

**Affixation Conventionalization:  
An Explanation of Regularly Disharmonic Spellings in Mayan Writing**

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**Abstract.** I propose that word-closing disharmonic spellings do not reveal information about the vowel complexity of the preceding syllable, as claimed by the disharmony hypothesis (DH) by Houston et al. (1998). Instead, I show that both synharmonic and disharmonic spellings are determined by the inflectional and derivational affixes a certain root or stem is more likely to take. I call this the affixation conventionalization hypothesis (ACH). I also argue that the ACH offers important insight into the origin of Mayan hieroglyphic spelling conventions. I present evidence that suggests that phonetic complements first arose not to disambiguate between two or more possible lexical readings for the same logogram, but instead, to disambiguate between the many inflectional and derivational combinations of a single lexical item represented by the same logogram.

**Key Words:** Mayan linguistics, Mayan epigraphy, disharmony, orthography, history

**1. Introduction.** The purpose of this paper is to discuss the development of some orthographic practices of the Classic Lowland Mayan script (A.D. 200-900) of Mesoamerica (Mexico, Guatemala, Belize, Honduras), including the conventionalization of phonetic complements and phonetic spellings. The orthographic practice pertains to the spelling of the second consonant in CVC sequences. Some such spellings follow a synharmonic pattern of the type  $C_1V_1C_2-C_2(V_1)$  or  $C_1V_1-C_2(V_1)$ , where the second vowel is silent but harmonizes in quality with the vowel of the preceding syllable. Other spellings follow a disharmonic pattern of the type  $C_1V_1C_2-C_2(V_2)$  or  $C_1V_1-C_2(V_2)$ , where the second vowel is silent and does not harmonize with the vowel of the preceding syllable. The first type is illustrated by spellings such as **b'a-la-m(a)** or **B'ALAM(-ma)** for Proto-Ch'olan *\*b'ahlām* 'jaguar' from Proto-Mayan *\*b'ahlam*, while the second is illustrated by spellings such as **TUN(-ni)** for Proto-Ch'olan *\*tun* 'stone' from Proto-Mayan *\*tooN*.<sup>1</sup>

I review a recent proposal by Houston et al. (1998, 2002) put forth to account for these orthographic practices from a linguistic perspective. Houston et al. suggest that disharmonic spellings of syllable-closing segments are indicative of vowel complexity in the preceding syllable, where vowel complexity refers to the presence of vowel length (V:C), vowel followed by a glottal stop (V'C), or vowel followed by a glottal fricative (VhC).<sup>2</sup> This proposal, which is sometimes referred to now as the Disharmony Hypothesis (DH), attributes a diacritical nature to disharmonic spellings (cf. **TUN(-ni)** for *\*tuun*), but theoretically not to synharmonic spellings. Based on my review of the proposal and the additional data I present here, I conclude that an earlier but rather cursory proposal by Justeson (1989), which I dub here the Affixation

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<sup>1</sup> The following abbreviations are used in this paper: C = consonant, V = vowel,  $C_1$  = same as previous consonant,  $V_1$  = same as previous vowel, \* = historical reconstruction based on comparative evidence. Also, the following phonetic symbols require explanation: <N> for [ɲ], <ā> for a mid central schwa vowel, <'> for glottal stop, <:> for vowel length. Unless otherwise stated, Proto-Ch'olan and Proto-Mayan reconstructions are based on Kaufman and Norman (1984).

<sup>2</sup> There is another proposal by Lacadena and Wichmann (2001) that assumes the correctness of the proposal by Houston et al. (1998) and aims to expand its applicability and to explore some of its implications for the history of the script, but I prefer to await for the final, published version of this second proposal before addressing it. I do cite their unpublished manuscript with regard to their discussion of the origin of certain spelling conventions.

Conventionalization Hypothesis (ACH), conforms more closely to the epigraphic and linguistic data than the DH. This proposal essentially suggests that it is the pattern of typical affixing of a spelled root or stem that is more likely to determine its standard spelling or sets of spellings.

In addition, based in part on the implications of the ACH, I present preliminary arguments against a proposal by Houston et al. (2001). This proposal is referred to as the Morphosyllable Hypothesis (MH), and it suggests that certain signs were neither logograms (i.e. signs representing units of meaning such as words) nor syllabograms (i.e. signs strictly representing phonetic sequences of CV and CVC syllable shapes), but instead something in between: signs that could act as syllabograms in some contexts, but also as logograms to represent grammatical markers in others. I show that the data suggests the existence of polymorphemic logograms in the script: logograms that could represent a root by itself or an inflected or derived stem with affixes. Then I show that such polymorphemic logograms optionally take syllabograms as phonetic complements to disambiguate which inflected or derived stem is meant to be read.

The implications for the origin of Mayan writing are clear: I suggest that syllabograms first arose as phonetic complements to disambiguate specific syntactic and semantic functions of polymorphemic logograms, rather than to disambiguate homophonic but unrelated lexemes represented by the same logogram. I conclude that what Houston et al. (2001) call morphosyllables may be simply, in origin and in practice, phonetic complements. While certain such phonetic complements may have become fixed with certain logograms due to tradition, there is evidence that the principles of polymorphemic logography and disambiguation through phonetic complementation were highly productive throughout the history of the script.

**2. The Disharmony Hypothesis (DH).** The main version of the Disharmony Hypothesis, henceforth DH, was put forth by Houston et al. (1998, 2002). I review this version in 2.1. In 2.2 I also review an insightful paper by Totokovine and Davletshin (2001) that discusses examples of frozen phonetic complements and their implications for the DH, which those authors assume to be correct. And in 2.3 I review part of a recent public discussion by

Justeson (2000) where he suggests that the phonetic complements that were of greater significance were not the disharmonic ones, but the synharmonic ones, specifically those of roots with the vowel ä.

**2.1. Houston et al. (1998, 2002).** Houston et al. (1998:276) have proposed that disharmonious vowels have a function unrelated to representing a final V(C) suffix or enclitic:

We propose another view, (1) that synharmonic spellings yield CVC or, more rarely, CVCVC roots, and (2) that disharmony marks additional, medial elements within roots: CV:C (which preserved Common Mayan \*CV:C or \*CV'C > CV:C) or CVhC (which preserved Common Mayan \*CVhC). To put this another way, disharmony registers what we call 'complex vowels': those with vowel length, a feature formerly thought to have been ignored in Maya script (Justeson 1989:33).

These authors thus argue that (CV)CVGC roots and words (G = /:, h, '/) were spelled syllabically following a disharmony rule: the last CV sign of a (CV-)CV-C(V) spelling of a (CV(G))CVGC word differs in its vowel from that of the preceding CV sign, resulting in (CV-)CV<sub>1</sub>-C(V<sub>2</sub>). For example, these authors suggest that the disharmonic vowel of the syllabogram **ki** in **B'AK-ki** (as in **u-B'AK-ki** or **AJ-B'AK-ki** or **AJ-b'a-ki**) indicates that the root of the word was long, \*b'aak and not \*b'ak, as reconstructed by Kaufman and Norman (1984:116) for Proto-Ch'olan. In this proposal disharmonic word-closing phonetic signs in general serve a marked diacritical function, while synharmonic spellings are unmarked spellings; as such, synharmonic spellings say nothing about the vowel complexity of the spelled roots (whether simple or complex), only disharmonic spellings could provide such information. There are some methodological flaws in Houston et al.'s (1998) proposal.

1) In Houston et al. (1998:Table 1) the authors list a great number of spellings but do not make explicit which of them are included in the data set that they use for analysis. This makes it difficult to assess the reliability of their analysis, since, as I mention next, there are problems with many of the terms they list (i.e. lack of etymological, semantic, and contextual controls). Houston et al. (2002), in an update of their first presentation of the DH, also fail to make explicit which spellings they have counted as evidence, adding only that "the numbers

include *only* those lexical items for which we are able to reconstruct the antecedent form.”

As I show next, this statement does little to clarify the situation.

2) Justeson (2000) and this author (Mora-Marín 2001) have pointed out that Houston et al. (1998) use hieroglyphic spellings whose meaning and etymology they do not know (e.g. **yi-chi**, which they nevertheless reconstruct as y-ich; **pa-xi** ‘month name’, which they reconstruct as paax; **MAN-ni**, which is a proper name with unknown meaning and etymology, but which they reconstruct as maan and forget that it is also spelled **MAN-na** and **MAN-ma-na**; **ki-ta**, for which they do not offer a meaning or etymology yet reconstruct as kiit; **k’u-ti-ma**, which they note is a “name connected with El Cayo” but for which they provide no meaning and no etymology yet they reconstruct it as k’utiim). Moreover, even though they emphasize that synharmonic spellings were not marked, and therefore that a complex vowel could be spelled synharmonically, the authors seem to reconstruct terms spelled synharmonically with short vowels, whether other lines of evidence point to the contrary (e.g. **ti-li** for Proto-Ch’olan \*tihl ‘tapir’, which they reconstruct as til; **tz’i-b’i** for Proto-Mayan and Proto-Ch’olan \*tz’ihb’, which they reconstruct as tz’ib’). Many of the spellings cited by those authors exhibit one or more of the following problems: their exact phonological shapes are not known, they lack semantic and etymological controls, they lack comparative evidence in support of a reconstruction. Following is a list of such spellings: **CHAN-na-ni**, **ch’a-ti**, **ch’a-hi**, **i-tz’a-ti** (1998:279); **pa-xi**, **na-li**, **mu-wa-ni**, **MAN-ni** (1998:280); **wo-hi**, **pi-ki**, **pi-si**, **yi-chi**, **pi-tzi** (1998:281); **ki-ta**, **K’AWIL-la**, **ni-la**, **ka-se-wa**, **SIJOM-ma**, **si-ya** (1998:282); **la-ka-ma**, **la-ta**, **MAK-ka**, **na-b’a**, **a-nu**, **ta-la** (1998:283); **ma-su**, **ku-nu**, **ku-yu**, **su-ju-yu**, **tu-ku** (1998:284). For none of these terms is it possible to know whether it had a CVGC or CVC shape, and thus all needed to be eliminated from the data set (Justeson 2000). Reconstructing them as CVGC or CVC on the basis of disharmony (or synharmony) of spellings, as the authors seem to do, amounts to proving a hypothesis by assuming it is correct, rather than by testing it.

3) Houston et al. (1998) also use spellings that they know contradict their proposal. In some cases they seem to ignore comparative linguistic evidence, and reconstruct the linguistic

item based on the hieroglyphic spelling, using their hypothesis as evidence for the reconstruction (e.g. **tz'i-b'i** and **ti-li** already mentioned above; **yi-ch'a-ki** for likely Proto-Ch'olan \*y-ihch'ak (Kaufman and Norman 1984), which they reconstruct as \*y-ich'aak; **ju-b'i** 'conch, trumpet', which they reconstruct as juub' despite presenting no comparative linguistic evidence supporting a long vowel). Justeson (2000) eliminated such spellings from his revised and extended data set. Houston et al. (2002) claim that the only example of a disharmonic spelling they admit may not have represented a syllable with a complex vowel nucleus is \*ihch'ak 'claw'. Nevertheless this is not the only case: the Proto-Ch'olan root \*ha' 'independent pronoun base' (Kaufman and Norman 1984:139), used for ha'-Ø PRO-3sABS 's/he/it, him/her/it' and ha'-ob' PRO-3pABS 'they/them', was most often spelled **ha-i**, despite the fact that it is reconstructible to Proto-Mayan with short vowel as \*ha'. Other examples, which I discuss in more detail below, include **yi-tz'i-na**, **jo-k'o-b'a**, and **u-k'i-b'a**. There are probably more cases that need to be discussed, but for now these will have to suffice.

4) The spellings of root transitive and intransitive verbs are also highly problematic, yet were included in the data set analyzed by Houston et al. (1998). Indeed, the spellings of root transitive verbs, with their characteristic synharmonic **CV<sub>1</sub>** root-closing syllabograms (e.g. **u-chu-ku-wa**, **u-tz'a-pa-wa**), cannot be used as evidence that CVC roots were never spelled disharmonically, as Houston et al. (1998, 2002) do, because of the fact that the most common status marker of root transitive verbs was likely one with a synharmonic vowel, \*-V<sub>1</sub>(w) (e.g. **u-chu-ku-w(a)** for u-chuk-uw 's/he/it carried him/her/it' and u-tz'ap-aw 's/he/it planted it'). Also, the spellings of intransitive verbs, with their characteristic **Ci** root-closing syllabograms regardless of the quality of the root vowel (i.e. **hu-li**, **ta-li**, **u-ti**, **hi-li**, **o-chi**), cannot be used as evidence for disharmony, because of the fact that the vowels of the root-closing syllabograms could easily be spelling the status marker that immediately follows intransitive roots in the completive status (e.g. **hu-li** for hul-i 's/he/it arrived', **ta-li** for tal-i 's/he/it came', **u-ti** for uht-i 's/he/it/ was finished/happened'). It is important to emphasize that a **Ci** syllabogram was used when the intransitive root spelled has an i vowel too (e.g. **hi-li** for hil-i 's/he/it rested'), showing

the i of the **Ci** syllabograms on intransitive verb spellings had nothing to do with the quality of the vowels. For these reasons it is necessary to eliminate spellings of root transitive and intransitive roots from the data set, something Justeson (2000) has done in his data set. In their update to Houston et al. (2002) now assume that the **Ci** syllabogram in the spellings of root intransitives is a remnant or vestige of the \*-i(h) ~ \*-i(k) ‘completive status’ marker of root intransitives in Proto-Mayan, but does not serve to represent such marker. However, there is evidence for the existence of such marker in Proto-Ch’olan and Proto-Western Ch’olan at least (Kaufman and Norman 1984), and it is thus quite likely that the word-closing **Ci** syllabogram of intransitives was used to represent precisely that marker. Justeson also eliminated suffixes such as **-wa-ni** and **-la-ji** whose final (disharmonic) vowel i may have been just part of the spelling of the reconstructed Proto-Ch’olan suffixes \*-wan-i and \*-laj-i ‘completive status of positionals’ (Kaufman and Norman 1984). Houston et al. (2002) have also removed **-wa-ni** or **-la-ji** from their data, though they do not explicitly state if it was for the same reason they removed the spellings of root intransitives.

