2014: 189-191). The Tetelcingo variety of Nahuatl, for example, retains this system whereby five, ten, fifteen and twenty are all expressed by single lexemes, indicating a hybrid five-ten-twenty system (see Tuggy, 1972: 72). Guerrero Nahuatl has also retained monolexemic terms for 5

[53] Colville (1985: 400, following Belmar, 1900: 76-78) gives the alternate form *malpucmashnuc* 4x(5x20) for 400.

(*macuili*), 15 (*kaštolih*), as well as one for 20 (*sempowalih*), but multiples of 200 or more have more recently been borrowed from Spanish (Chan, 2019; Sischo, 2015).

Evidence from just three languages - Purepecha, Nahuatl and Tequistlatec - already indicates that the internal structure of the respective numeral systems shares certain features, notably monolexemic terms for ten and twenty, and the use of twenty as a base for higher multiples. In contrast, it is also evident that this composition varies in distinct ways. First, each language has a different construction for the numeral twenty: a word meaning 'man' (Tequistlatec), a word meaning 'a count' (Nahuatl), and a word referring to 'a configuration of long objects' (Purepecha). Second, the next power (400, i.e. 20 x 20) has very different origins: a numeral compound (Tequistlatec), a single lexeme meaning 'some hairs' (Nahuatl), and a word likely referring to a settlement size (Purepecha). Third, only Nahuatl has an extensive set of numerals, stretching far beyond 400. In addition, Purepecha has a monolexemic term for 'six', unlike the other languages where it is '5+1', or a monolexeme in a series of non-derived terms to ten. Thus they all differ between each other in terms of their internal composition, extent, and dimensionality.

Yet despite these internal compositional differences, Campbell et al. (1986) consider the presence of a base 20 (in whatever form) and its subsequent use in forming multiples and higher powers to be a strongly diffused areal trait. This position is supported, with more detail and a great deal more data by Colville (1985), who presents a more refined areal picture. According to Colville (1985: 1), the numeral systems of Mesoamerican languages can be divided into two main groups: (i) the Central Mexican System, which "uses quinary features such as special terms for 5 and/or 15 which serve as bases for other number names", as well as a consecutive counting method he refers to as "undercounting"[54]; and (ii) the Eastern Mexican System, which is found only in Mayan languages[55] (and therefore could well be a phylum trait), and is characterised by a lack of quinary features and "an anticipatory, or *overcounting*, structure in the higher numerals" (Colville, 1985: 1, see also Yasugi, 1995: 80). The Central Mexican System is divided into four sub-groups, according to the presence or absence of lower group numerals (i.e. five, ten and fifteen),[56] as outlined in Table 3. Note that I have re-assigned some languages to different

[54] Undercounting refers to "consecutive incrementation constructions", as found in the English numeral system, for example 'twenty-one'. Overcounting, on the other hand, refers to anticipatory constructions of the Yucatec (Mayan) type *hun tu kal* 1-([ ]x20) '21' (Colville, 1985: 16; 191).

[55] Colville (1985: 759) further divides the Eastern Mexican System into two groups, with two further sub-divisions in each, on the basis of the presence or absence of special terms for particular numerals (e.g. 80, related to a quantity of cacao beans) and the point at which overcounting begins.

[56] A group numeral "is a term that represents some quantity of numerals in a particular numeral system, that is not composed of other basic numerals, and that may act as a multiplicand or base upon which to construct other derived numerals. [...] Thus, the group numeral reflects the predominant cyclic pattern of the system. [...] The lower group numerals in a vigesimal system would be other group numerals in the series below 20 that do not necessarily reflect

language families, in accordance with contemporary accepted classifications (Hammarström & Forkel, 2019).

