The Use of Semantic Determinatives
in Nahuatl Writing

El uso de determinativos semánticos
en la escritura náhuatl

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Abstract

This article systematically presents arguments in favor of the existence of semantic determinatives in Nahuatl writing, something that has already been proposed by several researchers, including Joseph Marius Alexis Aubin when he made his original outline of how this writing system worked. Semantic determinatives were used as a mechanism to allow easy discrimination of items on a list, which was necessary due to the variable reading order of the Nahuatl script. After a description of how this scriptural element was used by other writing systems of the world, including the Maya, evidence of its use in the Nahuatl script is presented. Finally, a comparison is made between determinatives and noun classifiers, used in several languages in the world, to conclude that although several linguists see classifiers and determinatives as equivalent elements for semantic denotation, they are actually different since one works on the linguistic level and the other on the scriptural level.

Keywords: Semantic determinatives, noun classifiers, pictorial lexicalization, Nahuatl writing system, Maya writing system

Resumen

Este artículo presenta de forma sistemática argumentos a favor de la existencia de determinativos semánticos en la escritura náhuatl, algo que ya había sido propuesto por varios investigadores, incluido el propio Joseph Marius Alexis Aubin al realizar su descripción de cómo funcionaba este sistema de escritura. Los determinativos semánticos fueron empleados como un mecanismo que permitía la fácil discriminación de elementos conformados en listas, herramienta necesaria debido al orden de lectura variable que posee el sistema de escritura náhuatl. Después de realizar una descripción de la forma en que este elemento escritural fue empleado por otros sistemas de escritura del mundo, incluido el maya, se presenta la evidencia de su uso en la escritura náhuatl. Finalmente, se realiza una comparación de los determinativos con los clasificadores de sustantivos empleados en varias lenguas del mundo para concluir que, aunque varios lingüistas ven a los clasificadores y a los determinativos como elementos equivalentes de denotación semántica, éstos son en realidad diferentes, ya que uno funciona a nivel lingüístico y el otro a nivel escriturario.

Introduction

As the latest research on the Nahuatl[1] writing system has demonstrated (Lacadena García-Gallo 2008a, 2008b; Whittaker 2009, 2018a; Zender 2008), the inner workings of this writing system were first established in 1849 by Marius Alexis Aubin (Aubin 1885),[2] who clearly showed it to be a logosyllabic script (Lacadena García-Gallo 2008a, 8; Whittaker 2009, 59; 2018a; Zender 2008, 28; Velásquez García 2019, 61). This writing system, whose reading order seems to be variable or emblematic, also uses other typical scriptural resources associated with writing systems in general, such as rebus, phonetic complementation, and the use of redundant logograms (Aubin 1885, 25; Cossich Vielman 2014; Lacadena García-Gallo 2018; Whittaker 2018a; Velásquez García 2019, 72–78). One of the few scriptural mechanisms that has not been analyzed in detail, in relation to this writing system,

[1] Regarding the names of the many indigenous languages mentioned in this paper, I will adhere to the same principles stated by Kettunen and Helmke (2010, 10–12) regarding the orthography of these terms, with one exception, for the language used by the Aztec groups in Mesoamerica, I will continue to use the word Nahuatl (*náhuatl* in Spanish) due to the large volume of research done using this name.

[2] Recent research (Rodríguez Zárate 2017, 97, note 206) has pointed out that another scholar was working on the mechanisms of Nahuatl hieroglyphic writing around the same time as Aubin. As indicated by Alfredo Chavero in his introduction to the *Historia antigua y de la conquista* (Ramírez 2001, 22, note 1), José Fernando Ramírez was making great advances in the study of this writing system: "*Y no solamente nos mostró de esta manera el verdadero camino para escribir la historia, sino que siendo su mejor fuente los jeroglíficos, se dedicó con empeño a encontrar las reglas para leerlos. El señor Ramírez hizo copiar en tarjetas más de dos mil figuras con su significado, y de su comparación encontró el modo de leerlas, habiendo conseguido así fijar las primeras reglas de la lectura jeroglífica. No tuvo tiempo el señor Ramírez para escribir lo mucho que sabía: sin duda que preparaba estudios importantes, como se ve por los apuntes que dejó, aunque muchos de ellos no pueden entenderse*" (Chavero 1884–89, LVIII–LX).

is the presence of so-called "semantic determinatives," defined as graphic elements used by various writing systems of the world to disambiguate the readings of some logograms or groups of writing signs with ambiguous or homonymous readings. They have been widely used by various ancient writing systems of the world, such as Hieroglyphic Luwian (Payne 2018), Egyptian (Cervelló Autuori 2016, 334; Davies 1987, 34; Goldwasser 2002, 1; Polis and Rosmorduc 2015, 162), Sumerian, Acadian (Michalowski 1996, 33; Rude 1986, 135; Selz, Grinevald and Goldwasser 2017, 281) or Chinese (Coulmas 2003, 55; Boltz 2011, 65), in order to provide additional information about the possible reading value of a set of signs, by indicating the semantic field associated with them. Within Mesoamerican writing systems it has been complicated to determine if this writing resource was employed, because Maya writing did not make extensive use of this mechanism of differentiation, notwithstanding having several logograms that possessed more than one reading value. The objective of this paper is to demonstrate that the Nahuatl writing system made extensive use of this writing mechanism, at least in certain particular contexts.

One important characteristic of semantic determinatives is that they do not possess a reading value (Lacadena García-Gallo et al. 2010, 3; Velásquez García 2019, 70) and do not have a phonetic equivalent (Cervelló Autuori 2016, 334), although in some writing systems the same signs used as semantic determinatives may also appear as logograms in other contexts, where they do possess a reading value. These signs are usually located adjacent to the signs with a phonetic value they need to disambiguate; and they do so by indicating the semantic category to which they belong, using mainly the iconicity of their image (Cervelló Autuori 2016, 334), or by convention of sign usage, when iconicity has been lost.

Even though the use of a capital letter to mark substantives in German, personal names in Spanish, or specific nouns in English is not an example of a semantic determinative, but a Capitonym—a word that changes its meaning, and sometimes its pronunciation, when the first letter is capitalized[3]—it might help us to understand the usefulness of a semantic aid while reading a text. There has been some research about the effect of the use of this semantic mechanism in the field of Cognitive Psychology, where it has been demonstrated that the use of capital letters at the beginning of certain

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[3] https://www.macmillandictionary.com/dictionary/british/capitonym.

nouns maximizes the "foveal[4] preview benefit" (Rayner and Schotter 2014) of the reading process, which is defined as the minimum time required to maximize the capacity to discern the meaning of the word immediately to the right (parafoveal word) of the word where the gaze has been fixated (foveal word) while reading (Yang et al. 2012, 1032). In order to measure this capacity, an imaginary border between the foveal and the parafoveal words is defined; when the foveal preview benefit is maximum, the time required for the gaze to change its fixation point between the foveal and the parafoveal words is minimum (Yang et al. 2012, 1032). This means that the use of any semantic aid is a useful tool for the reader to understand a written text more quickly (Rayner and Schotter 2014; Pauly and Nottbusch 2020, 6).

Some writing systems use only the context where the words are employed in order to discern the semantics associated with them, but many ancient writing systems made extensive use of semantic determinatives, and I will try to demonstrate that the Nahuatl writing system was among them. To justify this idea, examples from Egyptian, Sumerian, and Chinese writing systems will be shown, to then discuss the Mesoamerican case, especially the presence of semantic determinatives in the Maya writing system. Finally, I will present evidence of their presence in the Nahuatl system, along with a discussion of how determinatives relate to noun classifiers.

Use of Semantic Determinatives in Egyptian Writing

The Egyptian writing system is possibly the one that made the most extensive use of this semantic mechanism (Cervelló Autuori 2016, 334; Goldwasser 2002, 1; Polis and Rosmorduc 2015, 162). Champollion (1836) was the first to notice the presence of these scriptural elements, which he named *signes tropiques ou symboliques*, in the sign classification he presented in his book *Grammaire égyptienne*. He clearly differentiated these scriptural elements from the two other phonetic groups of signs, which he called *figuratifs ou mimiques,* and *phonétiques*, which correspond to logograms and phonograms. This is what he specified in his book:

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[4] Fovea, a small depression in the center of the macula that contains only cones and constitutes the area of maximum visual acuity and color discrimination (https://www.merriam-webster.com/dictionary/fovea).