5) Some of the attested disharmonic spellings are found in free variation with what I regard below to be fuller spellings of the same word in identical contexts. For instance, the glyph **ma-su** is attested in a title sequence both as **ma-su-l(a)-AJAW** (e.g. Tikal Stela 10:G10) and as **ma-su-AJAW** (e.g. Rio Azul earring); the **ma-su-l(a)-AJAW** spelling suggests a form mas-ul which was probably underspelled in the **ma-su-AJAW** form. Also **TUN-ni** is attested in a nominal phrase both as **u-LAKAM-TUN-ni-l(i)** (Tikal Stela 12:D3) and **u-LAKAM-TUN-ni** (Quirigua Stela I:C3-D3), as well as **u-TUN-ni-l(i)** (e.g. Copan Hieroglyphic Stairway) and **u-TUN-ni** (e.g. Nim Li Punit Stela 15:E1). In these examples the i of the suffix -il in the form tun-il in **u-LAKAM-TUN-ni-l(i)** appears to be underspelled in **u-LAKAM-TUN-ni**.<sup>3</sup> Underspelling accounts for many cases of spelling variations in

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<sup>3</sup> Houston et al. (2001:30) have suggested that when possessed a noun may not take a possessive suffix unless followed immediately by the possessor. The example of the possessed noun phrase **LAKAM-TUN-ni** on Quirigua Stela I:C3-D3 is immediately followed by its possessor at D3-C4, **TIL(-ti-li)-wi CHAN-na yo-AT-ti**, yet it lacks an explicit -VI possessive suffix.

identical morphosyntactic contexts; some of these spelling variations lead to a false appearance of disharmonic phonetic complementation, as the case of **TUN-ni** vs. **TUN-ni-l(i)** illustrates, yet Houston et al. (1998, 2002) do not consider them in their discussion. Underspellings, as I show below, constitute one of the two major lines of evidence in favor of the ACH approach.

6) Some of the attested disharmonic spellings are maintained in different morphosyntactic contexts where the vowel of the word-closing syllabogram could very well be used to spell the vowel of a following suffix. For instance, **na-b'i** is attested both as **a-na-b'i** for a(j)-na(h)b' in a context where a(j)+na(h)b' is unpossessed (Naj Tunich Drawing 29), and as **ya-na-b'i-l(i)** for y-a(j)+na(h)b'-il in a context where a(j)+na(h)b' is possessed and likely required an -il possessive suffix whose vowel i could have been easily provided by T585 **b'i** (Naj Tunich Drawing 29). The same may have been the case for **TUN-ni**, which could appear unpossessed as **TUN-ni** in some contexts (e.g. Palenque Tablet of 96 Glyphs), and possessed as **u-LAKAM-TUN-ni-l(i)** (e.g. Tikal Stela 12:D3) or **u-TUN-ni-l(i)** (e.g. Copan Hieroglyphic Stairway) in others; or the case of **e-b'u** for ehb' 'step', which could appear unpossessed as **e-b'u** in some contexts (e.g. Copan Ante Step), and possessed as **ye-b'u** (Naranjo Hieroglyphic Stairway 1 Step XI:W1) or **ye-b'u-li** (e.g. Copan Hieroglyphic Stairway), possibly for y-ehb'-ul 'his/her/its step', in others. This third point also forms part of the basis of my proposal for explaining disharmonic spellings below.<sup>4</sup>

7) The DH by Houston et al. (1998) requires that another hypothesis, the "morphosyllable" hypothesis (Houston et al. 2001), be correct. Houston et al. (2001) suggest that morphosyllables constitute a distinct type of sign which combines the traits of logographic and syllabic signs: they are based on the values of CV syllabograms but have grammatical (inflectional or derivational) functions. Their values are only partly provided by the CV

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<sup>4</sup> It is possible that the instance of **te-mu** (K1524) for 'throne' could parallel the **ye-b'u** case, since it appears to be preceded by **u**, yielding **u-te-mu**. Unfortunately, it is unclear to me whether the sign that follows the **mu** syllabogram is a **li** sign, on the one hand, or whether there are any other instances of this glyph in the first place, on the other hand. So for now not much can be said about it.

syllabograms they are based on, the reader fills in the rest. For instance, they suggest that T130 **wa** functions to spell -V<sub>1</sub>w ‘plain status of root transitives’ in examples like T1.710:130, which in their view should not be read **u-CHOK-wa**, but **U-CHOK-WA** for u-chok-ow (i.e. perhaps more accurately stated as **U-CHOK-WA = U-CHOK-V<sub>1</sub>W = U-CHOK-OW**, although those authors do not express it thus). Other examples include T17 **yi** as **-YI** (i.e. -V<sub>1</sub>y), T24 **li** as **-IL**, T57 **si** as **-IS**, T181 **ja** as **-AJ**, and T585 **b’i** as **-IB’**.<sup>5</sup> The authors define T130 **-WA** and T17 **-YI** as regular morphosyllables, by which they seem to mean “vowel harmonic,” and the rest as irregular, by which they mean that the vowel of the suffix is not determined by the root they attach to in a predictable way (2001:16).<sup>6</sup>

Houston et al. (2001:15) argue that morphosyllables “further underspecify by suspending disharmony.” This, they argue, is clear in examples like the alternation between unpossessed **K’AWIL-la** (which they transliterate as **K’AWI:L-la** for k’awi:l), where the disharmonic **la** sign is supposed to indicate a long vowel i: in the preceding syllable, and possessed **u-K’AWIL-wi-la-li** (which they transliterate as **U-K’AWI:L-wi-la-IL** for u-k’awi:lil, assuming the correctness of both the disharmony and morphosyllable hypotheses), where the disharmonic **la** sign is also present but followed immediately by **li**, which the authors argue is purely a morphosyllable in function in this context (i.e. **-IL**). In other words, they argue that **la** has a silent vowel a in this context, and is therefore a case of vowel insertion (cf. Bricker 1989) that

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<sup>5</sup> Houston et al. (2001:16) transliterate T17 **yi** as **-YI** when interpreting it as a morphosyllable, even though they propose it represents a suffix -V<sub>1</sub>y. The same is true for T130 **wa**, which they transliterate as **-WA**, even though they interpret it as representing -V<sub>1</sub>w. It seems to me like a better transliteration would be **-VY** instead of **-YI** and **-VW** instead of **-WA**, if one assumes morphosyllables exist.

<sup>6</sup> Justeson (1978, 1985, 1989), Fox and Justeson (1984a, 1984b), and other authors as well, such as MacLeod (1984), have presented the analysis of certain phonetic signs that were used in some cases to spell grammatical morphemes as both phonetic and logographic. One such example is T181 **ja**, which they have transliterated as **-AJ** in some contexts, T24 **li**, transliterated as **-IL** in some contexts, and T1 **u**, transliterated as **U-** in some contexts. Thompson (1950:282-284) himself deciphered T1 **u** and T89 **tu**, and he regarded them essentially to be logograms for u- ‘third person singular ergative’ and t-u- (contraction of preposition ti/tä and u-), respectively (i.e. as **U-** and **T-U-** following the conventions for transcription and transliteration in Fox and Justeson [1984b]). He also read T24 **li** as -il (i.e. **-IL**). Knorozov (1967:44, 78) suggested that a CV syllabogram could be read as a VC sign as well, which could provide the basis for the reading of CV signs as -VC logograms (e.g. he suggested T140 as -el or **-EL**). Fox and Justeson (1984) and Closs (1986) supported the existence of such a rule, and Closs referred to it as the commutativity rule. These contributions provide partial precedents for the “morphosyllable” hypothesis by Houston et al. (2001).

serves to convey the (presumed) long vowel of the preceding syllable through disharmony (i.e. **u-K'AWI:L-wi-l(a)-IL**). Assuming the correctness of disharmony, they claim T24 **li** cannot be anything else but a morphosyllable (i.e. **-IL**) in this context:

... the possessed version of the god name [i.e. **u-K'AWI:L-wi-la-IL**] adds another sign that has been assumed by many epigraphers to represent a purely syllabic glyph. This cannot be. Disharmony never affects more than the terminal vowel of syllabic spellings, leading to the inevitable conclusion that the final element in u-k'awi:lil must represent an entirely new kind of sign, at once syllabic and morphemic [i.e. logographic].

In 4.2 and 4.3 I revisit this example and suggest an explanation not considered by Houston et al. (2001) for the presence of the **la** sign in both the unpossessed and possessed examples, based on other possible examples of a similar alternation, and on the fact that vowel insertion was without exception synharmonic. In 5.2 I also discuss certain characteristics of the Mayan script that suggest that the so-called morphosyllables may be in fact phonetic complements to polymorphemic logographs, or in other words, to logographs that consist not of a single root, but of a root and additional derivational and/or inflectional affixes (e.g. **AJAW(AL)**, **CHAN(AL)**, **K'UH(HUL)**, **(Y)OTOT**).

**2.2. Tokovinine and Davletshin (2001).** Assuming the basic correctness of the DH by Houston et al. (1998), and also of the morphosyllable hypothesis by Stuart et al. (1999) and Houston et al. (2001), Tokovinine and Davletshin (2001) discuss cases of conventionalized spellings of words that appear to run counter to the DH.

Tokovinine and Davletshin (2001) discuss, among other examples, the variant spellings for presumed Proto-Ch'olan \*hu(ˀ)n 'paper' in **u-TI-HUN-na** (e.g. Tonina Monument 165, Copan Stela 7) ~ **u-TI-HUN-na-li** (e.g. Tonina disc) ~ **u-HUN-na-HUN-li** (Tila Stela B) ~ **u-TI-HUN-li** (e.g. Randel Stela) found in similar or identical contexts. These authors regard the final **li** of the spellings **u-TI-HUN-na-li**, **u-HUN-na-HUN-li**, and **u-TI-HUN-li** as a morphosyllable **-IL**: “There is no reason to believe that the **u-TI-HUN-na-li** spells anything but *u-ti-hun-il*.” Such a statement only makes sense following a morphosyllable perspective in which the a of **na** is

assumed to be silent and used to mark the vowel of the preceding syllable as complex vowel (i.e. **u-TI-HUN-n(a)-IL** for u-ti'-hu'n-il). A minimal distinction between phonetic signs and logographic signs could render **u-TI-HUN-na-l(i)** for u-ti-hu(')n-al, which is supported by the purely phonetic spelling **hu-na-l(a)** found in the same text as a logosyllabic spelling **HUN-la** (Palenque Temple of Inscriptions Center Tablet).

The main points of their paper are two: (1) scribes learned the spellings of roots and words based on their most common contexts; and (2) such conventionalized spellings may persist as fixed templates of an almost logographic nature even when the affixes the root or word is going to take in a different context leads to an orthographic redundancy or an orthographic contradiction. Justeson and Fox (1989:7) have previously discussed the problem of traditional spellings, saying that “if the compound is ancient it can be inherited as a fixed, arbitrary way of spelling a word,” adding that for that reason traditional spellings are “not as reliable indicators of the language of a text as are novel spellings.” Justeson and Fox also add that while “Phonetic complements in particular are used only optionally with most logograms, and thus are usually reliable indicators of the language of a text,” there are cases where they prove untrustworthy, as in “cases in which such spellings are habitual for a given compound.” In the case of the **u-TI-HUN-na ~ u-TI-HUN-na-IL ~ u-TI-HUN-na-HUN-IL ~ u-TI-HUN-IL** spellings, Tokovinine and Davletshin (2001) observe, the **u-TI-HUN-na-IL** and **u-HUN-na-HUN-IL** spellings are examples of such templates, where the phonetic complement **na** in **HUN-na** is a fixed part of the spelling possibly as a result of tradition.<sup>7</sup>

In the spelling **u-TI-HUN-na-IL**, according to Tokovinine and Davletshin, the sign **HUN** preserves the phonetic complement **na** that is basic to the spelling of \*hu(')n ‘paper’ and which also indicates, through disharmony (cf. Houston et al. 1998:282), that the vowel of the preceding

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<sup>7</sup> These spellings of **HUN** just mentioned, and of **TAN** in phrases like **yo-OL-la-TAN-na-li** (Yaxchilan Lin. 25) and **yo-OL-la-TAN-li** (Palenque Palace Tablet) closely parallel spellings of **CHAN** in **CHAN-na ~ CHAN-na-li ~ CHAN-NAL-la ~ CHAN-la**. The **CHAN-NAL-la** example in particular suggests a form cha(')n-al or cha(')n-nal, which could also be derived from **CHAN-na-li** if interpreted as **CHAN-na-l(i)** instead of as **CHAN(-na)-IL**. I discuss these patterns further below.

syllable is complex. At the same time, the morphosyllable **-IL** is present to indicate by itself, and in spite of the presence of the a vowel of the **na** sign that precedes it, that an inflectional or derivational suffix **-il** is present after \*hu()**n**, rendering hu()**n-il** and not hu()**n-al**. The same basic process is found in the spelling **u-HUN-na-HUN-IL**. The only exception here is that the scribe has apparently decided to emphasize the fact that what immediately follows the root \*hu()**n** is a suffix of the form **-il**, if one accepts the reading of T24 **li** as **-IL**. Both spellings, in the authors' view, are better analyzed as **u-TI-HUN(-na)-IL** and **u-TI-HUN(-na-)(HUN)-IL**, where the parentheses enclose the unread signs. Based on this, they argue that

These examples illustrate that, when a final complement should be either dropped or replaced in a derived form spelling, sometimes, it is neither dropped nor replaced, but the spelling of derivational suffixes is added directly to the remaining complement (Tokovinine and Davletshin 2001:4).

These authors cite Zender (1999) as discussing examples of conventionalization of common sign sequences to the point that they become pseudologographic in nature. Two such examples are found on Yaxchilan Lintel 30 at F5b, where **ch'o[ko]-ko** is found instead of simply **ch'o-ko**, the normal spelling of \*ch'ok 'sprout', and at H4a, where **u-u-ti** is found instead of simply **u-ti**, the normal spelling of \*uht 'to be finished/happen'. In the case of **ch'o[ko]-ko** the hypercorrected spelling can be explained by the fact that \*ch'ok 'sprout' was commonly spelled with the **ko** sign infixed in the **ch'o** sign for artistic effect, to the point that it may have become almost a logographic form for **CH'OK**; given such a customary use, the addition of another **ko** may have been perceived as a phonetic complement. In the case of the **u-u-ti** example, the likely reason for such spelling may be the main sign appearance of the second **u** sign; phonetic complements often are used before or after a main sign, which often corresponds to a logograph.

The authors also discuss examples like **chu[ku]-ja** (La Mar Stela 3:C1) and **chu[ku]-ka-ja** (Palenque Slaves:E2). Previously, Bricker (1986:133) had described both of these examples and cites Justeson on this regard as saying that

in a fused form like T532 [i.e. **chu[ku]**], there is a *prima facie* case for interpreting the spelling as simply harmonic and having no implications beyond the root.

Bricker adds to this that

Evidently, the Maya scribe had two options in selecting a sign to represent the second syllable of the “capture” collocation: (1) one based on a spelling of a root, and (2) one that anticipated the vowel of the suffix. In most cases he chose the second alternative.

These observations by Bricker and Justeson foreshadow the suggestion made in Justeson (1989) on the importance of “typical suffixing” for the conventionalization of spellings, as I discuss below. Totokovine and Davletshin (2001), however, see templates or conventionalizations as frozen spellings that in some cases run counter to the convention of disharmony (DH) that they assume to be correct. They add that while “In a broader sense [a] template is any fixed spelling,” that their paper focuses “on the spellings where orthography works against itself” (2001:4). These include cases where the DH appears to be contradicted, such as **AJAW-wa**, **CHAN-na**, and **K’IN-ni**. I agree with these authors in the significance of the process of conventionalization of spellings based on common contexts. However, below I present evidence that suggests that, rather than running counter to disharmony as a means of marking vowel complexity, such conventionalizations explain not only the existence of standard disharmonic spellings, but also the existence of standard synharmonic spellings.