Group	Lower group numeral(s)	Languages possessing this system (language family)
1a	10	• Chichimec, Matlazinca (?), Chocho, Chinantec, Subtiaba† (Oto-Manguean) • N. Tepehuan (Uto-Aztecan) • Tequistlatec† (Tequistlatecan) • Totonac, Tepehua (Totonac-Tepehua) • Huave, Cuitlatec† (isolates)
1b	5, 10	• Pame, Otomi, Mazahua, Matlatzinca (?)[57] (Oto-Manguean) • S. Tepehuan, Tepecano, Mayo, Cora, Huichol (Uto-Aztecan) • Texistepec, Mixe, Sayula, Oluta (Mixe-Zoque) • Purepecha (isolate)
1c	10, 15	• Ixcatec, Chocho, Mazatec, Amuzgo, Mixtec, Cuicatec, Trique, Zapotec, Chatino, Chiapanec, Tlapanec (Oto-Manguean)
1d	5, 10, 15	• Nahuatl, Pipil (Uto-Aztecan) • Zoque, Mixe (Mixe-Zoque)

Table 3: Presence of lower group numerals in Central Mesoamerican Languages († indicates the language is extinct), following Colville (1985)

In line with the observations above, Colville (1985) also recognises that Purepecha, Nahuatl and Tequistlatec possess different sub-types of vigesimal systems; he also presents data for higher multiples and powers, but does not use this for the purposes of sub-classification. Yet he considers these differences in internal composition minor enough to draw a very similar conclusion to Campbell et al. (1986), namely that the presence of a vigesimal numeral system in Mesoamerica is a widely diffused trait, so much so that it extends beyond its boundaries, south into Central America, and north in northern Mexico and the southern USA. He accounts for its diffusion through the various linguistic groups by means of extended contacts and multiple migrations, offering a chronology from the Formative period through to the Postclassic (c. 1500 BCE - 1500 CE;[58] Colville, 1985: 789-793). Following Kaufman (e.g. Kaufman, 1977), he claims that the vigesimal system was invented by Mixe-Zoque-speaking Olmecs (group 1d), probably around 1500 BCE, and was rapidly adopted by genealogically and geographically related groups,

the predominant cyclic pattern" (Colville, 1985: 15-16). Five and ten function as lower group numerals in many Mesomerican languages, forming the base for the numerals that follow, up to the next (lower) group numeral.

[57] Colville (1985: 281) is unsure whether Matlatzinca possesses unit numerals from one to seven, or whether six and seven are derived from the term for 'five'. If the latter is the case, then Matlatzinca should belong to group 1b.

[58] Following Coe & Koontz (2008: 236), the archaeological periods cited here are as follows: Formative/Preclassic (1800 BCE-150 CE, where the latest part is also termed Protoclassic), Classic (150-650 CE), Epiclassic (650-900CE), Postclassic (900-1521CE).

e.g. the Otomanguean-speaking groups in Oaxaca (group 1c), facilitated by trade contacts with central Mexico, the Isthmus of Tehuantepec and the Pacific coast (Colville, 1985: 790; 794-795).

The languages in Colville's group 1b, with the exception of the Mixe-Zoquean members, developed vigesimal numeral systems through interaction with Mesoamerican languages in different stages. Otomi was an early recipient, developing its system in the late Protoclassic or the early Classic, through contact with (presumably Mixe-Zoquean or Totonacan speakers) in Central Mexico (Colville, 1985: 800; see also Hull, 2019: 127 on the debate as to which language was spoken by the inhabitants of Teotihuacan). Mazahua may have possessed the same system before its split from Otomi (estimated at prior to 400 CE), but the other Oto-Manguean languages in the group acquired the system through diffusion, with the rise of Mesoamerican influence in West Mexico in the late Classic (600-900 CE). The non-Mesoamerican Uto-Aztecan languages in this group partially or fully borrowed the vigesimal system from Mesoamerican Uto-Aztecan groups that had already adopted it in the same period, or perhaps in the early Postclassic. Purepecha also started acquiring the vigesimal system around this time, although the source is unclear (see Colville, 1985: 798-800 for a detailed discussion).