Figure 1. Some examples of semantic determinatives.
Drawing by Rogelio Valencia Rivera based on Davies 1987, 34

68. Puisque la plus grande portion de tout texte hiéroglyphique consiste en signes phonétiques, l'écriture sacrée fut en liaison directe avec la langue parlée, car la plupart des signes de l'écriture représentaient les sons de la langue orale. 69. La même liaison, mais moins directe, exista également entre la langue parlée et les caractères *figuratifs* ou *mimiques*, parce que chacun d'eux répondait à un mot de la langue, signe oral de l'objet dont le caractère présentait l'image ; le *mot* devait donc habituellement servir de prononciation au caractère *image*. 70. Il en fut de même quant aux caractères *tropiques* ou *symboliques* : on attacha, pour ainsi dire, à chacun de ces signes un mot de la langue parlée, exprimant par le son précisément la même idée que le caractère rappelait, soit par synecdoque, soit par métonymie, ou au moyen d'une métaphore (Champollion 1836, 48).

Figure 1 presents some examples of signs employed as semantic determinatives in Egyptian texts. One of the cases where semantic determinatives could be of real use is to identify proper names, in order to indicate what or who is being named. In the same book, Champollion (1836, 109) makes a more specific statement regarding these elements *symboliques*, as they relate to personal names. He states that names are formed by adding two parts, the first one is phonetic, and the second one is a determinative (his own word) that indicates the class to which the name specified by the phonetic part belongs:

111. Les noms propres véritablement égyptiens, c'est-à-dire tirés du fond même de la langue, étaient tous significatifs ; aussi se composaient-ils de deux parties bien distinctes : 1° Des signes ou groupes, soit phonétiques, soit symboliques ou même

figuratifs, qui constituent le nom lui-même ; 2° D'un caractère **déterminatif** du genre auquel appartient l'espèce de l'individu désigné par le nom propre. (Champollion 1836, 109; bold type added by the author).

In figure 2, two examples of personal names are shown, a male name, and a female name, where gender is indicated by the last semantic determinative, both shown inside a dotted box. In figure 2.A, we have the expression, **sξ-n-h-t**-TREE-MAN, *sinh[ue]t,* a name that means "son of the sycamore," which explains the use of another semantic determinative to indicate the presence of a tree in the name. In figure 2.B, the text indicates a female name, **mr-r-t**-FEEL-WOMAN, *m[e]r[e]t,* "the loved one." In this case, just before de semantic determinative for WOMAN-, we find another one for -FEEL-, associated to the actions related to feelings, and in this case to the name. The last example in figure 2.C includes the expression **s-s-m-t**-MAMMAL, *s[e] sm[e]t,* "horse," which includes the semantic determinative for mammals at the end (Goldwasser and Grinevald 2012, 17).

In ancient Egyptian writing, semantic determinatives were signs that appeared next to logograms or phonograms to provide some hint about their meaning, or about its form in a certain context (Polis and Rosmorduc 2015, 165). Determinatives were derived from logograms (Davies 1987, 33), and were used to define the semantics of the word, as well as its lexical boundaries, as they commonly signaled the end of a word (Davies 1987, 33; Goldwasser and Grinevald 2012, 17–18), and could be combined to narrow down the meaning intended by the writer, as was shown on figures 2.A and 2.B. When combined, they follow a strict meronymic[5] taxonomical order (Goldwasser and Grinevald 2012, 33), going from the particular to the general. Even though these signs were used consistently throughout the life of the Egyptian script, they were not strictly necessary to be able to read the texts, as they were sometimes omitted, and some words never used them (Goldwasser and Grinevald 2012, 18). Semantic determinatives were basically used as classifiers (Goldwasser and Grinevald 2012, 18), and in this sense they let us gaze into the way Egyptians conceived their world. They were also used to emphasize a certain characteristic or property which the writer of the text considered important for the reader to

[5] A meronymic hierarchy is a hierarchy in which the relationship between lexical items is one of meronymy. Meronymy is defined as a relation holding between two lexical words when one denotes a part of the *denotatum* of the other, such as "leg" and "foot," hold a meronymic relationship, where "foot" is a meronym, and "leg" is a holonym (Brown and Miller 2013, 283).
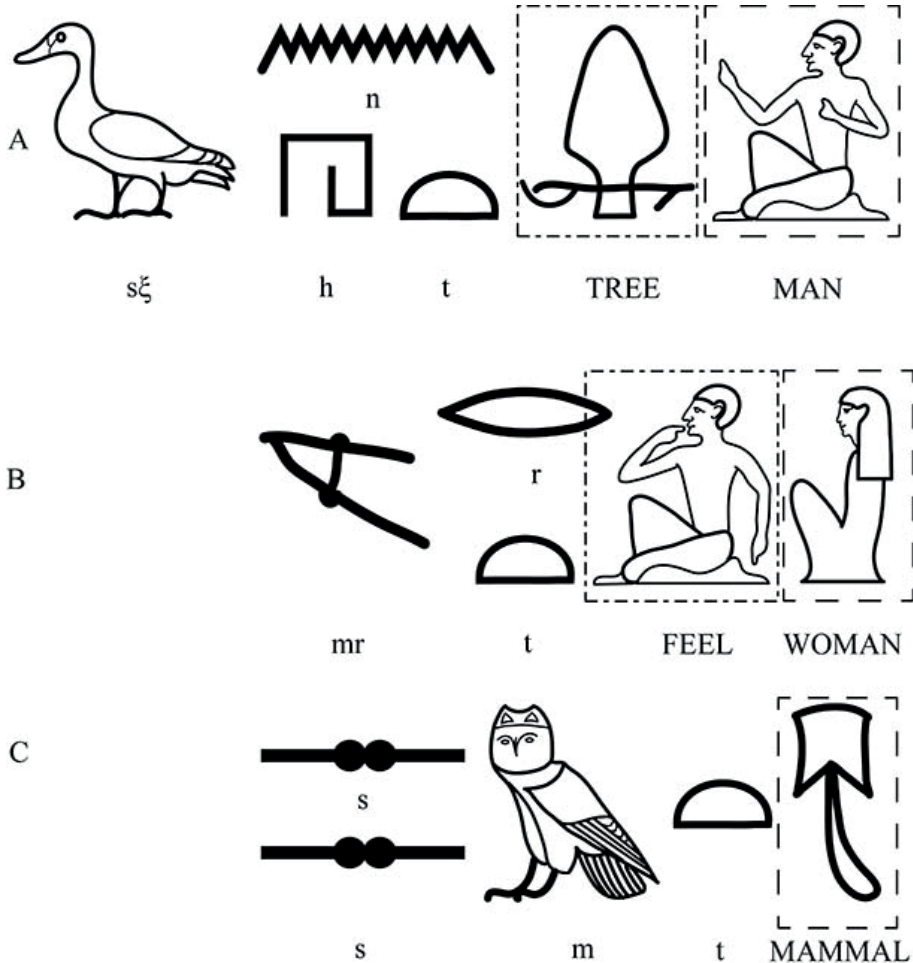
Figure 2. Examples of the use of semantic determinatives in ancient
Egyptian hieroglyphic writing. The semantic determinatives are indicated
inside the dashed line rectangles, in the first two examples there are two
semantic determinatives. Drawing by Rogelio Valencia Rivera based on
Goldwasser and Grinevald 2012, 17

know, such as the material something was made out of (Davies 1987, 35),
the social status of a person, the gender; marking someone as a king, a pris-
oner, a priest, a widower, or simply as common people (see figures 2.A
and 2.B). This implied that the determinatives assigned to a word could
vary depending on what the creator of the text wanted to emphasize,
showing the writing system included a lot of semantic information that

went beyond the simple phonetic use of the script (Davies 1987, 35), and which provided a certain discourse-pragmatic[6] purpose to their use (Goldwasser and Grinevald 2012, 22). When naming somebody in ancient Egyptian, the writer could choose to define the person as a common person or as an enemy for example, and in this sense, Egyptians considered this information to be a fundamental part of their writing system.