**2.3. Justeson (1989, 2000).** Justeson (1989) has observed that spellings of  $C_1V(G)C_1$  roots, regardless of the presence or absence of G (i.e. /:, ‘, h/) after the vowel, are synharmonic (e.g. **k’a-k’(a)** for \*k’ahk’ ‘fire’, **k’u-k’(u)** for \*k’uk’ ‘quetzal’ < from Proto-Mayan \*q’u’q’, **po-p(o)** for \*pohp ‘mat’, **chu-ch(u)** for \*chuch ‘loom’, **ta-t(a)** for \*tät ‘thick’, **ma-m(a)** for \*mam ‘grandfather, grandson, nephew’, **tz’u-nu-n(u)** for \*tz’unun ‘hummingbird’ < Proto-Mayan \*tz’uunu’n). Justeson (1989) has also pointed out that all CV’ roots are spelled synharmonically:  $CV_1-’(V_1)$ . This is the case of roots like Proto-Ch’olan \*mo’ ‘macaw’ spelled **mo-’(o)** or **MO’(-’o)**, \*te’ ‘tree, wood’ spelled **TE’(-’e)**, \*k’ab’a’ ‘name’ (Lowland Mayan \*k’aab’aa’) spelled **K’AB’A’(-’a)**, among others. These cases show that it is not entirely correct that synharmonic spellings are unmarked, as Houston et al. (1998, 2002) contend. These cases show that scribes prescribed synharmony in specific phonological contexts:  $C_1V(G)C_1$  and

CV(G)' roots or sequences. In other words, these contexts are cases where one can clearly see that scribes did not care about vowel complexity, but instead, only about the presence of two identical consonants or the presence of final glottal stop. Still, by themselves these contexts do not negate the existence of a principle like that called for by DH elsewhere.

Justeson (2000) did not only point out some major problems with the data set utilized by Houston et al. (1998) and Stuart et al. (1999), but he also reanalyzed the data set that was left after he eliminated problematic examples and added more examples of phonetic spellings not included originally by Houston et al. (1998). Since Justeson has yet to publish his data set and hits analysis, I will summarize only the main point of his public presentation using the data set in Houston et al. (2002), which is substantially revised with respect to the one in Houston et al. (1998).

Justeson (2000) has observed that the most significant number of synharmonic cases in the data consists of examples of roots of the general form Ca(G)C (i.e. CăC, Ca:C, CahC, Ca'C), with a total of 24 examples in Houston et al. (2002:Figure 1), out of a total of 78 spellings in total in their data set. At the same time, the most significant number of disharmonic spellings in the data is made up of examples of roots of the form CaGC, totalling 16, with only one example listed in their data set of a disharmonic spelling of a CaC root.<sup>8</sup> All examples of disharmonic spellings with different root vowels (i.e., Ci(G)C, Co(G)C, Ce(G)C, Cu(G)C roots) in their sample total only 21, and all other examples of synharmonic cases (i.e., Ci(G)C, Cu(G)C roots) total 16. Justeson (2000) has focused on the most significant patterns: the synharmony of CaC spellings (18 examples out of 24 synharmonic examples in the data set by Houston et al. (2002)), and the disharmony of CaGC spellings (16 out of the 17 disharmonic examples for spellings of the form Ca(G)C). Based on this pattern (but with figures derived from his own data set), Justeson

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<sup>8</sup> The data set in Houston et al. (1998:Figure 1) uses 90 spellings, while that in Houston et al. (2002:Figure 1) uses 78. The major changes from the first to the second data set include the removal of 4 spellings from the row showing words with root vowel i, the addition of one spelling in the row showing words with root vowel e, the removal of 4 spellings from the row showing words with root vowel a, and the removal of 5 spellings from the row showing words with root vowel u.

has argued that Classic scribes may have in fact represented a distinction between a and ā through a consistent use of **Ca** syllabographs for syllable-closing consonants whenever the vowel preceding those consonants was ā, and an avoidance of **Ca** syllabographs for syllable-closing consonants when the preceding vowel was a. If correct, Justeson argues, such a strategy would suggest the six-vowel system proposed by Kaufman and Norman (1984) for Proto-Ch'olan times, in which \*V: > V and \*a > ā, rather than a pre-Ch'olan(-Tzeltalan) system where \*VV and \*V were still phonemically distinct. In such a pre-Ch'olan(-Tzeltalan) system ten distinctions, not just six, would be necessary. Since he finds no statistical evidence that would point to a parallel orthographic distinction between ee:e, ii:i, oo:o, and uu:u, there is no reason to assume a distinction between aa:a. Because of this, Justeson concludes, the only distinction that can be discerned in the script is one between e, i, o, u, a, and ā, which corresponds to the reconstructed vowel system of Proto-Ch'olan.

In my opinion, there may be other explanations besides vowel complexity for the word-closing spelling patterns in Houston et al. (2002) and Justeson (2000). For instance, their data set includes cases of disharmonic **Ci**, **Ca**, **Cu** word-closing syllabograms only. The total number of spellings taken into account is of 78. Of these, there are a total of 25 spellings with **Ci** word-closing syllabograms, 37 with **Ca** word-closing syllabograms, and 14 with **Cu** word-closing syllabograms. Also, there are a total of 8 spellings of roots with vowel i, 4 of roots with vowel e, 41 spellings of roots with vowel a, 7 of roots with vowel o, and 18 of roots with vowel u. One of the strongest patterns here is that the majority of word-closing syllabograms were of the shapes **Ci** (32.1%) and **Ca** (47.4%), for a total of 79.5% of the total number of spellings. Consequently, there is a strong preference for **Ci** and **Ca** word-closing syllabograms. I think it is possible, following an ACH approach, that the high incidence of such syllabograms could be explained by the high incidence of i and a in nominal suffixes (e.g. -il, -al, -ij, -aj, -is, -as).<sup>9</sup>

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<sup>9</sup> Even if one were to take into account spellings of verb roots, in which **Ci** and **Ca** word-closing syllabograms predominate, the same explanation can be used, since the vowels i and a are the most frequent with intransitive and intransitivized verbs (e.g. -i, -aj, -laj-i, -wan-i, -w-i, -w-a).

Moreover, Houston et al.'s (2002:Figure 1) data set may still need revisions. For instance, they list 4 examples of disharmonic spellings of CeGC roots, which therefore exhibit 100% correlation between disharmony and vowel complexity. Two of these are of the forms  $C_1e:C_2-(C_2a)$  and  $C_1e'C_2-(C_2a)$ , and the other two of the forms  $C_1e:C_2-(C_2u)$  and  $C_1ehC_2-(C_2u)$ . However, a quick examination of what these glyphs actually are suggests this sample is not useful. For one, they seem to have used the spelling **ka-se-wa** 'month name (one of eighteen different ones)', whose etymology and precise shape they do not know, as one of the two cases of disharmonic spellings with the form  $C_1e:C_2-(C_2a)$ . Since this form has to be eliminated, one is now left with only three examples for the Ce(G)C set (one  $C_1e'C_2-(C_2a)$  case, two  $C_1eGC_2-(C_2u)$  cases). Second, of the remaining examples, two of them, **te-mu** for teem 'throne' and **e-b'u** for ehb' 'step', occur in glyphs that could occur in contexts where an ul suffix may have been intended with the use of the word-closing **Cu** sign (e.g. **u-te-mu-?li**, **ye-b'u-li**, see below). In reference to the ACH proposals by Justeson (1989) and others, Houston et al. (1998:276) note that "While plausible, these explanations have yet to gain wide acceptance, nor have they effectively explained all occurrences of disharmony." It seems to be a fair assessment that Houston et al. (1998, 2002) have not attempted to test the ACH hypothesis. Had they done so they would have been compelled to list the morphosyntactic contexts where their data occur, as well as the signs that may precede (i.e. **u-**) or follow (i.e. **-li**) the immediate spellings of the roots themselves (e.g. **te-mu**). Such signs, as I argue below, could explain the choice of the vowel of the word-closing CV syllabogram (e.g. **mu** in **u-te-mu-?li** to allow the spelling of ul with **(m)u-?l(i)**). And even if **e-b'u** occurs as a free form without affixation, in other morphosyntactic contexts the same root is spelled **ye-b'u-li**, suggesting a form y-ehb'-ul. Such a form could have led to the conventionalization of the spelling of ehb' as **e-b'u**. If so, the u of **b'u** may be simply a reminder for the scribe of the most common affixation pattern of ehb' in the texts, which likely made it the default spelling of that root. In any case, these revelations about **te-mu** and **e-b'u** can be used to eliminate them from the data set too. This would only leave one example of a

CeGC spelling left, that of -eem in **ke-le-ma**. And while -eem most likely did have a long vowel one spelling hardly constitutes a significant sample.

**2.4. Discussion of Proposals for Diacritical Disharmonic Spellings.** In conclusion, Houston et al.'s (1998, 2002) proposal remains difficult to evaluate given that the authors have not made explicit which spellings they used in their analysis. Also, they still seem to count problematic examples such as the spellings of root transitive verbs. In addition, they do not take into account the possibility of affixation conventionalization across different morphosyntactic contexts, nor do they think it inappropriate to use examples that occur in the corpus in just one instance without the possibility of testing their spellings across different morphosyntactic contexts. These methodological problems need to be addressed before the DH can be considered more seriously. Likewise, the alternative by Justeson (2000) is perhaps unnecessary, since the ACH could easily account for the very high incidence of **Ci** and **Ca** as word-closing syllabograms, although this needs to be tested in a future paper.

### **3. The Affixation Conventionalization Hypothesis.**

**3.1. Justeson (1989, 2000).** Justeson has suggested that some cases of disharmonic spellings may have been conventionalized based on the pattern of “typical suffixing” of a given root (1989:35):

The citation form of intransitive verb roots is 3rd person completive, marked by an -i(h) suffix; in spelling such roots, **Ci** signs are favored for syllable-closing consonants, as in Cholan ENTER-(i) for o and Yucatecan ENTER-(**ki**) for ok ‘enter’, while transitive verb roots are synharmonic.

Houston et al. (2002), in their update to Houston et al. (1998), now assume that the i in the word-closing syllabogram of spellings of root intransitive verbs does in fact represent the i ‘completive status’ marker of root intransitives descendant from Common Mayan \*-ik in Robertson’s (1992) model, or Proto-Mayan \*-i(h) ~ \*-i(k) in Kaufman’s (1989) model. Justeson (1989:35) proposes the same process for the disharmonic spellings of nouns, as in the case of the spelling **tz’i-b’a** for \*tz’ihb’ (e.g. **AJ-TZ’IB’(-b’a)** on vase K794, and **AJ-tz’i-b’a** on Xcalumkin Panel 4:A1, both meaning ‘Mr. Scribe’), possibly influenced by the potential for

derivation of a verbal noun like *\*tz'ihb'* 'writing' into a verb by means of *\*-ä* 'applicative', as in Proto-Ch'olan *\*tz'ihb'-ä* 'to write/paint (vt)'. Justeson (2000) argues too that the typical spelling of root transitives as CV-CV<sub>1</sub> (e.g. **u-chu-ku-wa** (Piedras Negras Throne 1:A'1; Palenque House D Pier:A4) and **chu[ku]-ka-ja** (Palenque Slaves:E2; Yaxchilan Structure 44 Southeast Doorway Upper Step:D1)) could also be due to the fact that the typical context of root transitives would have been as active transitives that take the plain status suffix *-V<sub>1</sub>w* (cf. Justeson and Campbell 1997:64-65). Justeson (1989, 2000), however, does not say anything about synharmonic spellings possibly being the result of such an affixation conventionalization rule; his remarks on such process are only about disharmonic spellings. As I show below, disharmonic and synharmonic spellings can be explained as the consequence of the affixation conventionalization rule.

**3.2. Bricker (1989).** Bricker (1989) has conducted a thorough and illuminating comparative study of the orthographic conventions of the prehispanic hieroglyphic texts and the postcontact Chilam Balam texts. She has noted that consonant deletion was a strategy of both the postcontact manuscripts and the prehispanic texts. In the case of the Chilam Balam of Chan Kan she even notes a case with parallels in the prehispanic texts: the spelling < u muti > for u-mut-il 'his bird, omen', attested three times as **u-mu-ti** in the Dresden Codex (e.g. Dresden 18b). She also suggests that the "absence of vowel harmony in these examples makes it possible that the principle of syllabification employed was consonant deletion, not vowel insertion, and that they were intended to be read as u-mut-il, not u-mut" (1989:45). She notes two additional examples of the principle of consonant deletion in spellings of **AJAW-le** (Piedras Negras Stela 3:F5) instead of **AJAW-le-l(e)** (Piedras Negras Throne 1:G'3) for ajaw-lel 'rulership', and **ka-tze** (Yaxchilan Lintel 41:B1) instead of **ka-tze-wa** (Palenque House A Pier A). A very well known case of consonant deletion is found in spellings of *\*kākāw* 'chocolate': **ka-ka-w(a)** (K1837), **ka-ka** (K518, K703), **ka-w(a)** (K511, K2695), and **ka** (K532). Consonant deletion, which I discuss further below, thus amounts to the underspelling of certain sounds or syllables. It is possible that every case of word-final consonant deletion takes place when there is a

sequence of the form ...C<sub>1</sub>VC<sub>1</sub>, as in **le** for lel, or a sequence of the form ...C<sub>1</sub>V<sub>1</sub>C<sub>1</sub>V<sub>1</sub>, as in **ka** for kākā in kākāw.<sup>10</sup>

**3.3. Hofling (1989) and Lacadena and Wichmann (1999).** Hofling (1989) is concerned mainly with the structure of discourse in Mayan texts, and specifically with the use of word order and deictic markers for the purpose of highlighting information, using the Dresden Codex Moon Goddess almanacs as a case study. Hofling (1989:52-53) notes that while the modern Lowland Mayan languages have a system of deictic markers used to highlight the discourse functions of noun phrases, no such system has been described for ancient Mayan texts. Hofling suggests this may be “due to confusions with phonetic complements and syllabic signs,” and that “what may appear to be violations of the ‘synharmonic’ constraint [proposed by Knorozov] may in fact be deictic marking” (1989:53).

Lacadena and Wichmann (1999:11) have discussed a series of spellings of nouns using **Ce** syllabograms for the word-closing consonantal segments (e.g. **u-TUN-ni-le**, **u-K’IN-ni-le**, **u-tz’i-b’a-le**, **yo-to-che**, **u-wo-jo-le**) in the northern Yucatan. These nouns are otherwise spelled with **Ci** syllabograms (e.g. **u-TUN-ni-li**, **u-K’IN-ni-li**, **u-tz’i-b’a-li**, **yo-OTOT-ti**, **u-wo-jo-li**) at the same sites and throughout the rest of the Mayan lowlands. The authors suggest, as a possible explanation, that these **Ce** word-closing spellings could point to the enclitic +e’ of Yukatekan, and therefore that such northern sites could have housed Yukatekan scribes. Interestingly, while the authors are open to the possibility that these **Ce** word-closing syllabograms are used to spell a following segment, they do not seem to be open to the same possibility for **Ci** word-closing syllabograms.