In stark contrast to Colville (1985) and Campbell et al. (1986), Brown (2011: 200) suggests that the vigesimal counting system spread from Nahuatl to other languages of Mesoamerica much later, primarily during colonial times (i.e. from 1521 CE onwards). As the *lingua franca* of the Aztec Empire and then of New Spain, Nahuatl acted as the language of commerce and trade across a very wide area, necessitating the use of Nahuatl numerals in transactions. Indeed, during the early Colonial period, Nahuatl reached its widest geographical spread, which may account for the distribution of the vigesimal counting system beyond the boundaries of Mesoamerica as a linguistic area (a distribution also recognised by Colville and Campbell et al.). As far as the Purepecha are concerned, this scenario is very unlikely since little direct interaction between Central and West Mexico remained by the Middle Postclassic (c. 1200 CE), with participation in exchange instead limited to regional cultures (Toby Evans, 2004: 245-249). Moreover, by the mid-1400s, the Purepecha and the Aztecs were the most formidable of enemies (Gorenstein & Pollard, 1983: 1), generally not a socio-political situation that lends itself readily to intense interaction and therefore borrowing.

4.2 Re-considering pan-Mesoamerican diffusion

In both of the diffusion scenarios presented above, it is assumed that the vigesimal numeral system was borrowed from a more prestigious, core language (i.e. Nahuatl) to a less prestigious, more peripheral one (including Purepecha), on numerous separate occasions. Importantly, only the structure was borrowed, without the numerals; notably, no Mesoamerican language possesses

loan numerals, other than much later impositions from Spanish (Colville, 1985: 848; see also Yasugi, 1995). Moreover, there is no clear evidence that the means for forming twenty, be it 'one man', 'one count' or otherwise, was borrowed either; realistically one could assume that the recipient languages already possessed a term for this amount. The fact that only the structure was borrowed without its forms or compositional principles below twenty therefore enabled it to be superimposed on existing, possibly decimal, systems, some of which contained quinary components,[59] which were also "carried over into this new hybrid system" (Colville, 1985: 799). Such structural borrowing would imply intensive or longer-term interaction, "typically taking place under conditions of long-term bilingualism by the borrowers" (Kaufman & Justeson, 2009: 222). Yet Purepecha, for example, possesses few clear lexical borrowings from other languages of the Mesoamerican LA, let alone any identified transferred structures, other than from Spanish (e.g. Chamoreau, 2012b; see also Bellamy, 2018b). Indeed, a more detailed study of the Mesoamerican LA traits said to be present in Purepecha also reveals that only the vigesimal system can be identified (Chamoreau, in press). This would suggest that either little of the required intense contact occurred, or that Purepecha functioned as the donor language in such a hypothesised borrowing scenario (for which we also currently lack evidence). Could it be the case then that lexical borrowing was avoided, allowing structural borrowing in 'by the back door', as has been observed in the Vaupés region of the Brazilian Amazon (e.g. Epps, 2007)? In the absence of a written record prior to the colonial period for most languages, it is hard to lend greater credence to a particular proposed diffusion scenarios.

Yet interaction, here trade, as a catch-all explanation for the development or spread of a particular trait, in Mesoamerica as in any other defined linguistic or cultural area, has for some time received strong criticism in the archaeological literature(e.g. Englehardt & Carrasco, 2019). Diffusionism presented this way reduces the vigesimal system to a linguistic/cultural trait that is adopted by all the cultures it comes into contact with, seemingly without any agency. But to treat the numeral system like this risks falling back on a reductionist argument, that treats interaction as not only the primary cause of social evolutionary change, but also as the result (Englehardt & Carrasco, 2019: 8). This argument also evokes an outdated vision of Mesoamerica, whereby the vigesimal system spread from the "active" core Mesoamerican cultures to the more "passive" peripheral ones, which were then brought into the Mesoamerican sphere through the adoption of this prestige cultural trait, amongst others (see, e.g., Punzo Díaz, 2019: 263).