Use of Semantic Determinatives in Sumerian Writing

Another ancient writing system that employed semantic determinatives was Sumerian, a system that was first used in the Mesopotamian city of Uruk from the period comprised between 3200 to 3000 BC (Michalowski 1996, 33; Rude 1986, 135), being perhaps the first writing system created by humanity, although it is uncertain if it was developed before or after the Egyptian writing system (Michalowski 1996, 33). The system was used originally to write the Sumerian language and was later adapted to write other Semitic languages used in Mesopotamia and Syria by 2500 BC. The system used logograms to represent words and phonetic complementation was present since its early stages of development. It also made use of some special signs as semantic determinatives that could be preposed or postposed to the word they were classifying (Michalowski 1996, 35). Unlike the Egyptian case, semantic determinatives were only applied to nouns (Rude 1986, 135) to disambiguate signs with multiple possible readings.

To show how the system employed the semantic determinatives, we consider the signs presented in figure 3. The second part of each of the two words shown in this figure is the same and could be read as *apin*, "plough," or as *engar*, "ploughman." In order to know which of the readings is appropriate, a semantic determinative is preposed to the word. In figure 3.A, the semantic determinative *giš*,[7] "tree, wood," is employed to indicate the material the plough is made of. In figure 3.B, the semantic determinative *lú*, "man," is used to indicate that the word should be related to a person.

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[6] A very interesting discourse-pragmatic use of semantic determinatives is cited in Goldwasser and Grinevald (2012, 22), the verb *rx*, "to know," when used to mean "knowing a woman in the biblical sense," may use a phallus classifier.

[7] The value *giš*, for this semantic determinative, or the value *lú* for the following example, are obviously related to their semantic charge in their original language, not as a reading value, as these signs do not have it.
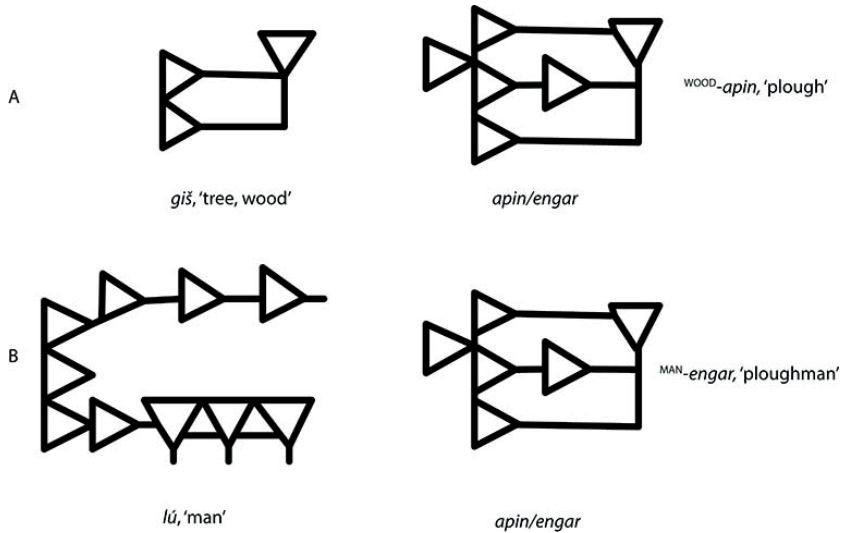
Figure 3. Examples of the use of semantic determinatives in ancient
Sumerian cuneiform writing. Drawing by Rogelio Valencia Rivera
based on Rude 1986, 136

Essentially, both systems operate in the same way (Selz, Grinevald and
Goldwasser 2017, 281), but the semantics of the Sumerian system fall in the
lexical field, while in the Egyptian hieroglyphic writing system the iconic-
ity of the signs plays a very important role in the categorization process.

Use of Semantic Determinatives in Chinese Writing

Semantic determinatives are a very important part of the Chinese writing
system. The Chinese script is formed by two types of characters, those com-
posed of simple graphic elements, called unit characters, that could not be
analyzed beyond basic strokes, and those formed by the composition of two
or more unit characters, called compound characters (Boltz 2011, 57). To
form a compound character, a unit character is taken as its primary element,
then another character is added to differentiate all the possible words for-
med using the same primary element, which created a series of related terms.
The secondary element is usually a semantic determinative that helps to tie
the sound of the word to a specific meaning, which helps the reader to
disambiguate homophonous words (Boltz 2011, 63). This compound

character could be also joined with another semantic determinative to create a new compound character, in a recursive manner. Even though the system could use infinite cycles of semantic determinative incorporation, very few words include more than four or five, suggesting that practical considerations and common sense were imposed on the system (Boltz 2011, 65). This implies that semantic determinatives are an important structural part of this writing system.

Noun Classification Systems and Semantic Determinatives

I have previously indicated that semantic determinatives operate as classifiers, but I do not think they are equivalent, and I would try to illustrate why. Rude (1986) was the first researcher to notice the similarities between semantic determinatives and noun classifiers, which are a wide range of characterization devices, used in some languages of the world (Aikhenvald 2000, 1). Classifiers are independent elements whose function is to place objects in classes that relate to how humans interact with the world (Denny 1976). These categorization mechanisms employed by languages serve to create cognitive associations among the different elements that the language could describe, based mainly on prototypical categories (Craig 1986, 1). In language, the realization of the association between concepts and categories is expressed through a concrete articulation of linguistic formats, such as words or other more complex linguistic elements (Pommerening and Bisang 2017, 3). In the case of noun classifiers, they are always included as separate lexemes, being their main purpose the inclusion of a noun or verb into a certain category[8] or its numeral quantification, through the use of a special group of classifiers named as numerical classifiers that specify some characteristics of the object being counted or quantified (Dixon 1986, 105). We can see classifiers at work in the following example from Jakaltek, a Maya language (the classifiers are indicated in bold type):

Xil	*ix*	*malin*	*naj*	*pel*	*b'oj*	*no'*	*cheh*
saw	[WOMAN]	Malin	[MAN]	Pel	with	[ANIMAL]	horse

"Malin saw Pel with a horse" (taken from Goldwasser and Grinevald 2012, 19)

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[8] Some possible categories could be the size of the object, the material it is made of, if the object is animate or inanimate, if it is a person, and many more.

Since Rude noted this similarity, many other researchers have equated the use of semantic determinatives in writing systems to the use of noun or verb classifiers in language, making them equivalent (Goldwasser 2002, 2006; Goldwasser and Grinevald 2012; Lincke and Kammerzell 2012; Rude 1986; Selz, Grinevald and Goldwasser 2017). But there is a very important difference between the two systems. While they serve basically the same purpose—the assignment of a noun or verb to a specific category—they do not work in the same way. Classifiers need to be uttered, and more often than not, their inclusion in the phrase is compulsory, therefore they need to be present, and they are pronounced. On the other hand, semantic determinatives are not a part of speech, they are not pronounced, and their inclusion is optional. Although classifiers and semantic determinatives basically serve the same purpose, they tend not to be present at the same time, because when a language uses one, it does not need the other. While this does not mean that they are mutually exclusive, it may make a language that exhibits a vast use of classifiers not use semantic determinatives when written, and those languages whose writing systems employ semantic determinatives, might do so because the language does not use classifiers. Obviously, a language, and its writing system may be perfectly understandable without any of these categorization mechanisms. This might explain why the presence of semantic determinatives is almost non-existent in the Maya writing system, since the languages represented using this script[9] do have classifiers, especially numerical ones (Wichmann 2011), making the presence of semantic determinatives residual in this system.

Use of Semantic Determinatives in Maya Writing

The presence of semantic determinatives in the Maya writing system has been a controversial issue. This writing system shows two characteristics that might call for its presence: polyvalence, which implies the existence of multiple readings for a single sign, and homophony, meaning that a group

[9] At least four languages are represented using the Maya hieroglyphic writing system during the Classic period (ca. A.D. 250–900), Classic period Ch'olti', Classic period Yukatek, Classic period Western Ch'olan, and Classic period Tzeltal (Lacadena García-Gallo and Wichmann 2002, 2005). There is a possible fifth language registered using this script according to Beliaev (2005).

of different signs have the same reading (Lacadena García-Gallo et al. 2010, 4). After an intense debate about their existence (Hopkins 1994; Kelley 1976, 150; Lacadena García-Gallo 2010; Mora-Marin 2008; Schele 1983; Zender 1999), the only elements in the Maya writing system that could be considered as semantic determinatives are the fire sign that is used along with other signs to identify objects or actions related to fire (figure 4), which was not uttered (Kelley 1976, 150), and the use of the colors red and black to indicate the way numbers are employed in calendar almanacs in the Maya codices (Lacadena García-Gallo et al. 2010, 3).