### **3.4. Additional Evidence Supporting the ACH.**

**3.4.1. Incomplete Spellings.** I deal first with an orthographic aspect that has important implications for the issue of disharmonic and synharmonic spellings. This is the problem of

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<sup>10</sup> Other examples are readily available, such as **yu-ne** ~ **yu-ne<sup>2</sup>** for y-unen for Proto-Ch’olan \*unen ‘baby’ (Kaufman and Norman (1984:135) reconstruct it as \*une..., leaving open the question of what to reconstruct after the g; however, the Classic spellings **yu-ne<sup>2</sup>** and the Proto-Tzeltalan form \*unin both support a Proto-Ch’olan form \*unen), **tz’u-nu** ~ **tz’u-nu<sup>2</sup>** for Proto-Ch’olan \*tz’unun ‘hummingbird’ from Proto-Mayan \*tz’uunu’n, and others.

incomplete/defective/partial spellings, discussed to a lesser or greater extent in Fox and Justeson (1984), Mathews and Justeson (1984), Justeson and Fox (1989), Mora-Marín (1999), and Zender (1999). For instance, in his discussion of the spellings of the Ch’olan month <caseu>, and in particular of its full spellings (i.e. **ka-se-w(a)**) and underspellings (i.e. **ka-se**), Justeson (1978:230) observes that “40% of the syllabaries and all of the logosyllabaries” typically underrepresent final w. This is not the case only of weak consonants (i.e. /h, ’, w, y/). Justeson (1978:231) refers to cases of underspelling as abbreviations, which are used “for common words on public monuments in the most phonic scripts as well as in logographic ones.” The title sajal (possibly \*saj-al, which I analyze as fear-PRTC ‘feared one’, possibly based on \*saj ‘to fear’ and \*-al ‘participial/adjectivizer’) is most often spelled **sa-ja-la**, but in a few occasions it appears as **sa-ja**. This is particularly clear in alternate spellings of proper personal names, where it may appear as **sa-ja-la** (e.g. Yaxchilan Lintel 54:G1, **IX-CHAK-? IX-sa-ja-la na-xa-AJAW**) or as **sa-ja** (e.g. Yaxchilan Lintel 14:C3, **IX-CHAK-? IX-sa-ja ya-xa-BAT-AJAW**) in otherwise identical contexts.<sup>11</sup>

Another example from personal names and titles at Yaxchilan is the name **a-u-ku**, which appears as **a-u-ku** (Yaxchilan Lintel 42:G3) or **AJ-u-ku** (Yaxchilan Lintel 3:G1 and Lintel 41:D5b) and also as **a-u-ku-ma** (Yaxchilan Lintel 54:C2), suggesting the u of phonetic **ku** either represents or anticipates an underspelled -um suffix, possibly an allomorph of the -Vm suffix attested in forms like Proto-Ch’olan \*b’ahlām ‘jaguar’, \*kahlam ‘jaw, chin’, and \*k’uk’um ‘feather’ (Kaufman and Norman 1984:117, 124).<sup>12</sup> A similar case is that of the spellings **sa-ku** for the month name, which appears as **sa-ku** (Quirigua Stela E:D13) and **sa-ku-ma** or **sa-ku-la** (Quirigua Stela C; Tonina Monument 69). Locations and Emblem Glyphs are often underspelled. For instance, the placename **ma-ta-wi-la** (Palenque Temple of the Foliated Cross Alfarda:B2) appears also as **ma-ta-wi** (Looted panel at D3).

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<sup>11</sup> The spelling **sa-ja-XIB’** discussed in Houston et al. (2001:37) is probably an underspelling of saj-al xib’ rather than saj xib’, and may mean ‘feared male’, where the -al suffix can be interpreted as a ‘participial/adjectivizer’.

<sup>12</sup> In what may be a related term, the glyph **YAX-u-ku-ma** appears on Yaxchilan Lintel 37.

Another example, this time with the glyph **na-ja**, appears in a database of 243 PSS texts on pottery vessels compiled by this author in the summer of 1999 (Mora-Marín 1999). The glyph appears as **na-ja-la** in 17 cases and as **na-ja** in 56 cases, often in identical contexts. This is an indication of the optionality of representing final l. For example, K625 shows **na-ja** in the sequence [...] **u-tz'i-b'i na-ja yu-k'i-b'i** [...], and K2295 shows **na-ja-la** in the sequence [...] **u-tz'i-b'i na-ja-la yu-k'i-b'i** [...].<sup>13</sup>

There are cases where an incomplete spelling results in an apparent case of disharmony. For instance, the glyph **yu-ta-la** in the PSS of pottery vessels most often appears as **yu-ta**. In the same database a total of 50 cases of the glyph are attested; 17 are spelled **yu-ta-la**, 2 are spelled **yu-TAL** (K791, K1440), and 31 are spelled **yu-ta** (e.g. K532, K625, K633). The 19 cases indicating a form y-ut-al support the idea that the 31 remaining examples were also intended as y-ut-al. In the same database the glyph **u-tz'i-b'a-li** appears in 29 instances, while **u-tz'i-b'a** appears in 3 instances; some of these are in identical contexts, such as K2206 with [...] GOD.N-**yi u-tz'i-b'a-li yu-k'i-b'a** [...], and K2352 with [...] GOD.N-**yi u-tz'i-b'a yu-k'i-b'i** [...]. This suggests a form u-tz'ihb'-al that is underspelled in the cases with **u-tz'i-b'a**.

Another set of examples, some discussed at length by Zender (1999:135-142), involve the underspelling of final consonants m and n, in addition to those of final l. The spelling of the epithet ch'aj-om drip-POT/AG 'dripper' appears in at least one instance as **ch'a-jo** (Caracol Stela 3), though normally it appears as **ch'a-jo-m(a)** (e.g. Copan Stela 10:E6). Also, the verb uht-om-Ø 'it would happen/be.finished' is on occasion spelled **u-to** (e.g. Copan Stela A:C11), though normally it appears as **u-to-ma** (e.g. Palenque Temple of Inscriptions West Tablet:D12). Another example is that of **yu-ne** (e.g. Copan Stela 63, Tikal Stela 31), also attested as **yu-ne<sup>2</sup>** (e.g. unprovenanced panel in Mayer [1987:Plate 54], shown in Zender [1999:Figure 48]). Final n was usually underspelled in preconsonantal contexts as in **i-tz'i-WINIK** (e.g. Naj Tunich, Site Q Panel, Palenque Palace Tablet, shown in Zender (1999:Figure 49)) for ih tz' in winik, among

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<sup>13</sup> Another set of cases include a scribal title attested at Piedras Negras as **AJ-b'i-k'i** (Piedras Negras Stela 12) and **AJ-b'i-k'i-la** (Piedras Negras Throne 1).

other examples (e.g. **u-ja-wa-TE'** for u-jaw-an=te'). To this effect Justeson and Fox (1989:8) make the following generalization: the “final consonant of a root in a compound” occurring before another consonant may be omitted both in “the spoken language and in hieroglyphic spellings,” which they illustrate with cases like **ta-ja-l(a)-mo-(')o** (Yaxchilan Stela 21:Gp5-Hp5), **ta-ja-mo-(')o** (Yaxchilan Hieroglyphic Stairway 5:84), **ta-mo-(')o** (Machaquila Structure 4:Block F; Yaxchilan Lilintel 10:C7b) (cf. Mathews and Justeson 1984:195).

It is clear from examples like these that underspellings of final l, m, and n, not to mention the weak consonants (i.e. /h, ' , w, y/), were an accepted practice among scribes (Zender 1999), especially in preconsonantal positions and word-final positions (Justeson and Fox 1989; Mathews and Justeson 1984). Underspellings, consequently, must be taken into account before a certain spelling can be regarded as disharmonic or synharmonic with regard to a preceding vowel nucleus. In the examples of underspellings examined so far the final vowel of the word-closing CV sign presupposes or anticipates a following suffix of the form VC present in at least some morphosyntactic contexts for that word. Can this phenomenon account for other patterns that have been regarded as cases of disharmonic phonetic spellings, or as cases of synharmonic spellings that would violate (or be exceptions to) the proposed DH? Testing this hypothesis would require one to list alternate spellings of a word in identical and different morphosyntactic contexts, something that Houston et al. (1998, 2002) fail to do. Testing this hypothesis would also require one to avoid using examples of unique spellings or even unique words, something that Houston et al. (1998, 2002) also fail to do.

**3.4.2. Disharmonic Spellings.** Most disharmonic spellings can be shown to be cases of incomplete spellings or of conventionalized spellings indicative of the more common affixes a word may take.

The first set of examples consists of nouns marked for uncertain possession and exhibiting the following spellings: **B'AH-hi-ja** (Tamarindito Hieroglyphic Stairway 3, Step III:E1), **u-ha-ja** (Palenque Temple of Inscriptions Center Tablet:B8), **tu-pa-ja** (Palenque Temple of Inscriptions Center Tablet:A9), **si-hi-ja** (Tamarindito Hieroglyphic Stairway 3, Step II:E1),

which suggest a suffix -ij ~ -aj, and **o-la-si** (Unprovenanced shell ornament at Yale Art Gallery), **k'a-k'a-si** (Rio Azul shell plaque), **k'a-b'a-si** (Tikal Miscellaneous Monument 48, Burial 116), **WAY-ya-si** (K2777), and **B'AJ-si** (K1440), which suggest a suffix -is ~ -as.<sup>14</sup> When possessed with a possessive prefix (e.g. u- ~ y- 'third person possessive/ergative') these nouns are spelled as **u-B'AH-hi** (Tikal Stela 5:D4), **yu-UH-li** (Chichen Itza jade earring), **u-tu-pa** (Chichen Itza jade earring), **u-si-hi** (Itzan Stela 17:C1), **yo-OL-la** (Palenque Temple of Inscriptions West Tablet:B7), **u-k'a-k'a** (Chichen Itza Casa Colorada), **u-k'a-b'a** (Piedras Negras Lintel 2:S2-U1), **u-WAY-ya** (K0771), and **u-B'AJ-ji** (Quirigua Stela E West).<sup>15</sup> Such spellings, without exception, reflect the vowel of the inflectional marker -ij ~ -aj or -is ~ -as, respectively, and not just any other vowel. This is not likely to be a coincidence. Furthermore, if vowel length is represented disharmonically in examples like **(u-)tu-pa** for **\*(u-)tuup** 'earring', why then is the

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<sup>14</sup> Uncertain possession suffixes are attested in various Mayan languages, including Ch'ol, Ch'orti', Tzeltal, Tzotzil, Ixil, K'iche', Poqom, and Q'eqchi'. They mark nouns that are possessed but whose possessor is either unknown or irrelevant. Nouns inflected with these markers are therefore not really 'absolute', and for that reason that term could be misleading and should be avoided. The following examples from Q'eqchi' illustrate these facts (Stewart 1980:92):

- (a) chaab'il-Ø                      yuwa'-b'ej  
good-3sABS                      father-UPOSS  
'He is a good father (i.e. someone's father)'.  
(b) ma      k'am                      li      che'  
NEG      take                      DET      stick  
ab'anana' a'an                      si'-ej  
because DMNS      firewood-UPOSS

'Don't take the stick, because it's firewood (and thus it belongs to someone)'.

The same is true of Ch'ol. For example, the term **chich-äl** 'the older sister' (Warkentin and Scott 1980:14-15), where the root **chich** 'sister' takes an unknown possession marker -äl, implies possession. In fact, kinterms in general, whether possessed with possessive prefixes or with unknown possession suffixes are always implicitly possessed, so it is simply not correct to speak of unpossessed or absolute kinterms.

Zender (2000) initially interpreted examples like **tu-pa-ja** and **si-hi-ja** as reflective of -aj and -ij suffixes, respectively, and examples such as **u-WAY-ya** and **u-B'AJ-ji** as reflective of -as and -is suffixes, respectively. More recently, however, Zender (2001) has adopted the morphosyllable hypothesis of Houston et al. (2001) and now argues that the suffix is -aj (i.e. **-AJ**) in the first pair and -is (i.e. **-IS**) in the second pair only. Here I assume the spellings are purely phonetic in nature, and therefore that **si-hi-ja** indicates a form **sih-ij** and that **B'AJ-si** is suggestive of the form **b'aj-is**. The latter is supported by the parallel between the example of **WAY(-ya)-si** ~ **u-WAY-ya** and **B'AJ-si** ~ **u-B'AJ-ji**. In fact, Mocho' has two likely cognate forms in -itz and -atz in addition to -otz (Kaufman 1967), Tz'utujil has the forms -aaj ~ -ijj ~ -eej and not just -aaj (Dayley 1985:143-151), and K'iche' also has both -aaj ~ -ijj (:64-65, 99-100, 102-104)). If a spelling can be interpreted as rendering an -iC suffix, and cognates in other Mayan languages support it, then there is no need to obscure such evidence with a priori assumptions (i.e. morphosyllable hypothesis).

<sup>15</sup> That these forms are merely "unpossessed" or "absolute" forms of these nouns is confirmed by the fact that several of them occur in the texts completely unpossessed, without a possessive prefix and without an -is/-as or -ij/-aj marker (e.g. **k'a-k'a** at Chichen Itza's Temple 4 Lintel 1).

uncertain possession suffix not spelled disharmonically, given that comparative evidence suggests it had vowel length? Indeed, the ‘absolute’ (i.e. ‘uncertain possession’) suffix that Houston et al. (2001) and Zender (2001) claim was spelled with T181 **ja** as **-AJ** has cognates with long vowel, as -aaj in Tz’utujil and K’iche’. If disharmony represented vowel length, why is **tu-pa-ji** or **tu-pa-je** or **tu-pa-ju** or **tu-pa-jo** not attested? Clearly the vowel of the root-closing syllabogram anticipated the vowel of the suffix in the cases noted so far. Otherwise, one must assume something like the morphosyllable hypothesis (i.e. that T181 **ja** spelled the suffix \*-a(a)j as **-AJ**), in which case there is no need to explain why disharmony is "suspended" (Houston et al. 2001:21); rather, one simply states that with morphosyllables there is no need for disharmony, and then the problem is solved. This is clearly a case of assuming the correctness of the hypothesis in order to prove it.

These same nouns may very well have taken other suffixes with as great a frequency. For example, **B’AH** often appears as **u-B’AH(-hi)-li**, and **WAY** as **WAY(-ya)-la**. Interestingly, such examples actually support the ACH: indeed, while **B’AH** appears more frequently inflected as **u-B’AH-hi-li** than as **B’AH-hi-ja**, the fact is that both inflections support an i-initial suffix, -il and -ij respectively, and the same can be said of the **WAY(-ya)-la** and **WAY(-ya)-si** spellings, both of which support an a-initial suffix, -al and -as, respectively. I hereby propose the Affixation Conventionalization rule:

- (1)  $C_1V_1C_2(-C_2V_2)$  or  $C_1V_1-C_2(V_2)$ : in phonetic complementation or phonetic spellings of root-closing segments the second vowel is likely to correspond to the vowel of the most common suffix or suffixes that a root may exhibit in the texts.