[59] The primacy of five in as a lower group numeral in many Mesoamerica languages may have provided the impetus for the development of the bar and dot numeration system found in pre-Columbian Mixe-Zoque and Zapotec writing (Colville, 1985: 796).

Such an over-reliance on core-periphery relations also reflects an out-dated view in archaeology, whereby intercultural contacts and interregional patterns of interaction are reduced to one dimension and one direction, namely the transmission of trait X from core language A to peripheral language B (Englehardt & Carrasco, 2019: 14). Yet to treat West Mexico, location of the Purepecha (amongst others), as a peripheral region of Mesoamerica, is to ignore the specific cultural configurations that characterised it, such as extensive trade networks (reaching as far as the southwestern USA), the development of metallurgy, and the emergence of a specific type of centralised state, best represented by the Tarascan (i.e. Purepecha) State (Gorenstein, 2000: 350). This is not to deny that interaction occurred between peoples, but rather to highlight that the vigesimal system may not have "careened" through Mesoamerican languages. A more nuanced contact scenario could be conceived of as a combination of regional and longer-distance interaction scenarios, with ideas and symbols flowing through a network of nodes rather than from a small number of centres outwards (Smith, 2003: 183). The development of such scenarios would require greater interaction between linguists and archaeologists, including a more valued treatment of the local.

4.3 Implications for Purepecha

Irrespective of whether one prefers the late Classic/early Postclassic or the colonial diffusion scenario, both imply that the vigesimal numeral system was superimposed onto an existing system, which is likely to have been decimal. While we might not expect to find loanwords in the formation of number words up to twenty, it might be reasonable to expect at least calquing in the construction of the base itself, as well as the forms for higher multiples (40, 50, 60, etc.) and powers (400, 8000). But in Purepecha we find only idiosyncratic terms for the base (*ekuatsi* '20') and its next power (*irepita* '400'), with no connection to the widely shared derivations relating to the body in the case of the former, nor to calculations with 20 or a connection with 'hair' (cf. Nahuatl) for the latter. On the basis of this system, coupled with what is known about prehistoric language distributions, migrations, and interactions in ancient Mesoamerica, two possible scenarios for the presence of the hybrid 5-10-20 system in Purepecha seem reasonable.

The first is that the vigesimal numeral system was not the single feature that Purepecha acquired via diffusion through the previously postulated Mesoamerican LA (cf. Chamoreau, in press), but instead was an internal development that happens to coincide. The internal complexity and lack of transparency of the lower numerals (especially with reference to *kwimu* 'six') suggests that the Purepecha system is attuned to the needs of its users; the use of a base twenty as the foundation for higher calculations would fit this model. One could envisage the need for the concept of twenty (*ekwatsi*) and its multiples in relation to a key local commodity, firewood, but

not necessarily for commercial purposes (initially at least). The configuration of objects, as well as their spatial and locative relations, are key concepts in Purepecha grammar, therefore their inclusion in the numeral system (i.e. the root *ekwa-*) is not surprising. Moreover, the data available to us in early historical sources of Purepecha suggest that the vigesimal system was already well entrenched in the language by their time of writing, being used for dates, ages and quantities. If anything, the late Postclassic/early colonial system possessed more complexity and flexibility than that present today. Importantly, the language possessed two terms for 'twenty', *ekwatsi* and *k'atari,* for counting different types of objects, which also suggests that the system is old and connected to other parts of the grammar (notably classifiers). The errors in the higher numerals cited in, for example, de la Grasserie & Leon (1896) suggest that the extent of the system was not that high, and therefore that larger numerals were perhaps not used frequently at the local level. In contrast to Nahuatl, for example, which can enumerate efficiently to 8000 and beyond, Purepecha numerals beyond just 800 are rather unwieldy. Had a more extensive numeral system been borrowed, then one might expect a higher extent in Purepecha.