Another sign once strongly considered to be a possible candidate for a semantic determinative is the frame used to indicate *tzolk'in*[10] dates. This idea has been discarded, mainly because this sign presents phonetic complementation in some inscriptions, implying that it was actually read[11] (Lacadena García-Gallo 2010, 1026; Zender 1999, 43). There is also some debate regarding the use of some combinations of signs that some researchers (Mora-Marin 2008, 206) claim could signal the presence of semantic determinatives, because in some cases the addition of one of these signs to another sign changes the reading value of the latter, but it does so by using the semantic relationship between both signs, and their relative location in the glyphic composition, not its phonetic value (figure 5).

In this case, none of the logograms, nor their combination behave as a semantic determinative, but as stereotyped elements whose semantic values are combined and lost in order to create a new element with a different semantic value. This phenomenon is also present in Egyptian hieroglyphic writing and is called "pictorial lexicalization," where the pictorially fused hieroglyphs are prototypical and no longer sensitive to contextual or pragmatic considerations (Goldwasser and Grinevald 2012, 38). Stuart (1995, 39) called these combinations "representative logograms," a definition that properly signals their function as a mechanism to create new logograms, and not as semantic determinatives.

One possible explanation for the poor representation of semantic determinatives in Maya writing could be the fact that some of the Maya

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[10] The *tzolk'in* was a basic count of days that was used during the Classic period by the Maya as part of their calendar. It was also used during the Postclassic and Colonial periods and is still used by some communities in the Guatemala Highlands, such as the Ixil and the K'iche', where it is employed in divinatory contexts (Lacadena García-Gallo et al. 2010, 23).

[11] This sign is sometimes followed by the syllable –**ni**, to indicate a reading value of *k'in*, "day," for the frame.
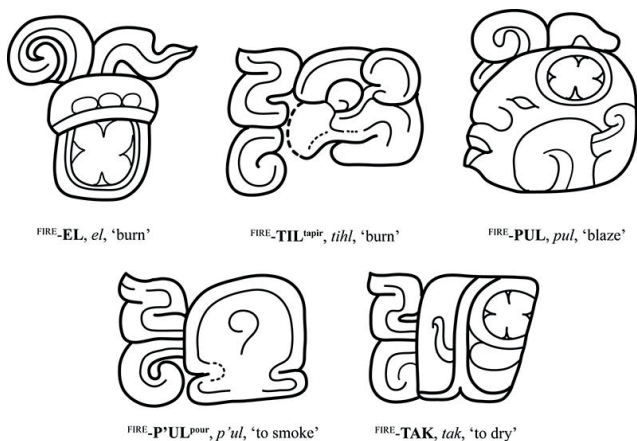
Figure 4. The fire sign employed as a semantic determinative.
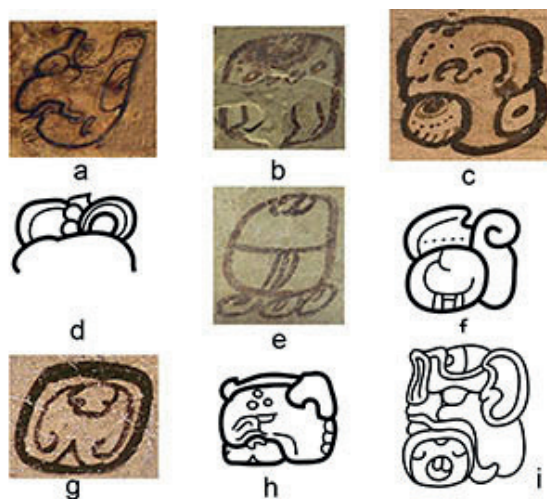Drawing by Rogelio Valencia Rivera based on Lacadena et al. 2010, 3

Figure 5. Examples of "representative logograms" or "pictorial lexicalizations."
a) **TI'**, "mouth" (K1440); b) **HA'**, "water" (Capstone 5, Dzibilnocac, photograph by
Rogelio Valencia); c) **UK**, "drink" (PC.M.LC.p2.147 DO); d) **TI'**, "mouth" (Stela I,
Copan, drawing by Rogelio Valencia based on a drawing by Linda Schele); e) **WAJ**,
"maize bread" (Capstone 5, Dzibilnocac, photograph by Rogelio Valencia); f) **WE'**,
"eat" (Stela 35, Yaxchilán, drawing by Rogelio Valencia based on a drawing by Ian
Graham); g) **WINIK**, "man" (PC.M.LC.p2.70); h) **KOJ**, "cougar" (Stela 8, Piedra
Negras, drawing by Rogelio Valencia based on a drawing by Ian Graham); i) Vampire
(Stela 5, Tikal, drawing by Rogelio Valencia based on Jones & Satterthwaite 1982,
figs. 6–7) (taken from Salazar and Valencia 2017, 87)

languages using this script were some of the few that employed noun and
numerical classification, and these classifiers were actually written using
Maya hieroglyphs. In figure 6, an example of how the noun classifier for
female gender, *ix*, works in a phrase, is shown.

In this example, the text talks about a baldachin and its corresponding
palanquin (Baliaev and Davletshin 2014), which belonged to the lady
whose titles and name follow the indication of these objects. Her name
is preceded by the classifier **IX**, "woman," represented by the image of a
female head in profile (Zender 2014, 5–6), which acts as a noun classi-
fier, indicating that the proper name following it belongs to a woman. As
a noun classifier it had to be uttered. This logogram did also represent
the word **IXIK,** "woman, lady," that acted as a substantive, and when used
like this, it was phonetically complemented to indicate so. We can find
some examples of this phonetic complementation in some inscriptions
from Yaxchilán—a site located in the Usumacinta basin—where the term
is written **IXIK-ki**, and also at Piedras Negras—another Maya site located
in the same region—where we can find a complete phonetic substitution,
i-xi-ki, *ixik*, indicating that the form of the logogram, when used as a
substantive, was **IXIK**. When used as a noun classifier, the logogram is
not optional, as could be seen in the hieroglyphs following the specifica-
tion of the object possessed by the main character of the inscription,
whose name is K'abel. Her name is indicated as "ix K'abel," and immedi-
ately following her name we find the text "Ix ajaw," where *ajaw*[12] refers
to a title of nobility, similar to lord, or governor. Both *ix* classifiers are
necessary to qualify the name and the title; both need the specification
that they are being applied to a woman. The same happens again with the
last title *Uxte'tuun Ix kalo'mte'*, "the lady kalo'mte' of Uxte'tuun," where
"Uxte'tuun" is one of the ancient names of the place where the inscription
is located, Calakmul, and *kalo'mte'* is a title equivalent to emperor, but as
it is being applied to a woman, it translates as empress instead, and again
the classifier *ix* cannot be elided.

The vast majority of the rest of the classifiers that appear in Classic
Maya texts have a quantifying nature and are thus called numerical clas-
sifiers. Here are some examples: *b'ix*, for counts that include multiples of
five and seven; *pis*, for counts of years (in Yukatek); *te',* to count units

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[12] The logogram **AJAW**, "lord," is represented in this case using the head of a vulture
wearing a headdress.

u-pa?-chi, *upaach?*, 'her baldachin'

u-PIT-ta, *uplit*, 'her palanquin'

title-IX, title *ix*, 'lady...'