The examples so far suggest that syllable nucleus complexity (V:, Vh, V’) is not indicated in any way, and that the pattern is followed in the spelling of CVC and CV(G)C roots and syllables alike. Consequently, the pattern that results in disharmonic complements or spellings is only disharmonic by accident and reflects a conventionalization based on the preferred or more frequent affixes of a root. Below I show this same factor accounts for most

synharmonic spellings. But first, more examples of disharmonic spellings are necessary to test rule (1).

Other examples are readily available, including some already discussed in 2.1. The term **a-na-b'i** alternates with **ya-na-b'i-li** in different syntactic contexts: **a-na-b'i** (Naj Tunich Drawing 29) is unpossessed, while **ya-na-b'i-li** (Naj Tunich Drawing 29) is possessed and suggests the form y-aj-na(h)b'-il with an -il suffix anticipated by the vowel of the **b'i** sign in **a-na-b'i**. The same explanation can account for the alternation between **TUN-ni** and **(u-)TUN-ni-li**: **TUN-ni** (Palenque Tablet of 96 Glyphs:L4) is unpossessed, while both **u-TUN-ni-li** (Copan Hieroglyphic Stairway), which is possessed, and **TUN-ni-li** (Tonina Monument 95:E1-F1 and Monument 30:A5-A6; Machaquila Stela 2; Palenque Creation Panel:B2), which is a derived form, indicate an -il suffix. Another instance of a disharmonic spelling that can be explained in this way is **e-b'u** for 'step': it has the attested forms **ye-b'u** (Naranjo Hieroglyphic Stairway 1 Step XI:W1) and **ye-b'u-li** (Copan Hieroglyphic Stairway), the latter pointing to an -ul suffix and the former to an underspelled -ul suffix. The same may be the case with examples like **SAK-HUN-na** (Palenque Temple of Inscriptions Center Tablet:F4) and **u-SAK-HUN-na-la** (Palenque Temple of Inscriptions Center Tablet:J6, K5).

Another example is that of the spellings of \*tɪhl 'tapir': two logosyllabic spellings render that word as **TAPIR-la** (Palenque Eaves of House C and Yaxchilan Lintel 35:A7), and two purely syllabic spellings render it as **ti-la** (K1253) and **ti-la-la** (K1442). The last example suggests a suffix -al and at the same time that the other two spellings, **TAPIR-la** and **ti-la** also represent such a suffix through the convention of consonant deletion commonly used in the spelling of the -lel 'abstractive' suffix as in **ti-AJAW-le** ~ **ti-AJAW-le-le**, and more generally, it seems, in the spelling of ...C<sub>1</sub>VC<sub>1</sub> sequences. A similar case is that of the spellings for \*mut 'bird species' as **mu-ti** in **u-mu-ti** (e.g. Dresden 18b) and as **mu-ti-l(a)** (in **CHAK-mu-ti-la** on a bird-shaped vase from the Wray Collection).

Other examples include: **ma-su**, attested as **ma-su** (Rio Azul earflare) and **ma-su-l(a)** (Tikal Stela 10), suggesting that the u of **su** in the former example anticipates the u of -ul

indicated in the second example; **to-k'a**, attested as **to-k'a** (Yaxchilan Lintel 25:C1) and also as **AJ-to-k'a-l(a)** (cf. Stuart et al. 1999:44) and as **to-k'a-l(a)** (Yaxchilan carved bone from Structure 23 burial; Comacalco Spine 2, Urn 26); **B'OLON-ni**, attested as **B'OLON-ni-ji** and **B'OLON-ni-ji-ya** (cf. Stuart et al. 1999:34) and **u-B'OLON-ni-l(i)** (Yaxchilan Lintel 33), suggesting that the *ɪ* of **ni** in the former example anticipates the *ɪ* of ɪj and ɪl, respectively; **CHAK-ki**, attested as **cha-ki** (Caracol Ballcourt Marker 3), **CHAK-ki** (Dos Pilas Stela 8), **u-cha-ki-li** (Comacalco Incised Brick 5), and **u-CHAK-li** (Yaxchilan Lintel 33), where the last two examples suggests an ɪl suffix that is anticipated by the *ɪ* of **ki** in the **cha-ki** and **CHAK-ki** spellings; and **B'AK-ki**, attested as **u-b'a-ki** (Copan peccary skull, see Schele and Loooper 1996b:38; Tikal incised bones in Coe and Van Stone 2001:149), **u-B'AK** (inscribed human femur in Coe 1973:146), as well as **u-B'AK-li** (Naranjo Stela 23; Comacalco stingray spine, see Zender 1999:Figures 45e,g).<sup>16</sup>

The El Chorro Emblem Glyph behaves similarly. The main sign “resembles the month sign Mol, but with the addition of internal volutes” (Houston 1986:3). The sign may take T12 **AJ** or T229 **a** as a proclitic, or T34 **K'UH(UL)** in its stead, and it may be followed by T116 **ni** and sometimes by T178 **la**, resulting in spellings like **AJ-EL.CHORRO-ni** vs. **AJ-EL.CHORRO-ni-la**. Such alternations are suggestive of underspellings of a final *ɪ* (i.e. **AJ-EL.CHORRO-ni-ɪ(a)**), given the identity of contexts.

In some cases a disharmonic spelling proposed by Houston et al. (2001) to be indicative of a morphosyllable could in fact suggest a different derivational affix. For example, the

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<sup>16</sup> The Copan peccary skull with **u-b'a-ki** and the Comacalco stingray spine with **u-B'AK-li** are interesting examples. In neither case was the glyph intended to represent u-b'ak-el 3sERG-bone-POSS ‘his/her/its bone (of his/her/its body)’, since the human possessors named after them cannot be the original, inalienable possessors of the bones. That much is clear. Yet it seems that a suffix follows the root b'ak, at least with the Comacalco stingray spine. Nevertheless, ownership possession of b'ak < Pre-Ch'olan \*b'aak (Proto Yukatekan \*b'ääk) < Proto-Mayan \*b'aaq in the Lowland Mayan languages (Ch'olan, Yukatekan) is normally realized with the marker -Q. In Tzotzil, there is dialectal variation for inalienable possession, with some dialects using -ɪl and others -el (cf. Hurley and Ruíz Sánchez 1978:17), but ownership possession is realized with -Q as well. However, it is possible that another type of possession is at work here. For example, Tzotzil has both -bakel, ‘something’s bone, bone to accompany something’, illustrated with k'ux j-b'ak-el hurt/pain 1sERG-bone-POSS ‘my bones (of my body) hurt’, and bakelil, ‘bone of some (indefinite) thing’ (Haviland 1980). Currently I lack data for comparable constructions in Ch'olan and Yukatekan, which are necessary to determine what form is represented in the glyphs **u-B'AK-li** and **u-b'a-ki**, the second one included here since it could be a case of underspelling of an -ɪl suffix.

possessed form of **K'AWIL** appears as **u-K'AWIL-wi-la-li** (Yaxchilan Lintel 25) in one case, and unpossessed in several instances as **K'AWIL-la** (Yaxchilan Lintel 24, Yaxchilan Lintel 39). I agree with Houston et al. (2001) in that the possessed form probably has a -VI suffix marking some type of possession. However, those authors assume that T24 **li** functions as a morphosyllable in this context and serves to represent **u-K'AWIL(-wi-la)-IL**. A purely phonetic approach would lead to the reading **u-K'AWIL-wi-la-l(i)**, where the possessive suffix involved would be -al. Houston et al. (2001) do not take into account the significance of the contrasting syntactic contexts; given that **K'AWIL-la** generally appears in the unpossessed spellings of **K'AWIL**, I think it is possible that the only known possessed form, **u-K'AWIL-wi-la-li**, would use that same **la** sign to aid in the spelling of a now contextually appropriate -VI possessive suffix. As we have seen already, this is clearly the case with examples like **a-na-b'i** vs. **ya-na-b'i-li**, where it is simply unnecessary to invoke the existence of morphosyllables since the sequence of signs **b'i-li** is up to the task of spelling the -il suffix in **ya-na-b'i-l(i)** for a(j)+na(h)b'-il 3sERG-PROCL+??-POSS.

Likewise, the spelling of the 'drinking cup' glyph with T585 **b'i** as the most frequent word-closing sign does not need to be attributed to a morphosyllable function to spelling either. If T77 is read **k'i** (Mora-Marín 2000), then the T62.77:585 glyph of the PSS would read **yu-k'i-b'(i)** (e.g. K504, K625), with the sequence **k'i-b'i** spelling the suffix -ib'. This is supported by the fact that on K6997 one finds the spelling **u-T77-b'a**, where T77-**b'a** must spell the suffix -ib' together. This can only be the case if T77 is a Ci sign, given that T501 **b'a** does not provide the opportunity for the vowel i of -ib', like T585 **b'i** would if it were really a morphosyllable or if it had a phonetic reading **-IB'** in addition to **b'i**. The preferred use of **b'i** (160 times in a database of 243 examples) over **b'a** (1 clear example) in the spelling of the 'drinking cup' glyph with T77 may instead be attributed to a possible -VI suffix, probably of the form -il, that may be attested in a few examples that show **yu-k'i-b'i-la** or **yu-k'i-b'i-li** (e.g. K1344, K1371, K2152, K4143, K4995). This is supported by the fact that the instance of **u-T77-b'a** is an unpossessed example where no -il possessive suffix would have been necessary: the unpossessed form of uch'-ib' in

modern Ch'ol is uch'-ib'-äl 'taza (cup)' (Aulie and Aulie 1978:125), where the ä of -äl could be spelled with the vowel of **b'a** while leaving the l of -äl underspelled.

The spelling **yo-ko-b'i-li** (Palenque Temple XIX Platform West Side:A3) which Houston et al. (2001:22) analyze as **yo-k(o)-IB'-IL**, again assuming the correctness of the morphosyllable hypothesis, is not justified as the only possible reading. As Kaufman and Norman (1984:86) note, "common Ch'olan had a morphophonemic rule of vowel syncope" in which the penultimate vowel of "stems of more than two syllables" was lost, as in the cases of \*na't-ä < \*na'at, \*eb't-el < \*eb'et, \*ixm-ä < \*ixim, \*xihb'-ä < \*xihäb', \*majn-ä < \*majan, \*ojb'- < \*ojob', and \*pojw- < \*pojow, as well as in \*b'äk't-a < \*b'ahk'ut, \*äk'b'-äl < \*ähk'äb', \*äk'n-i < \*äk'in, and \*äl(ä)s-i < \*alas. The word represented in the spelling **yo-ko-b'i-li** could be an example of such a process: y-ok-b'-il, where the i of the -ib' suffix is lost given that the stem /ok-ib'-il/ has more than two syllables due to the suffix -il.<sup>17</sup> Thus, the morphosyllable assumption may be unwarranted, since it is quite possible that the spelling was read as **yo-k(o)-b'i-l(i)**, with o of **ko** an example of vowel insertion (see below).

Houston et al. (1998) make reference to the spelling **lu-mi** for 'earth' as evidence of a complex root vowel for \*lum 'earth'. However, the full spelling of the word in question is **lu-mi-li pi-tzi-la** (K7749), suggesting the analysis as **lu-mi-l(i) pi-tzi-l(a)** for lum-il pitz-il, where **lu-mi-l(i)** may spell lum-il 'earth(l)y' (Houston et al. 2000:35, Figure 16c). In other words, there is no need to assume a morphosyllable hypothesis that would render **lu-m(i)-IL** if a simple phonetic spelling approach already renders the appropriate suffix -il as **lu-mi-l(i)**. There is no need either to assume the co-existence of disharmony as a diacritic for vowel complexity and morphosyllables.

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<sup>17</sup> The spelling **o-ki-b'i** occurs in the same text and elsewhere at Palenque as part of a personal name; if it spells the same stem as the spelling **yo-ko-b'i-li**, only unpossessed, it would further substantiate the attestation of the vowel syncope rule in the **yo-ko-b'i-li** spelling, since **o-ki-b'i** would render a stem of two syllables of the form ok-ib'. But at this time this is merely conjecture, since the contexts for **yo-ko-b'i-li** and **o-ki-b'i** are quite different syntactically.

**3.4.3. Synharmonic Spellings.** There are several contexts of exceptionless synharmonic spellings. First, as Justeson (1989) has proposed, full or partial phonetic spellings of  $C_1V(G)C_1$  roots are synharmonic, regardless of the presence or absence of a complex vowel nucleus: **k'a-k'a** for **\*k'ahk'** 'fire', **po-po** for **\*pohp** 'mat', and others. The one example suggestive of an exception to such a rule can be demonstrated not to be an exception at all. This is the case of the **k'a-k'u-pa-ka-l(a)** proper name identified by Lounsbury (1968) on Chichen Itza Monjas Lintel 2:B1. As already mentioned, this name is **k'ahk' u-pakal** 'His Shield is Fire', where the u vowel of the **k'u** syllabogram codes the u- 'third person ergative/possessive marker' that is prefixed to **pakal** 'shield'. This example therefore shows that the apparent violation to synharmony actually serves a specific orthographic function.

- (2) Spellings of  $C_1V(G)C_1$  roots and sequences were generally spelled synharmonically.

And second, boundaries of the forms ...VCCV... and ...VC-(C)V..., the former a case of a root- or stem-internal context, the latter a case of a morpheme boundary, also abide by the synharmony principle through the use of the vowel insertion principle (Bricker 1989, 1992). For instance, the verb **a-k'(a)-ta** (Edzna Stela 18:A2-B2) for **ahk't-a(j)-Ø-Ø** (dance-IVZR-CMP-3sABS) 's/he/it danced' is spelled with a synharmonic syllabogram. Though based on the verbal noun **ahk'ot** 'dance', with an o vowel before the final **t** of the root, a vowel deletion rule (see above) that takes place in common Ch'olan upon addition of a suffix **-aj** has taken place resulting in a form **ahk't-aj** or possibly **äk't-aj** (Kaufman and Norman 1984:86), exactly as is the case today in modern Tzeltal with the form **'ak't-aj** 'to dance' (Slocum 1948:83). Another example is the case of spellings of positional verbs, whose roots are always spelled synharmonically (e.g. **CHUM-m(u)-wa-ni** for **chum-wan-i-Ø** sit-POS-CMP-3sABS 's/he/it sat', but also **pa-t(a)-wa-ni**, **wa-(a)-wa-ni**, and **he-k(e)-wa-ni**, among others), as indicated by the fact that non-stative positional suffixes are all consonant-initial.

Another example of obligatory synharmony of this type may be found in the spelling **yo-k(o)-b'i-l(i)**, which may represent **y-ok-b'-il** 3sERG-enter(?)-INSTR-POSS 'his/her/its

entering/stepping thing'. In this example the instrumental suffix, normally -ib', has become -b' due to the same vowel deletion rule resulting from the addition of the suffix -il, and thus a neutral and synharmonic syllabogram **ko** was used to represent the final consonant of the root ok as **yo-k(o)** given that what followed was another consonant and not a vowel.