The second scenario holds that the vigesimal system (above twenty) appears in Purepecha as a diffused Mesoamerican trait, with the caveat that it was not necessarily borrowed directly from a core "prestige" language in central Mexico, but possibly through regional interaction in West Mexico. It is certainly noteworthy that all of the languages in Colville's 1b group, with the exception of the Mixe-Zoque languages, occur on the periphery of Mesoamerica, at its western and north-western fringes. This distribution does not appear coincidental. It may be that the similarities between these numeral systems are one result of long-term regional interaction of many types, such as commerce, trade, inter-marriage, and elite relations (see discussion above). Furthermore, it is possible that Purepecha could have played a more major role in the propagation of the vigesimal system (at least at some point), given its emergence as a regional power in the early Postclassic, the latest period during which Colville (1985) claims that the numeral system could have been diffused. Such regional importance might even lead to the possibility that Purepecha was the regional donor of the vigesimal system, but this is highly speculative. Nonetheless, given the importance and socio-political complexity of the Tarascan State (1350-1521 CE), it is impossible that Purepecha speakers borrowed the Nahuatl numeral system structure at such a late point in their development (see the discussion of Brown (2011) above).

5. Conclusions

To recap the key features of the Purepecha counting system: In terms of **numeral base**, multiples from twenty to 380 are formed by concatenating a numeral from one to ten with *ekwatsi*

'twenty', while *irepita* '400' may represent the size of an average settlement, hence its link to the root referring to 'living' (*ire-*). The numeral 400 also represents the **extent** of the system. We also find monolexemic terms for five and ten, where ten also plays a core role in the formation of the teens. As such, the system can be considered **three-dimensional**. The **composition** of numerals is regular, with only *kwimu* 'six' being irregular in the sense that it does not adhere to the incipient base five system. This form also sets Purepecha apart from other languages in Mesoamerica, since no other system has underived numerals finishing at six.

The use of twenty as a base for higher multiple formation may reflect the pan-Mesoamerican convention, considered a highly diffused trait and one key diagnostic of Mesoamerica as a linguistic area (Campbell et al., 1986, Colville, 1985). If this is the case, the diffusion may have occurred at the regional level, in West Mexico, given the predominance there of languages sharing the same internal structure of their numeral systems. On the other hand, given how peripheral Purepecha is to the LA, if it belongs to it at all, it might be more appropriate to view the convergence of the systems as a structural coincidence grounded in the cognitive ease and greater efficiency some claim accompany counting with a larger base (Bender & Beller, 2011). In any case, both scenarios highlight the need for a more nuanced look at language contact and interaction in Mesoamerica, as well as for more detailed study, especially from a diachronic perspective, of Purepecha.

Appendix 1: Historical data

	Diccionario Grande (1591)	**de la Grasserie & Leon (1896: 91-92)**	**(Basalenque, 1886 [1714], Gilberti 1898 [1558], in Yasugi 1995: 255-256)**	**de Lagunas (1574: 120-125)**
1	ma	ma	ma	ma
2	tziman	tziman	tziman	tziman
3	tanimu	tanimu	tanimu	tanimu
4	thamu	tamu	tamu	tamu
5	yumu	yuma	yumu	yumu
6		cuimu	cuimu	cuimu
7	yuntziman	yun-tziman	yun-tziman	yuntziman
8	yuntanimu	yun-tanimu	yun-tanimu	yuntanimu
9	yunthamu	yun-thamu	tun-thamu	yunthamu
10	temben	temben	temben	temben
11	temben ma	temben-ma	temben-ma	tembẽ ma
12	temben tziman	temben-tziman		tembentziman
13	temben tanimu	temben-tanimu	temben-ca-tinimu	tembentanimu
14		temben-thamu		tembenthamu
15	temben yumu	temben-yuma		tembenyumu
16		temben-cuimu		tembencuimu
17		temben-yuntziman		tẽbẽyuntzimá
18		temben-yuntanimu		tembẽ yũtanimu
19		temben-yunthamu		tembenyunthamu
20	maequatze (numero), macatari (personas o animales)	maequatze, makatari	ma-ekuatze	maequatze, makatarhi
30	maequatze temben, macatari temben (hombres)	maequatze catemben	ma-equatze-ca-temben	maequatze ca tẽben
40	tziman catari (hombres, o carneros, cauallos, etc.)	tzimanequatze	tziman-equatze	tzimanequatze
50	tziman ecuatze temben	tzimanequatze catemben		tzimã equatzecatẽbẽ
60	tanimequatze (numero), tanicatari (hombres)	tanime equatze		tanime equatze
70	tanimequatze temben (numero), tanincatarei temben (hombres)	tanime equatze catemben		tanime equatze catẽbẽ