IX-?-K'AB?-li, *ix ...k'abel*, 'lady K'abel'

IX, *ix*, 'lady'

K'UH-AJAW-wa, *k'uh[ul] ajaw*, 'sacred ajaw'

ux-TE-TUN-ni, *'ux te' tuun*, 'Uxte'tuun
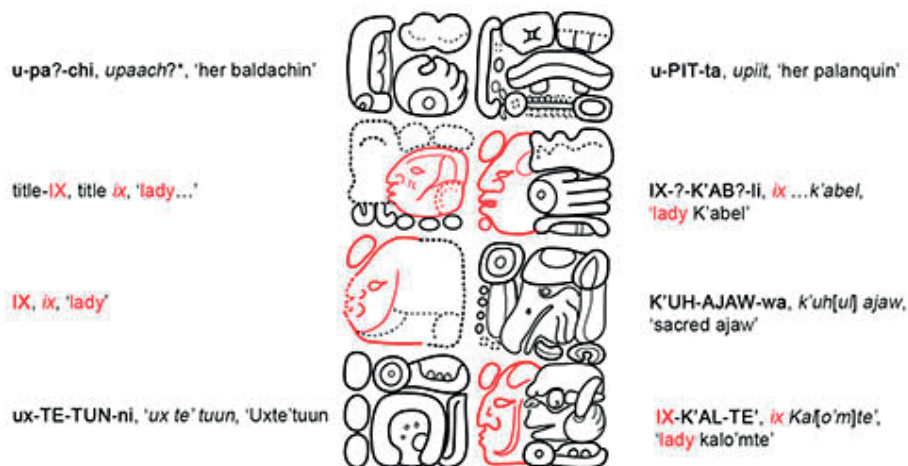
IX-K'AL-TE', *ix Kal[o'm]te'*, 'lady kalo'mte'

Figure 6. Part of a text from Stela 55, from the archaeological site
of Calakmul, dated in the Calendar Round date 9.15.0.0.0 *4 ajaw 13 ya'xsijo'm*,
August 22, 731. In red are indicated the logograms for **IX**, *ix*, "lady".
Drawing by Rogelio Valencia Rivera

of time; *tz'ahk*, to indicate things that are put in order; *tal*, to indicate things
that are put in order too; *tikil*, to count human beings; and *lat*, to count days
elapsed (Lacadena García-Gallo et al. 2010, 47). As I have already indi-
cated, these two classification systems complement each other, and the
poor presence of semantic determinatives in the Maya writing system may
be due to the presence of classifiers that covered basically the same function
but were required to be uttered by the speakers. It is important to note that
classifiers are a part of speech, while semantic determinatives are a part of
the writing system, and each has its own internal working mechanics, even
if their goal might be the same, to provide some semantic background to
the information presented on each medium.

Use of Semantic Determinatives in Nahuatl Writing

Nahuatl was another Mesoamerican language that employed classifiers to
some extent. According to Wichmann (2011), the following are the classi-
fiers originally employed in the Nahuatl language:

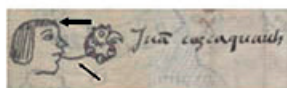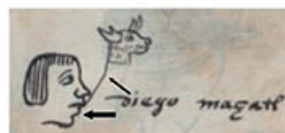| Suffix	Used for
–Ø	animates, types of wood, fruit-trees, chili, paper, mats, boards, tortillas, ropes, cords, thread, hides, canoes, boats, ships, skies, knives, candles and similar things
–*tetl*, "stone"	chicken, eggs, cacao, fruit of cactus, maize bread (tamale), bread, cherries, cups, butts, fruits, beans, squashes, melons, books, round and cylindrical things
–*pantli*, "flag"	lines, rows, walls, lines of people or other things ordered in lines
–*ipilli*	paper, mats, tortillas, pieces of cloth, skins
–*tlamantli*	talks, sermons, walls, shoes or sandals, paper, dishes, shields, troughs, heavens, when one thing is folded on top of another or when something is diverse or different from another
–*olotl*, "corn cob"	corn cobs, some flowers called *yeluxuchil*, columns of stones, bananas, certain bread of seeds like buns, which they call *tzoualli*, and others like *cañutos* that they call *tlaxcalmimilli*

But at the time of contact with the Spaniards, there had been a decline in the use of classifiers, and only –*tetl* and –*tlamantli*[13] still appeared in texts (Lockhart 2001, 185; Wichmann 2011). These classifiers only had a quantifying use, and there are no examples of classifiers used to qualify semantically nouns or verbs. So, there is some room for the possible appearance of semantic determinatives in the Nahuatl script. The presence of this writing artifact has already been proposed by some researchers, starting with Aubin who signaled the presence of a "generic sign" for *ville et village*, "city and town", in his study of the mechanics of Nahuatl writing (Aubin 1885, 14). Some other authors have described this scriptural mechanism,

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[13] In Siméon's Nahuatl dictionary we find the following entries: "*Tetl*. En numeración *tetl* se usa como prefijo en la formación de los adj. n. que sirven para contar los objetos redondos, gruesos: *centetl ayotli*, 'una calabaza', *nauhtetl tomatl*, 'cuatro tomates', etc." (Siméon 1992 [1885], 520). "*Tlamantli*. S. Cosa. Esta palabra se une a los adj. n. *ce*, *ome*, etc. para contar objetos tanto diversos como parecidos: *ontlamantli cactli*, 'dos zapatos', *etlamantli tlatlatolli*, 'tres discursos', etc." (Siméon 1992 [1885], 610). See also Davletshin and Lacadena García-Gallo (2019, 304).

either directly, by mentioning its presence in the script (Manrique Casta-ñeda 1989, 166–67; Prem 2008, 20, 22; Whittaker 2009, 2018a, 180–81; Zender 2013, 2017; Cossich Vielman 2014, 117; Davletshin 2017), or indi-rectly, by mentioning the semantical character of some hieroglyphs used in the Nahuatl writing system (Williams 1984, 104–05; Offner 1984, 129–34; Williams and Harvey 1997, 21–23; Williams and Hicks 2011, 25–26). Following Aubin's suggestion, Manrique Castañeda (1989, 166–67), Prem (2008, 20, 22), Whittaker (2009; 2018a, 180–81), Cossich Vielman (2014, 117) and Davletshin (2017), all indicate that the mountain sign denotes the presence of a city, although signaling its problematic nature, as some-times it might be included in a text and read as the TEPE logogram, a cir-cumstance that Prem in particular finds problematic, but that constitutes a common practice in other writing systems; the fact that in some contexts a sign might be used as a logogram and in other contexts as a semantic determinative is well proven. Zender (2013, 2017) also recognizes the existence of semantic determinatives and indicates that the system was open to the inclusion of new determinatives to signal the presence of new cultural elements introduced by the Spaniards in Mexico.

As I have already stated, in the Nahuatl writing system the reading order of the signs seems to be emblematic, as it was not very strict. Al-though it has a tendency to go from right to left, and bottom to top, this order varies considerably (Velásquez García 2019, 78). This may have been related to the fact that it was mainly used to write only proper names, top-onyms, and dates (Lacadena García-Gallo 2008a, 8; Whittaker 2018b), elements that could very well work in a heraldic or emblematic composition (Velásquez García 2019, 78). This very fact might have caused problems when reading information structured in lists of personal names or place names, as the hieroglyphs of one name might mingle with those of the adjacent hieroglyphic groups of another name. During the Colonial period, many documents required the listing of names or places, such as population censuses, tribute payment lists, and land ownership registers. These docu-ments used Nahuatl hieroglyphic writing and were generally glossed by official court translators. In order to avoid misinterpretation of the names, Nahuatl writers, or *tlacuilohqueh*, used specific signs to indicate the limits of each name, and these signs operate as semantic determinatives. In order to show that this was a basic operating principle of the script, I include some examples of its use in hieroglyphic compounds from different docu-ments that use the Nahuatl hieroglyphic writing system (figure 7).
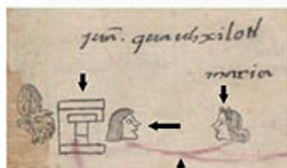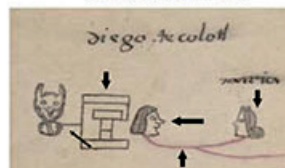
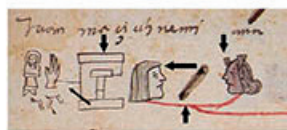Figure 7. Examples of the use of the semantic determinatives in Nahuatl documents (transcription included as it appears in the glosses). The semantic determinative for MAN- is shown using a horizontal arrow. Other determinatives (HOUSE-, WOMAN-, and the red line connecting MAN- and WOMAN- with the meaning of KINSHIP-) are indicated by vertical arrows. The line joining the name and its owner is marked with a thin slanted arrow; it was optional, as could be seen in examples B, D, and E. A) *Matrícula de Huexotzinco* f. 482v and 433v; B) *Códice Vergara* f. 2v and 3r; C) *Códice Santa María Asunción* f. 2r; D) *Libro de tributos de San Pablo Teocaltitlan* f. 4r and 5r (Mexicain 376 BNF); E) *Fragmento de un proceso* f. 1r (Mexicain 86 BNF)
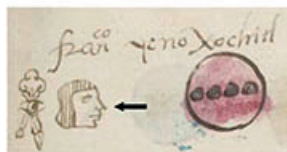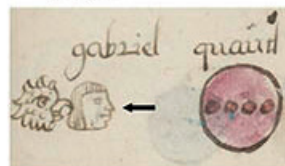
All the examples shown in figure 7 are personal male names included in lists for legal purposes. Each entry is signaled by means of a sign that represents a male head in profile, and next to it, on the left or right, the phonetic signs that record the proper name are located, sometimes linked to the semantic determinative by a dark line. Significantly, Spanish glosses are never used for the "male head" signs, only for the phonetic signs, which may imply that they were not uttered. Support for this idea comes from a similar source, but this time written in the Latin alphabet. These lists of people were also written in Nahuatl, but using the Spaniards' writing system, as can be appreciated in a document called the "Padrones de Tlaxcala del siglo xvi y Padrón de nobles de Ocotelolco," a census of the Tlaxcala region created in 1557, in order to organize tribute and record the activities of the men living in the towns included in it (Rojas Rabiela 1987) (figure 8).