Another example of this rule consists of some of the spellings of the verb 'to see' as in **yi-l(i)-a-ji** (Palenque Temple of Inscriptions Center Tablet:H2; Quirigua Stela E:C14), probably for y-il-a-Ø+jiy 3sERG-see-APPL-3sABS+ENCL 'since/after s/he/it saw it', where -a 'applicative suffix' derives il 'sight' into a verb \*il-a 'to see' in Proto-Ch'olan (Kaufman and Norman 1984:121).<sup>18</sup> The principle of synharmony was probably optional in cases of ...VC-V... boundaries, as suggested by the likely equivalent spelling **yi-la-ji** (Piedras Negras Stela 3:J1).

Yet another example may be present on the ceramic vase K2573 as **ta-tz'i-b'(i)-b'a-l(i)**, which may represent either tä+tz'ihb'-al 'for/with the inscribed (thing)...' or tä+tz'ihb'-b'al 'for/with the writing thing/implement'. In either case the root tz'ihb' is spelled synharmonically. This could favor the second analysis, tä+tz'ihb'-b'al 'for/with the writing thing/implement', since there the root tz'ihb' is immediately followed by a consonant, and as explained synharmony is obligatory in cases of vowel insertion, which are themselves most common when there is a ...VC-CV... boundary, as in tz'ihb'-b'al.

There is another important context where vowel insertion and synharmony may play a role. Bricker (2000:97-99, Figure 15) discusses the spellings of the names of three Nahuatl deities present in the Dresden Codex (cf. Whittaker 1986; Taube and Bade 1991). One corresponds to **ta-wi-si-ka-la** for tlahuizcapantecuhtli, where only the tlahuizcal part was spelled. The other two correspond to **xi-wi-te-i** for xiutecuhtli and **ka-ka-tu-na-la** for cactonal. Of interest here is the context where the Nahuatl words show a ...VCCV... boundary, such as ...izca... in tlahuizcapantecuhtli, ...iute... in xiutecuhtli, and ...acto... in cactonal. Such boundaries

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<sup>18</sup> Another possible analysis is y-il-Ø-aj-iy. However, whether analyzed as y-il-a-Ø+jiy or as y-il-Ø-aj-iy, the fact is that the synharmonic l of **li** in **yi-l(i)-a-ji-y(a)** cannot be proposed to represent a morpheme either by itself or with the assistance of the following sign (\*)**a**. Consequently, it has to be analyzed as a case of vowel insertion for the purpose of representing a consonant (i.e. l of il) that would otherwise go unrepresented.

were spelled following the synharmonic principle for ...VCCV... and ...VC-V... boundaries used by the Classic scribes (cf. **a-k'(a)-ta-j(a)** for ahk't-aj-Ø-Ø and **yi-l(i)-a** for y-il-a-Ø-Ø).

Although Bricker (2000) suggests that the vowel insertion strategy may have signaled the linguistic process of epenthesis, which I think is possible, the fact that the spelling strategy used is clearly without exception a synharmonic strategy, and that its contexts is identical to that where Classic scribes applied the synharmonic principle without exception strongly suggests that it could simply be an orthographic rather than linguistic principle that underlies the spellings.

In any case, examples like these, in which vowel insertion has taken place for the purpose of spelling a consonant and a silent vowel in order to allow the spelling of a following consonant or morpheme suggest the formulation of another rule:

- (3) Vowel insertion was always synharmonic for the spelling of ...VCCV... consonant boundaries and optionally used for the spelling of ...VC-V... inter-morphemic boundaries.

I propose here that all other cases where synharmony has been proposed as a principle do not explicitly follow a synharmony rule. This includes most cases of root- and word-closing syllables. For example, the root \*kākāw 'chocolate' is seemingly spelled following a synharmony principle, given its standard spelling **ka-ka-w(a)** (e.g. K1837). However, the affixation conventionalization rule proposed above could easily account for the use of T130 **wa** as the root-closing syllabogram, given that the only known derived form of this word in the texts appears as **ka-ka-wa-l(a)** (K2772), which most likely represents kākāw-al 'chocolatey' (Houston et al. 2001:32-33).

The examples of **AJAW(-wa)**, **K'IN(-ni)**, and **CHAN(-na)** cited by Lacadena and Wichmann (2001), as exceptions to their rules, or even as possible indications that the historical linguistic reconstructions of such words are incorrect, as well as other similar examples not cited by them, can be accounted for adequately with the affixation conventionalization rule too. For example, in the case of **AJAW(-wa)**, the lexeme has been reconstructed as \*aajaaw for Proto-Mayan by Kaufman (cf. Kaufman and Norman 1984:115), yet the sign for 'ruler, lord' takes T130 **wa** as a phonetic complement, despite the ancestral long vowel. First of all, Justeson and

Fox, according to Mathews and Justeson (1984:206), have reconstructed the term as \*aajaawal or \*aajw-al back to Proto-Greater Tzeltalan in the day name context. If so, one would expect to find evidence in Classic Lowland Mayan texts, perhaps, for an **AJWAL** reading for the ‘lord, ruler’ day sign. There are at least two examples of the day sign LORD appearing as **LORD-*la*** (Palenque Temple of Inscriptions East Tablet:Q3, S8), and **LORD-*wa-li*** (Quirigua Stela F), both of which support a reading **AJWAL** for the day sign (i.e. **AJWAL(-*la*)** and **AJWAL(*wa-li*)**). Such an inherent reading of the day sign could provide part of the rationale for the preference of the T130 **wa** sign as the preferred phonetic complement Ch’olan \*ajaw. The glyph T168:518 **AJAW**, the normal sign used in non-calendrical contexts such as parts of titles, sometimes carries a **la** sign as a phonetic complement or to spell a suffix. Two examples of this T168:518:178 for **AJAW-*la*** are found in Altar de Sacrificios Stela 10:D9 and Stela 11:D10. Such spellings could also support a basic reading for T168:518 as **AJAW(AL)**. In addition, a pottery vase (K1606) shows the spelling **ya-*wa-la*** possibly instead of the common title **ya-*ja-wa***; the title refers to someone who is the subject of the passive verb **chu-*ka-j(a)***. The spelling **ya-*wa-la*** may be underlying /y-ajaw-al/. There are also some possible examples of **ya-AJAW-*la*** (Rio Azul Plaques, Yaxchilan Lintel 37), which also support the idea that the standard phonetic complement for **AJAW**, T130 **wa**, was the preferred form because it included the vowel a, which was apparently the vowel present in the derived and inflected forms ajwal and y-a(j)w-al. Another interesting case is that of the spelling **AJAW-*ja*** (Quirigua Monument 26:C7), which suggests a form such as aj(a)w-aj.

The case of **K’IN(-*ni*)** can be accounted for in the same way. The glyph appears as **K’IN-*ni-l(i)*** (e.g. K6437, Chichen Itza 4 Lintel 2), **u-K’IN-*ni-l(e)*** (e.g. Kabah Structure 1 North Jamb B), **u-K’IN-*li*** (Late Preclassic jade plaque pendant at Dumbarton Oaks, illustrated in Coe [1976], Schele and Miller [1986], and Mora-Marín [2001]). These forms suggest that the standard phonetic complement **ni** was preferred because of the typical suffixing of Proto-Ch’olan \*k’in < Proto-Mayan \*q’iiN with -il. Moreover, T544 **K’IN** also appears in the spellings **K’IN-**

**ni-chi** and **K'IN-chi**, both of which suggest the form k'in=ich 'sun face', the Sun God's name.<sup>19</sup> Given these spellings the choice of T116 **ni** as a complement to **K'IN** was even more pragmatic because it covered two common spellings: the beginning vowel of -il and -ich 'eye, face, fruit'. In fact, one can also find a rationale for the choice of T671 **chi** that leaves synharmony (with T116 **ni**) out of the picture altogether. Indeed, the spellings **K'IN-ni-chi-la** (Quirigua Stela F) and **K'IN-chi-li** (Naranjo Stela 22) both suggest a form k'in-ich-il, which would account for the choice of **chi** over any other **chV** sign without reference to synharmony.

The case of **CHAN(-na)** for \*chan < \*ka'N 'sky' also follows the same pattern. It is in fact attested as **CHAN** (Tikal Stela 31), **CHAN-na** (Tikal Stela 31), **CHAN-na-li** (Yaxchilan Lintel 1:F1; Copan Stela B), **CHAN-NAL-la** (Costa Rican Jade Plaque), **CHAN-na-NAL** (Copan Stela B), and **CHAN-na-NAL-la** (Vase of Seven Gods). A strong case can be made, consequently, for the ACH since the standard phonetic complement to SKY, T23 **na**, anticipates the vowel of the suffixes -al and -nal suggested by these forms.<sup>20</sup> As in the case of T168:518 **AJAW**, a form T561:23.181 **CHAN-na-ja** is also attested (Dresden). A form **CHAN-na-b'a** (Cancuen Panel) is attested, and could spell a suffix -ab' with **na-b'a**, but perhaps also a relativizer postclitic +b'a. Again, the value of certain standard phonetic complements may have lied in their ability to anticipate the vowel of more than one common suffix for a given word. This was explained for **B'AH-hi** in **B'AH-hi-ja**, presumably for b'ah-ij, and in **u-B'AH-hi-l(i)**, presumably for u-b'ah-il; in both cases T60 **hi** anticipates the vowel of the suffix. The glyph

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<sup>19</sup> The spelling **K'IN-ni-hi-chi** attested on Copan Stela 11:A6 may show a full spelling of the root \*hich, which is the Proto-Yukatekan form for 'eye, face, fruit' proposed by Kaufman (1989). The reading may be analyzed as **K'IN(-ni)-hi-ch(i)** for k'in=(h)ich 'sun-eye/face'. The spelling **K'INICH-hi-chi** is also attested (e.g. incised human skull from Aguacateca Structure M8-10, C1). The spelling **K'IN-ni-hi-chi** alternates with the more common **K'IN-ni-chi** (e.g. Simojovel Shell) and **K'IN-chi** (Unprovenanced carved human femur at A3, A7, C1, in Coe (1973:146); also Naj Tunich 82), and the spelling **K'INICH-hi-chi** alternates with the more common **K'INICH-ni-chi** (Palenque stucco fragment) and **K'INICH-chi** (Naj Tunich 29).

<sup>20</sup> Other glyphs follow a similar and parallel pattern to that of T561 SKY. Just like SKY, which can appear as SKY, SKY-na, SKY-na-li, SKY-NAL, SKY-NAL-la, SKY-na-NAL, SKY-na-NAL-la, one finds too **he**, **he-na** (Copan Stela 20 West Side; Yaxchilan Lintel 15:D3), **he-NAL** (Palenque Tablet of the Sun:C12), as well as **IK'**, **IK'-na** (Early Classic Uaxactun Mural), **IK'-na-li**, **IK'-NAL-la** (Palenque K'an Tok Tablet), and also **CH'EN**, **CH'EN-na**, and **CH'EN-NAL** (Dresden 72c). This suggests these glyphs take suffixes of the forms -nal and -al. The closeness of the pattern suggests T23 is not logographic **IK'** in cases like T23:IK', but instead that it is simply a phonetic complement to the -nal logograph represented in **IK'-NAL** and **IK'-NAL(-la)**.

SNAKE for Proto-Ch'olan \*cha(a)n or Proto-Yukatekan \*kàan 'snake' may also follow this pattern. It is attested as **ka-KAN** (Naranjo Stela 25) and **ka-KAN-la** (Naranjo Hieroglyphic Stairway, Yaxchilan Lintel 35) in identical contexts (i.e. the Calakmul Emblem Glyph), suggesting that the standard T23 **na** complement also was meant to anticipate the vowel of a common suffix, probably -al suggested by the **ka-KAN-la** example.

One more point regarding synharmonic spellings and the issue of morphosyllables is necessary. The second context mentioned above for obligatory synharmony suggests that the morphosyllable hypothesis is incorrect or incomplete. If morphosyllables really exist one would expect synharmony to be used in conjunction with their spelling. For instance, in the case of **e-b'u** and **ye-b'u ~ ye-b'u-li**, given the synharmony principle illustrated above with **a-k'(a)-ta** and **yi-l(i)-a-ji-y(a)**, one would expect to find the spelling **ye-b'(e)-IL** instead. Indeed, Houston et al. (2001:27, Figure 10 and Table 5) suggest that the vowel of the **b'u** sign in **ye-b'u-IL** was the result of vowel insertion and was therefore silent (i.e. **ye-b'(u)-IL**), and that the word represented was y-ehb'-il. But that cannot be the case, since one would expect synharmony to take place with vowel insertion regardless of vowel complexity (e.g. **a-k'(a)-ta** for ahk't-a) and thus the vowel of the **b'V** sign (i.e. **b'u**) is most likely spelling the vowel of a VC suffix, -ul. In other words, if the morphosyllable hypothesis is correct, one would expect vowel insertion to apply without exception whenever a morphosyllable is present, regardless of any possible disharmony rule, and that is simply not the case (cf. **TUN-ni-li** rather than **TUN(-nu)-IL**).

In Houston et al.'s (1998) proposal synharmonic spellings are unmarked or default spellings. Lacadena and Wichmann (2001) argue that all spellings were originally synharmonic, and that disharmony arose later in the history of Mayan writing; spellings like **CHAN-na** for Proto-Ch'olan \*chan (from Proto-Mayan \*ka'N 'sky'), attested from the Early Classic through the Postclassic, in their view, were already archaisms by the Late Classic. Here I argue that synharmony does not account for spellings like **CHAN-na**. Instead, I propose that synharmony was only a principle in the spelling of interconsonantal boundaries (e.g. **a-k'(a)-ta** for ahk't-aj, underlying /ahk'ot-aj/, **yo-k(o)-b'i-l(i)** for y-ok-b'-il, underlying /y-ok-ib'-il/) through the use of

vowel insertion (cf. Bricker 1986, 1992), optionally also in the spelling of consonant-vowel boundaries, and finally in the spelling of certain other roots (cf. rule (2)). Examples like **CHAN-na**, as I have shown, can be accounted for by the proposed ACH alone (i.e. **CHAN-na** ~ **CHAN-na-li** ~ **CHAN-na-NAL** ~ **CHAN-NAL-la**). In other words, the ACH does not regard synharmonic spellings of word-closing syllables as unmarked or default; instead, they follow the same rule that disharmonic spellings do. Synharmony, as a principle, only applies to cases of intentional vowel insertion for the purpose of representing a consonant that would otherwise go underrepresented.

**5. Discussion.** The following discussion entails two parts. First I discuss the advantages of the ACH over the DH, and second, I discuss the implications of the ACH on the issue of the multiple readings of logographic signs and the origin of Mayan writing.

**5.1. Evaluation of the ACH.** The ACH represents a better account of the epigraphic facts than the DH for the following reasons.