80	thamequatze	tamequatze	tham-equatze	thaniequatze
90		tamequatze catemben		thamequatze catẽben
100	yumequatze, yuncatari	yumequatze	yum-equatze	yumequatze
200	tembenequazte, temben equatze, temben catari [kuiripuecha]	tembanequatze		tembenequatze
300		tembenequatze ca yumequatze		tembenequatze, ca yumequatze
400		mayrepata	ma-urepeta	mayrepeta
500	mayrepeta ca yumequatze	mayrepata cayumequatze		mayrepetacayũeqĩtze
600		mayrepata catemben equatze		mayrepetacatẽbẽequatze
700		mayrepata catemben yumequatze		mayrepeta ca temben yum equatze
800		tziman yrepata		tziman yrepeta
900	tziman yrepeta cayum equatze	tziman yrepata cayumequatze		tziman yrepeta ca yumequatze
1000	tziman yrepeta ca temben equatze	tziman yrepeta catemben equatze		tzimã yrepeta ca tẽbẽ eqĩtze
2000				yumyrepeta
3000				yuntziman yrepeta, ca temben equatze
4000				temben yrepeta
5000				temben tziman yrepeta, ca temben equatze
6000				temben yum yrepeta
7000				temben yumtziman yrepeta catemben equatze
8000			maxkuatze irepeta	maequatze yrepeta
9000				maequarzetziman (sic) yrepeta ca temben equatze
10,000				maeqĩtze yũ yrepeta
20,000		tziman equatze yrepeta catemben yrepeta		tziman equatze yrepeta catemben yrepeta
30,000		tanim equatze temben yrepeta		tanim equatze temben yrepeta, ca yumyrepeta
40,000		yumequatze yrepeta		yumeqĩtze yrepeta
50,000		cuimequatze yrepeta ca-yum yrepeta		cuimequatze yrepetaca yum yrepeta

60,000				yuntanim equatze yrepeta
70,000				yuntanim equatze yrepeta, ca yum yrepeta
80,000				temben equatze yrepeta, catemben yrepe (sic)
90,000				temben maequatze yrepeta, ca temben yum yrepeta
100,000		tembentanime quatze yrepeta[60]		tẽbentanimequatze yrepeta
200,000		makararhiequatze yrepeta cacuimequatze yrepeta[61]		makatarhiequatze yrepeta cacuim equatze yrepeta
300,000				makatarhi equatze catemben yuntham equatze yrepeta
400,000				tziman katarhi equatze, cayuntanim equatze yrepeta
500,000				tanim katarhiequatze, ca tziman equatze yrepeta
600,000				tanim katarhiequatze, ca tembẽ yũ equatze yrepeta
700,000				tham katarhi equatze, ca yuntanim equatze yrepeta
800,000				yun katarhiequatze, camaequatze yrepeta
900,000		yum katarhicquatze catemben thamequatze yrepeta[62]		yum katarhiequatze, catembenthã equatze yrepeta
1,000,000	yrepetamendo, nomendo thantziqua			

[60] (13*20)*400 (=104,000!)
[61] [(1*20*20)*(400)]+[(6*20)*(400)] (=208,000!)
[62] [(5*20)*20]+[(10+4)*(20)]*400 (=883,200!)

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