This document includes a list of personal male names written in Nahuatl that specifies the men living in different towns in the Tlaxcala region. As we can see, the header of the list indicates *Cuauhcaltzinco tlaca*, "The men from Cuauhcaltzinco," where *Cuauhcaltzinco* is the name of a town, followed by the names of each of the males living in that place, introduced by an early form of a bullet sign.[14] The list does not need to indicate that each name belongs to a different man, as is the case for Nahuatl writing texts. The text organization directs the reader to the start of the name, and it clearly indicates where it ends. The Latin alphabet uses rows and space to separate different lexical components, so there is no need to indicate the semantics for every single name. We can see a classificatory indication at the beginning of the text, explaining that those are the males from the town of Cuauhcaltzinco, and every name is clearly identifiable from the other.

The origin of the determinative for male is the logogram TLAKA, "man," which is also used with a phonetic value in this type of documents. We can see this phonetic use in the document "Chalco, recibos presentados por el

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[14] Albert Davletshin (personal communication 2019) has pointed out the possibility that this example might imply that male head symbols operate as a diacritic sign subtype, which substitutes the bullet sign at the beginning of the name. This is not the case, since in the previous examples the sign indicates the semantic category to which the personal names apply and could be combined with other similar signs to modify their meaning (being married, be the head of a household, etc.), implying that they operate as semantic determinatives. The introductory sign for each line might be a form of the "calderon" character.

Figure 8. The image shows the list of names for the men living in the town of Cuauhcaltzinco, included in the document named *Padrones de Tlaxcala del siglo XVI y Padrón de nobles de Ocotelolco*. Source: Rojas Rabiela 1987

capitán Jorge Cerón y Carbajal"[15] (figure 9). In this case, both logograms, ᴛʟᴀᴋᴀ, "men," and ꜱɪᴡᴀ, "women," have a logogrammatic value as they are complemented by another logogram, ᴘᴀɴ/ꜱᴇᴍᴘᴏᴡᴀʟ, "flag/twenty," to indicate "twenty men" or "twenty women," the amount of people that were employed by Jorge Cerón y Carbajal.

One interesting thing about the nature of the Nahuatl semantic determinatives is that they could be representations of the whole body of the subject, not only their head (figure 10). In figure 10.A we have an example of a lord being named using only his head wearing the Nahuatl crown, or *xiuwitzolli*,[16] but we also see another lord represented using a complete image of his body, seated on a little bench-type throne, both recognizable due to the presence of the glosses that state their names. In figure 10.B we can see a representation of another crowned lord, Don Diego de San Francisco Tehuetzquititzin, seated on his throne, again designated by means of the phonetic signs that compose his name (see Whittaker 2012, 143). Without the phonetic component of the composition, we would not be able to recognize the person represented in the image, as Mesoamerican art in general used stereotyped images to represent people, not portraits (Fuente 1970; Salazar Lama and Valencia Rivera 2017, 96).

In order to prove that these signs were not uttered in this kind of context, I include here some examples of the use of the semantic determinative for ᵂᴼᴹᴬᴺ- (figure 11). The example in figure 11.A is the one that really proves that Nahuatl semantic determinatives were not pronounced and only had a classification role in this writing system. In this example, we have the same sign, the head of a Nahuatl woman, working as the semantic determinative ᵂᴼᴹᴬᴺ- (marked with a vertical arrow) and as a logogram (marked with the inclined arrow), one with the reading value of SIWA, *siwā[tl]*, "woman" (Molina 2013 [1571], 22), and the other one providing the meaning *siwātl*, "woman". Both signs were included because each one serves a different function in the text, the one to the left indicates that the following text is related to a woman, in this case indicating the female's personal name; and the second has a logogrammatic function, indicating that the personal name of that woman includes the sounds corresponding to the word

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[15] This document, currently held in the Bibliothèque nationale de France Library (ʙɴꜰ Doc. 30), was presented in 1564 as part of a process against Jorge Cerón for misappropriation of tribute, by the people of Chalco, where he acted as governor.

[16] The *xiuhuitzolli*, "corona real con piedras preciosas" (Molina 2013 [1571], 30), was the most prestigious insignia in the Nahua world (Olko 2014, 37)

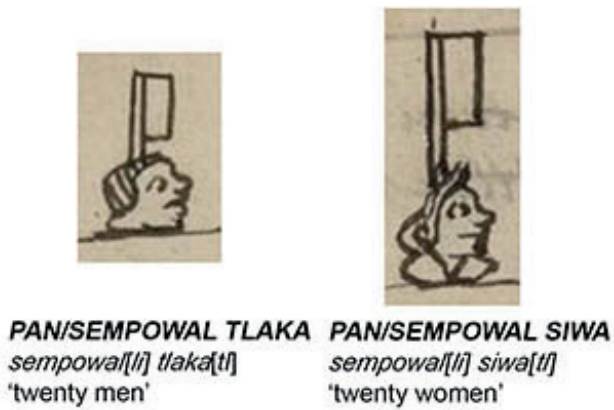Figure 9. Images coming from the document *Chalco, recibos presentados por el capitán Jorge Cerón y Carbajal*, where the logograms TLAKA and SIWA have a logogrammatic value. Source: Bibliothèque nationale de France, París
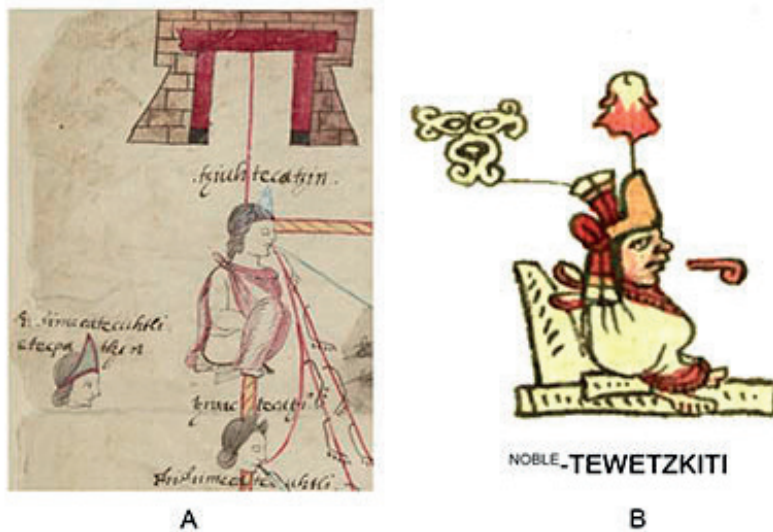