(1) ACH has an internal control system. At first sight, the ACH appears to have a major drawback in that it depends on the evaluation of at least two spellings of a given root or word, ideally occurring in contrasting morphosyntactic contexts. Single, unique spellings of a root or word are useless to this approach. This is not a drawback at all. It is an internal control built into the hypothesis itself, and one absent in the DH, which permits the use of unique examples as evidence. Indeed, while the ACH may disregard single, unique spellings of a root or word it makes predictions about what to expect should another attestation of that root or word be found, specially in a different morphosyntactic environment.

(2) ACH relies mainly on the epigraphic evidence, and not as much on hypothetical linguistic reconstructions. For the ACH it is irrelevant whether ‘sky’ in the language of the texts was \*cha’n or \*chan, or whether ‘lord’ was \*aajaaw or \*ajaw, or whether ‘bone’ was \*b’aak or \*b’ak. The only crucial set of data is the epigraphic data itself, or in other words, the actual spelling variations of a given root or word. Hypothetical linguistic reconstructions, however, can

be used to test results based on the ACH approach; this was illustrated with the case of \*aajaaw and \*aajw-al.

(3) ACH takes into account the phenomenon of underspelling of weak consonants. The DH by Houston et al. (1998) does not explicitly or implicitly do so.

(4) ACH accounts for cases where a given root or word is spelled similarly or differently in contrasting morphosyntactic contexts. Both versions of the DH fail to go beyond the level of representation of the root or word, to that of the alternating morphosyntactic contexts. In other words, the DH does not find it as relevant that \*ehb' 'step' is spelled the same whether as an unpossessed noun **e-b'u**, in which case no possessive suffix -VI is expected, or as a possessed noun **ye-b'u-li**, in which case a possessive suffix -VI is likely. According to Houston et al. (2001) this spelling yields **ye-b'(u)-IL**, where the u of **b'u** marks the vowel of \*ehb' as complex but is otherwise silent, while T24 **li** is a morphosyllable **-IL**. Given that vowel insertion is always synharmonic, one might expect a spelling **ye-b'(e)-IL** instead of **ye-b'(u)-IL**. Moreover, the analysis of T24 **li** as a morphosyllable **-IL** is only required if the u of **b'u** is silent. If one does not assume the correctness of the DH then the u of **b'u** could simply be explained as the u of an -ul suffix spelled in **ye-b'u-l(i)** (i.e. y-ehb'-ul).

(5) ACH does not rely on the existence of morphosyllables, or the logographic representation of affixes by means of otherwise phonetic signs, while the DH does. This dependence exists even when the DH would violate an otherwise inviolable orthographic rule: the rule of synharmony with vowel insertion. Also, this dependence exists even when the DH would contradict the expectations from a well known linguistic rule: the rule of vowel deletion when an addition of a suffix results in a stem of more than two syllables. ACH simply relies on the straightforward and universally accepted distinction between syllabograms and logographs to account for spelling variations in identical and in contrasting contexts; whether morphosyllables exist is irrelevant for ACH.

Also, the ACH makes other accounts of disharmonic spellings unnecessary. There is no place for a hypothesis of neutral vowels (cf. Fox and Justeson 1984; Justeson 1978; Mathews and

Justeson 1984), or a hypothesis proposing **Ci** signs when the root-final consonant is apical or **Ca** signs when the root-final consonant is labial (Justeson 1989). And while the correlation between Proto-Ch'olan \*ā (or pre-Ch'olan \*a) and synharmonic **Ca** spellings noted by Justeson (2000) is significant at first, the ACH proposal could also account for some or all of those spellings, given the very high frequencies of **Ci** and **Ca** word-closing syllabograms, which would be ideal to spell most nominal suffixes, most of which begin with either i or a/ā, although I have yet to test this systematically. As I stated already, the ACH is not concerned with the phonological context, only with attested patterns of affixation. The patterns of affixation of a root (i.e. whether *k'iin* takes *-il* rather than *-al* suffix) may very well be concerned with phonological contexts and rules (e.g. some affixes have fixed vowels regardless of phonological context, others have vowels that either assimilate or dissimilate to the vowel of the preceding syllable), but that is a separate issue altogether which I intend to deal with in a future paper. The relationship between patterns of phonetic spellings and patterns of typical affixation in the glyphs is the only variable I have tested in this paper.

**5.2. Implications for History of Mayan Writing.** Justeson and Mathews (1990:117-120) have argued that the origin of phonetic complements in Mayan writing, as in the case of other ancient scripts, may have been to resolve ambiguities in the readings of signs with more than one possible value. They show that the sign **ni** was first used as a phonetic complement on two signs, the month glyph **TZIKIN** (i.e. **TZIKIN-ni**), iconically an animal head with different values in other contexts, and the glyph T528 **TUN** (i.e. **TUN-ni**), which also has the readings **ku** and **CHAHUK**, and possibly **HAB'** (cf. Fox and Justeson 1984a). After these two polyvalent signs innovated the use of **ni** as a phonetic complement by ca. A.D. 455, Justeson and Mathews (1990:117) note, another sign, this time the unambiguous T544 **K'IN** for k'iin 'sun, day', began to use **ni** as well (i.e. **K'IN-ni**) around ca. A.D. 514, probably through analogical extension. This view of the origin of phonetic complementation does not necessarily concern the specific choice of the vocalic value of a CV sign, although in the case of **TZIKIN-ni** Justeson and Mathews (1990:117) suggest that the **ni** sign actually served to spell the presumed -in suffix (i.e.

as **-IN**) of the word tzik-in. An early case of a word-closing phonetic complement is found in the glyphs **K'AN-na** and **AJAW(-wa)** on the Hauberg Stela, which may date to ca. A.D. 197.

Word-closing and suffix-closing phonetic complements were present already by ca. A.D. 272 on an inscribed jade plaque in the words T528-**chi**, possibly for **TUNICH(-chi)**, and **CHAN-NAL(-la)**.

Lacadena and Wichmann (2001) have recently made a suggestion regarding the frequency of **Ca** word-closing syllabograms in early spellings such as **AJAW-wa** and **CHAN-na**, which violate the DH. They argue that such **Ca** syllabograms may have been the default type of CV syllabogram to be used for word-closing consonantal segments. I think this proposal deserves more attention. There is evidence, not just from nominal spellings, that could support such a convention. For example, verbal spellings, when shown with all the possible inflectional and derivational affixes they may exhibit, end in **Ca** (e.g. **hu-li** vs. **hu-li-ya** vs. **HUL-ya-ja**, **CHUM-wa-ni** vs. **CHUM-wa-ni-ya**, **u-ti** vs. **u-ti-ya** vs. **u-to-ma**, **u-CHOK-wa**).

However, in the case of the **AJAW-wa** and **CHAN-na** spellings, I have shown that the ACH offers a more satisfying explanation in terms of attested epigraphic patterns suggesting the final **Ca** syllabogram of these spellings was set as their default not arbitrarily but based on the most common **-VC** affixes that these roots could take. In the case of the verbal spellings I suspect the possible presence of a phrase-final enclitic of the form +a(´). This is suggested by a few possible cases of contrast with a +i(´) enclitic, as in an example of **u-K'AL-wi** (Caracol Stela 13, Schele and Grube 1994:97) instead of **u-K'AL-wa** (Machaquila Stela 2), and an example of **K'AL-wa-ni-yi** (Copan Temple 11, East Doorway, North Panel:C3) instead of the more common **K'AL-wa-ni-ya** (Palenque Temple of the Sun Tablet:P2), and examples of **STEP/GOD.N-ya** (El Cayo Lintel 1) instead of the more common **STEP/GOD.N-yi** (K4018). While Stuart et al. (1999) explain the **K'AL-wa-ni-yi** example as an instance of an idiosyncratic generalization of the synharmony principle in the particular text where this glyph occurs (Copan Temple 11), it is possible that an +i(´) enclitic may have been represented. Another example of this possible contrast is seen in **ha-(´)i** (Copan Stela 6) vs. **ha-(´)a** (Caracol Ballcourt Marker 3)

and **hi-ni** (K4113) vs. **hi-na** (K1398) for the demonstrative/independent pronoun ha' ~ hin (< ha'-in) 's/he/it//him/her/it'. In modern Mayan languages there are in fact enclitics of the forms +i(') and +a('), with generally spatial function (i.e. 'there' vs. 'here'), which could perhaps be extended to temporal relations (e.g. 'then' vs. 'now').

The ACH could have some significant implications for the origin of Mayan writing practices. In his discussion of early writing systems in general and early Mesoamerican writing in particular, Justeson (1986:448) has suggested that "early Mesoamerican signs represented only referential lexemes – no grammatical affixes or particles, and nothing phonetic." Justeson (1989:29) has also remarked that

Mesoamerican logograms were initially lexical, representing words and roots. Some compound words were spelled by unitary signs [...]. At first, derivational and inflectional affixes were probably not represented, and distinct allomorphs of roots never had separate logograms; for example, T528 **HAB'** represented both ha?b' and (y)a?b' 'year'. A single logogram could serve for inflected and uninflected forms of a root, and for derived forms differing semantically only in ways implied by the syntactic functions of the derivational affix. A different logogram may have been used when a derivational affix created a genuine lexical difference but apparently not when Cholan lacked the affix.

Mayan writing exhibits traits that suggest that at its onset the script was relentlessly logographic, and that logographs were potentially polymorphemic, which means that a single logograph could have represented one or more morphemes including a root and its derivational and inflectional affixes. The most conservative component of the script, the ritual calendar, is a case in point. Day names like **AJWAL**, **AK'B'AL**, and **KAB'AN** must be analyzed as composed of two morphemes each: ajaw-al, a(h)k'b'-al, kab'-a('), respectively.<sup>21</sup> The fact that there are polymorphemic logographs should not be a controversial matter. What I show here is that polymorphemic logographs could be far more widespread than previously thought.

As I already mentioned above, day signs are typically polymorphemic logographs. Phonetic complements sometimes confirm this, such as with the cases of **AJWAL-la** and

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<sup>21</sup> See Mathews and Justeson (1984:230) for discussion of T526 **KAB'(AN)**.

**AJWAL-wa-li** for Greater Tzeltalan \*aajw-al, which consists of two morphemes. Another example, more widely known, of a polymorphemic logograph is the PAW logograph, attested in the nominal phrase **YICH'AK-B'ALAM** (Dos Pilas Stela 2:A16), also spelled as **yi-ch'a-ki-B'ALAM** (Aguacateca Stela 2:F2). The phrase can be transliterated as y-ihch'ak b'ahläm 'jaguar's paw'. Clearly, the first example, PAW-JAGUAR, suggests that PAW could be read **YICH'AK** for y-ihch'ak, and not simply **ICH'AK** for \*ihch'ak. The context of the PAW glyph makes this clear: it is followed by its possessor, JAGUAR. So a Mayan scribe, if confronted by a texts made up of two signs only, PAW-JAGUAR, would be able to read it correctly as 'jaguar's paw' because in Mayan the possessee ('paw') precedes the possessor ('jaguar'). Thus I would suggest that the logograph PAW be transliterated **(Y)ICH'AK** when its context makes it unclear whether the root is possessed or not.

Another interesting case is that of the sign HOUSE, which apparently could be read **OTOT** or **YOTOT**. This is suggested by examples where it occurs in identical syntactic contexts (i.e. followed by a possessor) as **HOUSE-ti** (Chichen Itza 4 Lintels 1 and 2) and as **yo-HOUSE-ti** (Yaxchilan Lintel 31). A case like HOUSE in particular allows for some speculation on how polymorphemic logographs could arise: in the Lowland Mayan languages the word 'house', otot, most often appears possessed as y-otot, and in fact, some nouns may only appear possessed. So in designing a glyph to represent such a referent a Mayan scribe may have inherently read it as **YOTOT** for y-otot. I would also suggest transliterating the HOUSE sign as **(Y)OTOT** if the context does not clarify which reading is more appropriate.

Another glyph that can be effectively accounted for in this way is the T757 GOPHER glyph, when used as a logograph. It may appear as **u-B'AH** (Yaxchilan Lintel 24:B1b, G1a), **u-B'AH-hi** (Yaxchilan Lintel 1:E1), or **u-B'AH-hi-l(i)** (Yaxchilan Stela 11) for underlying u-b'ah-il 'his/her/its image' or '(it is) the image of in identical syntactic contexts'. An alternative to suggesting that the first two examples are underspellings would be to suggest that T757 was read as logographic **B'AH(IL)**, so that the above examples could be transliterated as **u-B'AHIL**, **u-B'AHIL(-hi)**, and **u-B'AHIL(-hi-li)**. In fact T757 could be read logographically as **B'AH(IJ)**

too. For example, it appears as **B'AH-hi-ja** in **B'AH-hi-ja u-HUN-TAN-na** (Tamarindito Hieroglyphic Stairway 3:3-4; Copan Hieroglyphic Stairway 1:6), as **B'AH-ja** in **B'AH-ja u-HUN-TAN-na** (Tikal Stela 39; El Encanto ST. 1). The alternations between **B'AH-hi-ja**, in which an i vowel is suggested by **hi**, and **B'AH-ja**, in which no i vowel is present, suggest that T757 in this context could be read logographically **B'AHIJ**. The form of \*b'ah 'image' with -ij or -iij 'uncertain possession marker', as b'ahij or b'ahiiij, may very well have been the citation form for the noun. As such a reading **B'AHIJ** would be expected given that it would be the most basic form of the noun, just like a possessed form of the noun \*otot would be expected as inherent to the reading of the sign HOUSE given the general obligatory possession of that noun.<sup>22</sup>

Two more examples strongly point to a polymorphemic interpretation of logographs. One has been recognized as polymorphemic in recent years: T1016 for **K'UH** \*k'uh 'god' or **K'UHUL** for \*k'uh-ul 'holy'. It is clear that **K'UHUL** was the intended reading when T1016 served as a modifier, for example, in Emblem Glyphs. This is demonstrated by phonetic complements in such contexts, as in **K'UHUL(-HUL) WAK-tzu-k(u)** (Nim Li Punit Stela 2:F3-E4), where the PIERCE logograph (\*jul 'to shoot/pierce') is used as a phonetic complement for the sequence hul in k'uhul. At the same time, T1016 may appear after a modifier, where it most likely has the reading **K'UH** 'god'. An example of this is seen in the phrase **CHAN-na-NAL-K'UH, KAB'AL-la-K'UH** (Copan Stela B), where chan-al 'heavenly' and kab'-al 'earthly' appear as modifiers to T1016, most likely rendering chan-al k'uh, kab'-al k'uh 'heavenly god, earthly god' (cf. Stuart et al. 1999).

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<sup>22</sup> Possible support for this comes from an instance of T757 on vase MS0445 (Coe 1973) as plain T757 **B'AH** in **B'AH ti-CHUM** without a preceding T1 **u** for u- '3sERG' or a postposed T24 **li**, T60 **hi**, or T181 **ja**. Phrases that begin with T757 and are followed by a progressive phrase headed by the preposition T59 **ti** almost always show T1.757 or **u-B'AH** (Josserand et al. 1985). Thus, **u-B'AH ti-AK'OT K'UHUL-AJAW** may represent u-b'ah ti ahk'ot k'uh-ul ajaw 'the image of the divine lord dancing (i.e. in dance)'. Yet in vase MS0445 there is no explicit possessive marker u-, even though one should be present. Perhaps it was a scribal error, or perhaps, just like the allomorph y- used with the words y-ihch'ak and y-otot, the marker u- could be read from the logogram itself whenever it was morphosyntactically appropriate. If so, then the appropriate analysis and interpretation of **B'AH ti-CHUM** may be as **u-B'AH ti-CHUM** for u-b'ah ti chum(-ul) 3sERG-image/portrait PREP sit(-STAT) 'the portrait of him in sitting posture (i.e. the portrait of him sitting)'.