Figure 10. A) Images from the document *Calpan, Confirmación de las elecciones* (BNF Doc. 73); B) Don Diego de San Francisco Tehuetzquititzin, ca. 1564 (AGN, Tierras, vol. 55, exp. 5, f. 387r)
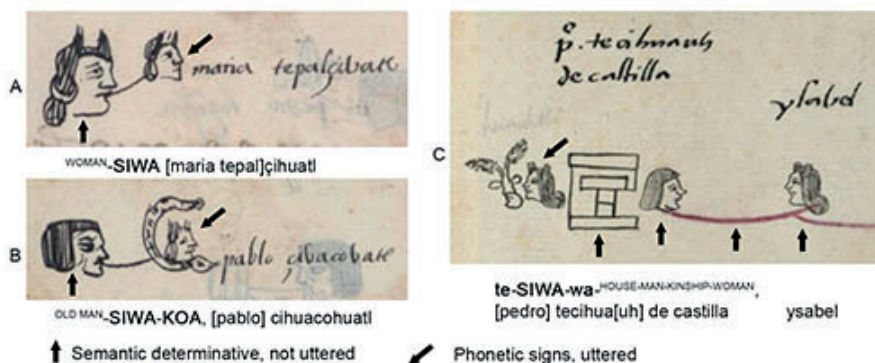
Figure 11. A) *Matrícula de Huexotzinco* f. 492r; B) *Matrícula de Huexotzinco* f. 490v; C) *Códice Vergara* f. 5r. The vertical arrow indicates a semantic determinative, a sign that was not uttered; the inclined arrow indicates a phonetic sign, a sign that was uttered

SIWA as part of it. The gloss in the Latin alphabet proves the latter point, as it gives us the rest of the information necessary to complete the name of the woman, which is, according to the gloss, "Maria Tepal**cihuatl**," where the Christian name of the woman, María, was omitted and the sound "tepal," elided. In figure 11.B we can again see the same sign, being used with a logogrammatic function in the personal name of an elderly male person, "Pablo **Cihua**coatl." Finally, in figure 11.C we can see the same sign being used again both as a semantic determinative and as a logogram, to indicate that the male whose name is provided by the phonetic signs to the left of the male head determinative includes the word SIWA in it, as his name is "Pedro Te**cihua**uh." The second sign represents the ^{WOMAN}- semantic determinative, which along with the red line that links it to the ^{MAN}- semantic determinative, is used to indicate that he is married.[17]

There are many examples of semantic determinatives present in colonial documents that still used the Nahuatl writing system. Some examples

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[17] Regarding the lines employed by the Nahua scribes to join different signs, some authors consider them as auxiliary signs (Houston and Zender 2018; Davletshin and Lacadena García-Gallo 2019). Davletshin and Lacadena García-Gallo propose the use of the sign = to indicate it in the transliteration of Nahua texts (Davletshin and Lacadena García-Gallo 2019, 207; Velásquez García 2019, 72). From my own point of view, regarding the case of the red lines that tie two spouses, they work in the same way semantic determinatives do, as they are not uttered and, instead, they provide semantic information that helps to determine the relationship of the terms they unite (see figure 7).
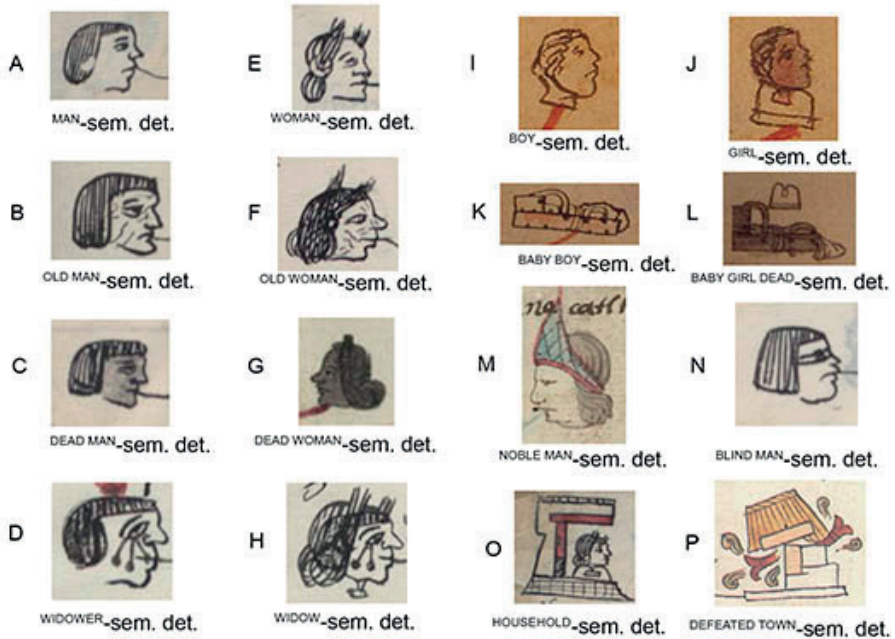
Figure 12. A) ᴹᴬᴺ- determinative with the face of a man (*Matrícula de Huexotzingo* f. 490r); B) ᴼᴸᴰ ᴹᴬᴺ- determinative with the face of a wrinkled man (*Matrícula de Huexotzingo* f. 490r); C) ᴰᴱᴬᴰ ᴹᴬᴺ- determinative with the shadowed face of a man (*Matrícula de Huexotzingo* f. 492v); D) ᵂᴵᴰᴼᵂᴱᴿ- determinative with the face of a man with tears (*Matrícula de Hue*xotzingo f. 608r); E) ᵂᴼᴹᴬᴺ- determinative with the face of a woman (*Matrícula de Huexotzingo* f. 492r); F) ᴼᴸᴰ ᵂᴼᴹᴬᴺ- determinative with the face of a wrinkled woman (*Matrícula de Huexotzi*ngo f. 532r); G) ᴰᴱᴬᴰ ᵂᴼᴹᴬᴺ- determinative with the shadowed face of a woman (*Códice Vergara* f. 6r); H) ᵂᴵᴰᴼᵂ- determinative with the face of a woman with tears (*Matrícula de Huexotzingo* f. 608r); I) ᴮᴼʸ- determinative with the face of a boy (*Códice de Santa María Asunción* f. 6r); J) ᴳᴵᴿᴸ- determinative with girl wearing a blouse (*Códice de Santa María Asunción* f. 6r); K) ᴮᴬᴮʸ ᴮᴼʸ- determinative with a baby's cradle (*Códice Vergara* f. 2v); L) ᴮᴬᴮʸ ᴳᴵᴿᴸ (ᴰᴱᴬᴰ)- determinative with a baby's cradle with a little blouse on top and shadowed (*Códice Vergara* f. 2v); M) ᴺᴼᴮᴸᴱ ᴹᴬᴺ- determinative with the face of a man wearing a *xiuhuitzolli* (*Calpan, Confirmación de las elecciones*, ʙɴꜰ Doc. 73); N) ᴮᴸᴵᴺᴰ ᴹᴬᴺ- determinative with the face of a man with the eyes crossed out (*Matrícula de Huexotzingo* f. 546v); O) ᴴᴼᵁˢᴱᴴᴼᴸᴰ- determinative with a house and the name of the family inside (*Matrícula de Huexotzingo* f. 485v); P) ᴰᴱꜰᴱᴬᵀᴱᴰ ᵀᴼᵂᴺ- determinative with thatched roofed house in flames (*Códice Mendoza* f. 2v)

are included in figure 12. This is not an extensive list, but it includes a number of the most common examples. As we can see on the list, the main use of these determinatives is the categorization of gender, as applied to personal naming, with the exceptions of the house that designates a household or family, and the defeated town that is represented by a house on fire associated with a toponym. If we attend to the mechanisms used to differentiate one determinative from the other, they employ a stereotyped image of how a category must be represented. In the case of the determinatives for man (figure 12.A) and woman (figure 12.E), what characterizes them are their haircuts, particularly that of the woman, as the two knots on top are shared by the determinatives associated with adult women (figure 12.E–H). Wrinkles are the main characteristic of aged people (figure 12.B, F) and tears represent a mourning person, which is the way widows and widowers are pictured (figure 12.D, H). Regarding dead people (figure 12.C, G), they are represented using the same determinatives for adults, but their faces have been grayed out, and sometimes their eyes shut, to signal the lack of life in them. This is applied to the children's determinatives too, which may take this determinative to indicate a deceased sibling (figure 12.L). Also regarding children, girls are distinguished by the display of a *huipil*, an embroidered blouse only worn by women (figure 12.J, L). Blind men are represented with lines crossing their eyes[18] (figure 12.N), as if wearing a band, to show their inability to see. Noblemen are shown wearing the *xiuwitzolli* to show their high status (figure 12.M).