This last example brings up the case of another set of logographs that can be shown to be read, in certain contexts, as made up of more than one morpheme. The phrase **CHAN-na-NAL-K'UH**, **KAB'AL-la-K'UH** attested on Copan Stela B is also attested as **CHAN-na-K'UH**, **KAB'AL-la-K'UH** (Palenque Temple of Inscriptions Center Tablet), and as **CHAN-K'UH**, **KAB'-K'UH** (Tikal Stela 31:A14-B14). This alternation between **CHAN**, **CHAN-na**, and **CHAN-na-NAL** in identical contexts suggests that T561 could be read logographically as **CHAN** or **CHANAL**. The same applies to the alternation between **KAB'-la** and **KAB'**: T529 could be read logographically as **KAB'** or **KAB'AL**. Earlier I mentioned the case of the spelling of SNAKE in identical contexts (as the Calakmul Emblem Glyph) as both **ka-SNAKE** (Naranjo Stela 25) and **ka-KAN-la** (Naranjo Hieroglyphic Stairway). Again, this alternation suggests that SNAKE could be read **KAN** or **KANAL**.

Another example is that of the Birth Glyph. It is read logographically as **SIJYAJ** (e.g. Tikal Stela 31) for sihj-y-aj, and appears with phonetic complements as **SIJYAJ(-ya-ja)** (e.g. Tikal Stela 4). This example clearly illustrates that verbal logographs could also be polymorphemic. Interestingly, some polymorphemic uses of verbs like this one are attested as part of proper names (e.g. **SIJYAJ-K'AK'**). Since writing may have started with the spelling of common and proper names anyway, whether the name included verbs or not, this type of context could provide direct clues to origin of orthographic conventions.

One more example will have to suffice for now. This is the case of T128[501], which Stuart (1997) has proposed to read DRINK, that is, either as Proto-Yukatekan \*uk' or Proto-Ch'olan \*uch'. I propose here that T128[501] may be read as **(Y)UK'** or **(Y)UK'IB'**. The evidence for this comes from examples of T128[501] in the Primary Standard Sequence in contexts where it substitutes for T62.77:585 **yu-k'i-b'(i)** for y-uk'-ib' 3sERG-drink-INSTR 'his/her/its cup'. On vases K635 and K1226 it appears as **yu-T128[501]-b'i**. Following Houston et al. (2001) this could be an example of the use of T585 **b'i** as a morphosyllable **-IB'** rendering **y(u)-UK'-IB'**. However, on vases K791, K1339, K1728, and K5453 the spelling appears as **yu-**

T128[501], with no T585 **b'i** following to spell the instrumental suffix -ib'. This difference in spelling has nothing to do with a difference in syntactic context.

Indeed, both spellings can be shown to fall in a context where a reading as 'his/her/its drinking cup' must be applied. On K635 one finds **yu-T128[501]-b'i** in the following sequence: [...] **?na-ja-la yu-T128[501]-b'i ta-yu-ta ?NA(HA)L te-le ka-wa [...]**. On K1728 one finds **yu-T128[501]** in the following sequence, which is essentially the same structurally as the preceding example: [...] **na-ha-ya yu-T128[501] ti-tzi-hi NA(HA)L te-le ka-ka-wa [...]**.<sup>23</sup> The point here is that both **yu-T128[501]-b'i** and **yu-T128[501]** seem to spell y-uk'-ib'. In another context (Piedras Negras Lintel 3), as I have argued before (Mora-Marín 1998, 2000), T128[501] appears in the spelling **(u-)T128[501]-ni**, probably for uk'-n-i-Ø drink-AP-CMP-3sABS 'he drank', where -n corresponds to an absolutive antipassive suffix; in this context the reading of T128[501] appears to be simply **UK'**. Hence, T128[501] was probably read as **UK'** and as **UK'IB'**, depending on context, and the T585 **b'i** sign in the **yu-T128[501]-b'i** spellings can be shown to have served as an optional phonetic complement: **y(u)-UK'IB'(-b'i)**.

Potential support for the reading of T128[501] as **UK'(IB')** comes from several inscribed containers. One, an inscribed shell container, shows **yu-T128[501] ka<sup>2</sup>-wa** followed by a proper personal name (G. Stuart 2001:Figures 2 and 3). The other shows **yu-k'i-b'i ka<sup>2</sup>-wa** also followed by a proper personal name (Helmuth 1987:Figures 45 and 46). They appear to be structurally identical, yet the first case has no explicit spelling of the instrumental suffix -ib', and must therefore be read **y(u)-UK'IB' + ka<sup>2</sup>-wa + [personal name]** 'It is the (drinking) cup of [personal name]'. Some of the Manik Complex (Early Classic) vases from Tikal (cf. Culbert 1993:Figure 19) have PSS texts that open with T62.128:501, for **yu-UK'IB'**, with no T585 **b'i** even though they occur in contexts where the form y-uk'-ib' is demanded by the syntax and

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<sup>23</sup> In Mora-Marín (1999) I have proposed that the glyph **na-ja-la** is also attested as **na-ja-ya** on K1398 and as **na-ha-ya** on K1728. I assume there and in this paper that both versions, whether with final **la** or **ya**, function in the same way. I suggest in Mora-Marín (1999) that the in **na-ja-la** a suffix -al 'participial, adjectivizer' is spelled, while in **na-ja-ya** a suffix -ay 'participial, adjectivizer' is spelled. This -ay suffix may be attested elsewhere in the glyphs, as in **b'u-la-ya** and **YAX-k'a-la-ya**.

semantics. Some contemporaneous vases at the same site do in fact show **yu-k'i-b'i** with T585 **b'i** (cf. Culbert 1993).

Additional examples of polymorphemic logographs exist, though I will discuss them more fully in a future paper. These include T544 (i.e. as **K'IN**, **K'INIL**, **K'INICH**), T528 (as **TUN**, **TUNIL**, **TUNICH**), **SUN.AT.HORIZON** (as **PAS**, **PASAJ**), **WAY** (as **WAY**, **WAYAB'**, **WAYAL**), **B'AK** (as **B'AK**, **B'AKIL**, **B'AKEL**), **NAL** (as **NAL**, **NAJAL**), and **YAL** for y-al 3sERG-say, among several others.<sup>24</sup> I further think all logographs representing verb roots were potentially polymorphemic, as already illustrated with the birth glyph, which functions logographically as **SIJ** and **SIJYAJ**. This is supported by examples such as **u-CHOK-wa**, **u-CHOK-(k)o-w(a)**, **u-CHOK-(k)o**, and **u-CHOK**, which can all appear in identical syntactic contexts, suggesting that **u-CHOK** was an underspelling of u-chok-o(w) (which is captured clearly by **u-CHOK-(k)o-w(a)** and **u-CHOK-(k)o**, but not by **u-CHOK** or **u-CHOK-wa**). Alternatively, **u-CHOK** may have been read as **u-CHOKOW**. Examples of **CHOK**, **CHOK-ja**, and **CHOK-(k)a-ja**, where the three instances demand a passive or mediopassive verb in -h-...-aj or -h- or -aj (i.e. cho[h]k-aj or cho[h]k or chok-aj), suggest **CHOK** is actually **CHOKAJ** and that **CHOK-ja** is actually **CHOKAJ(-ja)** (cf. **B'AHIJ(-ja)**). The same may be true for **u-CHOK** and **u-CHOK-wa**: the first may have been read **u-CHOKOW** and the second **u-CHOKOW(-wa)**.<sup>25</sup>

<sup>24</sup> There is suggestive evidence for T528 as **TUN/TUNIL**. For instance, one finds it as **TUN-ni-li** in **u-pa-ka-b'u-TUN-ni-li** in an unprovenanced lintel at Nelson-Atkins Gallery in Kansas City (cf. Zender 1999:Figure 29a), and in an identical context as **TUN** in **u-pa-ka-b'u-TUN** in the Po Panel, probably from Bonampak (Zender 1999:Figure 29b), suggesting that in the latter case the reader actually read T528 as **TUNIL** rather than plain **TUN**. An excellent pair of examples suggesting the reading **B'AKEL** for T **B'AK** 'bone' is found in a pair of shell pendants from Comacalco in the spelling of a proper name. In the first instance the spelling is **B'AK-ke-l(a)** for b'ak-el, while in the second it is **B'AK-la**, suggesting it is actually **B'AKEL(-la)**.

<sup>25</sup> MacLeod (2002) notes that Kaufman (1989) has reconstructed the plain status of root transitives as \*[-a(w)] for Proto-Western Mayan. Based on this, on the fact that CLM texts clearly reflect a form \*[-V<sub>1</sub>(w)], and on the fact that the script spelled that suffix with T130 **wa** whether the vowel of the -V<sub>1</sub>w suffix was explicit (i.e. **u-CHOK-ko-wa**) or not (i.e. **u-CHOK-wa**), she has suggested "that since \*-aw was the antecedent to \*-V<sub>1</sub>w in Proto-Ch'olan, the wa suffix may be an archaic synharmonic spelling." I think this idea is likely correct and deserves more attention. In other words, the use of T130 **wa** as the default spelling of the \*-V<sub>1</sub>w suffix could suggest that the script originated during a time when the suffix was in fact realized as \*-aw. Scribes may have learned to spell the suffix with T130 **wa** and may have maintained that practice, because of tradition, even after the suffix had changed to \*-V<sub>1</sub>w. Since it is possible to reconstruct this suffix as \*-V<sub>1</sub> for Proto-Ch'olan (cf. Kaufman

Again, the point here is not that an example like T757 **B'AH** was always read **B'AHIJ**, whether spelled as **B'AH-hi** or as **B'AH-hi-ja** or as **B'AH-ja**. Instead, I argue that the typical use of **hi** as the phonetic complement to T757 **B'AH** suggests that the uncertain possession suffix was not -aj but -ij, first of all, and second, that alternate spellings in identical contexts like **B'AH-hi-ja** and **B'AH-ja** both point to the form b'ah-ij and to a logographic reading **B'AH/B'AHIJ** for T757. If so, then T757-**hi-ja** could be analyzed as **B'AHIJ(-hi-ja)**, while T757-**ja** could be analyzed as **B'AHIJ(-ja)**. Thus, **hi-ja** and **-ja** can be analyzed as phonetic complements to a polymorphemic logogram **B'AHIJ**.

The evidence so far suggests that the use of phonetic signs to represent derivational and inflectional affixes developed as a process akin to that of phonetic complementation: phonetic signs were used as a means of disambiguating the precise derivational or inflectional form of a logograph in a given context. In other words, just as T23 **na** could be added to T561 **CHAN** to complement the final consonant of the root \*chan 'sky', T178 **la** could be added to T561 to complement the final consonant of the word **CHANAL**. Given that such potential ambiguities were permissible in the Late Classic period, when phonetic complementation and purely phonetic spellings became much more common, it is not unlikely that the earliest Mayan texts may have been relentlessly logographic, with syntactic information functioning as the main guide to resolve ambiguities (e.g. different between T1016 placed before a noun and read as **K'UHUL**, or after a modifier and read as **K'UH**).

**6. Conclusions.** The ACH can overcome the methodological deficiencies of the approaches supporting the DH by consigning the weight of the evidence to spelling conventions and spelling patterns alone without particular reference to the phonological shape of the roots represented. It does not question whether the language of the texts had phonemic vowel length, preconsonantal glottal stops, or preconsonantal glottal fricatives. Instead, it simply accounts for

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and Norman 1984), the Pre-Ch'olan stage may have seen both \*-aw shortly after the breakup of Greater Tzeltalan into Ch'olan and Tzeltalan, and \*-V<sub>1</sub>w shortly before the breakup of Proto-Ch'olan (with \*-V<sub>1</sub>) into Eastern Ch'olan and Western Ch'olan.

the preferred spellings of words in terms of their actual spelling variations in identical and contrasting syntactic contexts. The more frequent spellings of certain words are often sufficient to account for both synharmonic and disharmonic spelling patterns without reference to the vowel complexity. Because of this the ACH does not rely either on other types of accounts of disharmonic or synharmonic spellings on phonetic or phonological grounds, such as with the neutral vowel hypothesis, the apical vs. labial hypothesis, or the echo syllable hypothesis discussed above. Again, the ACH is concerned only with the actual spellings of words.

The ACH proposal has the potential to account for so-called “morphosyllables” as cases of phonetic complementation. Indeed, the evidence I have presented suggests that such examples are better explained as phonetic complements to polymorphemic logographs. In other words, Mayan logographs could have multiple related readings depending on syntactic context: T561 could be **CHAN** or **CHANAL**, with phonetic complements disambiguating the possibilities (e.g. **CHANAL-la**); PAW could be **ICH’AK** or **YICH’AK**; HOUSE could be **OTOT** or **YOTOT**. This practice, in turn, suggests that Mayan writing was originally a relentlessly logographic system, with little or no phonetic sign usage. Phonetic complements may have arisen to disambiguate different inflectional or derivational forms of a single word, but the weight of disambiguation may have initially rested on the syntax.

There are two steps that must follow to test the ACH: (1) more examples of alternative spellings of words in identical and contrasting syntactic contexts must be evaluated; (2) an attempt to reconcile the forms of the suffixes that are derived through this approach, as opposed to the disharmony and morphosyllable approaches, with data from more detailed historical linguistic reconstructions of such suffixes, and from careful elicitation of nominal morphology in varying possessed and unpossessed contexts. This second step is required to test not just the ACH but also for further testing of the DH.

Indeed, Houston et al. (2002), in their discussion of the six-vowel system for Proto-Ch’olan postulated by Kaufman and Norman (1984), remark that “Kaufman and Norman’s claim of vowel loss would seem to rest purely on assertion rather than proof. There is no independent

confirmation of their proposed sequence of vowel change.” They continue: “We do not believe there is any compelling reason to postulate a six-vowel system for Common Cholan. Indeed, the glyphic evidence points strongly to an opposing conclusion– that Common Cholan preserved the ten-vowel system of Common Mayan as it was transmitted through Greater Tzeltalan.” The problem here is that Houston et al. (2002) are using the same glyphic evidence that they used to propose their DH as evidence for a Proto-Ch’olan vowel system, assuming that CLM texts reflect Classic Ch’olti’an (i.e. pre-Eastern Ch’olan). Thus, their conclusion about the Proto-Ch’olan vowel system is colored by the assumed correctness of the DH and the Classic Ch’olti’an hypotheses. It may be more fruitful, instead, to conduct more historical linguistic research on modern Greater Tzeltalan languages and then test possible matches with the hieroglyphic data.

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