An example of the use of these determinatives outside the contexts of the list of names, can be appreciated in a document that employs them to describe the characteristics of a property (figure 13), on a house plan annexed to a land litigation document, to indicate the measures of the house under dispute, using Nahuatl writing signs to show the size of the house and the names of its owners (Valencia Rivera 2018). The document is part of the case of Ana Tepi, against Antón Ximénez, for the possession of the house depicted on the plan, which she claims she inherited from her deceased husband, Diego Pantecatl. As we can see in the image, the diagram of the house and its dimensions are shown, using hands (*maitl*) and hearts

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[18] We know that these are blind men as the text in Spanish that explains these images in the *Matrícula de Huexotzinco* says *ciegos*, "blind." This same convention of crossing the eyes with a line is used in other documents to signal foreigners, which indicates that in some cases these signs had a regional variation of use (I would like to thank Margarita Cossich for pointing this out).
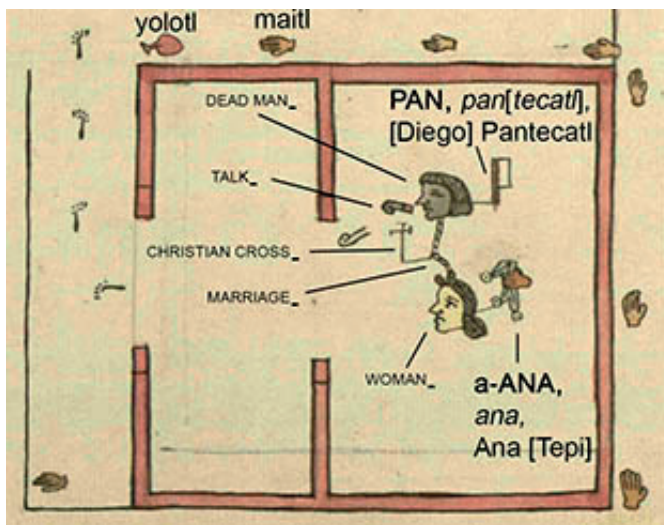
Figure 13. Property plan of Ana Tepi, bequeathed by Diego Pantecatl, ca. 1567.
Source: AGN, Tierras, vol. 20, expediente 3, f. 11v

(*yolotl*), and in the middle of the larger room, there is a Nahuatl text that includes the names of both, Ana Tepi and Diego Pantecatl. Each name has a semantic determinative, WOMAN- for Ana Tepi, and DEAD MAN- for Diego Pantecatl. To the right of each determinative, the phonetic signs that spell their names are located. For Ana, a hand holding water is written, which together spell **a**, for the water sign, and **ANA**, for the logogram "to hold, or take" (Molina 2013 [1571], f. 5v). In the case of Diego Pantecatl, the sign **PAN**, "flag," indicates his name, and close to his mouth, there is another determinative represented by a darkened speech scroll, which indicates Diego's will after his death. Both names are connected by a rope, which substitutes for the red line present in other documents[19] that designates a married couple (see figures 7.B, C, and 11.C).

With the decline of the use of the Nahuatl writing system, in favor of the use of the Latin alphabet, both systems started to intermix, and the glosses in Spanish began to substitute the phonetic signs in the names (See figure 10.A). This also implied that some elements from the Colonial culture started to be incorporated in the writing system (Zender 2013; Batalla Rosado 2018; Bueno Bravo 2018), and that is the reason why we could spot

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[19] See note 17.

a tiny Christian cross attached to the ᴹᴬᴿᴿᴵᴬᴳᴱ- determinative—being in this case a rope not a red line—in order to overload the symbol with a new meaning, that of the Christian marriage present in the new cultural world created in Mexico after the conquest. But this change did not mean the extinction of the Nahuatl writing system, which survived for many more years.

Conclusions

Traditionally, the signs analyzed in this study have been considered by some researchers as mere illustrations, due to their pictorial character, as they are often included inside or near the images that sometimes illustrate Nahuatl texts (Navarrete 2011; Boone 1994, 2011). Sign iconicity in Mesoamerican writing systems has also fueled the idea that writing signs were language independent, that they served to convey meaning regardless of the language used by the reader (Boone 1994, 9; 2011, 197–98; Grube and Arellano Hoffmann 2002, 33; Martin 2006, 63), but this is certainly not the case, as representation is culturally biased, and what might seem as a straightforward reading for a sign, might be misleading. Take for example the way Maya scribes represented the word for lord, using a vulture head as a logogram for the word **AJAW** (see figure 5, third line from top to bottom, right column) or the example taken from the *Memorial de los indios de Tepetlaoztoc* (figure 14), where part of the tribute paid by Tlilpotonqui, lord of Tepetlaoztoc, to the *encomendero* Miguel Díaz de Aux is shown (Valle 1994, 61).

In Figure 14, the images below each one of the two white bundles, or *cargas*, indicate their contents, but they do not illustrate them, which might lead to some erroneous interpretations (Valle 1994, 217), but they use writing to describe them instead. In this way we know that the first bundle contains beans, written in Nahuatl as **e-ᴇᴛʟ**, *etl* (Lacadena and Wichmann 2011, 29), as the gloss in Spanish indicate—*frijoles*, beans—but the second one instead of containing what indicates the gloss—*harina*, flour—contains maize grains, written in Nahuatl as **tla-ᴛʟᴀᴏʟ**, *tlaol* (Lacadena and Wichmann 2011, 24). This implies that these images are not iconic but writing signs instead, and that they were supposed to be read in a language where the phonetic complementation, **e-** in the first word and **tla-** in the second, makes sense.

As the evidence provided in this article has tried to prove, there is a group of signs that were used in the Nahuatl writing system as semantic determinatives, a mechanism used by the scribes to aid the readers to
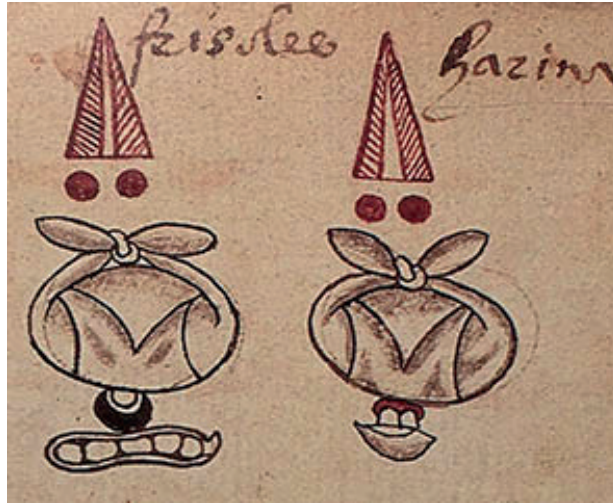
Figure 14. Page 12, figure B from the *Memorial de los indios de Tepetlaozctoc*. Source: Valle 1994, f. 12, lámina B

better comprehend some texts, especially those organized as lists of similar elements. Due to the variable reading order of Nahuatl texts, some aid must have been provided by the writer using this writing system to allow the reader to discern where a text unit begins and where it ends, especially when many similar items are included in the same text. We should remember that this was also one of the goals pursued by the Egyptians, when using this scriptural aid. Semantic determinatives are fairly similar to noun and verb classifiers and they tend to complement each other. This means that languages that have classifiers tend not to use determinatives, and languages that do not have classifiers depend on determinatives for this classification function. It is important to notice though, that classifiers are associated with language, and semantic determinatives with the writing system, so both basically perform the same function but on two different realization levels, which is why determinatives are not uttered, and classifiers are required and pronounced when they are present in the language. In many writing systems, semantic determinatives originated as logograms that acquire this new special function, and even though they might mainly be used as determinatives, this does not prevent their use as logograms in other contexts. Semantic determinatives may combine to enrich their meaning, or to create new determinatives. All in all, this proves that the Nahuatl writing system shared the same scriptural resources employed by

the vast majority of the writing systems of the world, and contrary to some researcher's opinions (Prem 2008, 38), it was a full-fledged writing system.

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