Making History Possible: Logograph in China and Hieroglyph in Central America

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Abstract—In the following paper, I will compare and contrast the development of script in two different writing systems: the Mayan and the Chinese. This paper will demonstrate how each system employed writing to map language into a durable technology for communication. By doing so, I will provide the general information that introduces readers to the origin, purpose, and function of the two writing systems. Through analysis of the development of Mayan and Chinese writing systems, the paper also shows that significant aspects of culture were preserved and transmitted by written materials as they contribute to the continuation of the two civilizations. This approach also has the benefit of emphasizing the strong relationship between culture and writing. Studying the origins, development, and use of writing in these two cultures mitigates against the tendency to devalue certain cultures. A study of both Chinese and Mayan writing is especially important since both cultures developed scripts that did not borrow from the writing systems of other civilizations.

Index Terms—Writing system, logograph, hieroglyph.

I. INTRODUCTION: THE ORIGINS OF WRITING

Human beings have distinguished themselves from animals not only through the use of language but also through the invention of writing. Writing was first invented over five thousand years ago in the region of Sumer in the ancient Near East. As an important cultural and technological accomplishment, the invention of writing allowed humans to externalize their thoughts so that they could reflect upon them from both spatial and temporal distances [1]. This technology also formed a system of nonverbal communication that contributed to the development of a variety of human achievements. Speaking was certainly essential for many human activities, but writing also exerted a profound influence because it gave humans the ability to record and store information, stories, and ultimately history [1]. As a result, writing became such an efficient and valuable technology that some of its signs were eventually understood universally.

Aside from being a major cultural achievement, writing also had a practical purpose because gave humans the ability to supplement and expand their memories [1]. With written texts and records, history could be left for subsequent generations and removed from the original moment of writing [1]. In addition, since writing allowed humans to store and pass on information, the technology contributed to the development of more complex societies. And the process

of the ensuing generations benefited greatly from the legacy recorded by writing from prior generations as it directed human society to further progress. Writing has also fostered a just society in which written information may be printed, published, and distributed [1]. With this power, writing can also be a double-edged sword because it both controls the manipulation of information, but also has the potential of producing lies and misleading truths if it is misconstrued. Therefore, it becomes crucial to understand how contemporary writings developed from the past and the relationship between writing and culture in the past human history in order to unravel certain cultural issues.

II. EARLY CHINESE WRITING

Writing has been invented at least four times in the world, including Mesopotamia, Egypt, China and Mesoamerica. In what follows, I focus upon the origins and development of two of such writing systems in order to gain a better understanding of the function that writing held in both China and Mayan cultures. From these pristine writing prototypes, other writing systems shaped their models from borrowing and exposing to the early literate cultures. This process also encouraged the assimilation of culture into today's diverse cultural groups with various writing systems.

Our earliest evidence for Chinese writing has been found as early as 1600 BC on what scholars call "oracle bones" [2] Oracle bones are animal bones or turtles' plastrons dating from the Shang Dynasty of China (1600 – 1046 B.C.) that were used for divinatory purposes [3]. For the purpose of divination, a fortune-teller was responsible for carving symbols on the surface of the animal bones or turtle shell. Respected for their special connection to spirits world of the ancestors, the fortune-tellers were consulted each time a decision needed to be made. People would visit fortune-tellers' shops for consult the same way as people check their horoscopes on the internet in the modern day. But the popularity of the fortune-telling divination was deeply rooted during the Shang Dynasty because people strongly believed that their ancestors had the power to influence the living as well as future events. In the royal courts, divination was carried out by trusted fortune-tellers or the king and the royal family themselves [2]. The actual ritual of divination and the use of writing occurred in several stages. First, the fortune-tellers would apply fire to the oracle bone until it cracked. Then, they would interpret the direction of the cracks to communicate with the ancestors. The answer would be interpreted to be auspicious if the cracks matched the pattern of the symbols that were inscribed or written before

fire was applied to the material. If the cracks did not match the written symbol that had been inscribed this would be interpreted as an inauspicious oracle [2]. In this way, by performing a simple ritual the fortune-teller was able to provide interpretations of the future. And based on the different subjects of divine inquiry, the fortune-tellers developed various symbols to indicate different situations.

The oracle bones attest to a wide range of divine inquiry, including predicting weather, curing illness, communicating with the ancestors, and seeking fortune in war or hunting. For example, a rubbing of an oracle bone from the reign of Wu Ding was used to predict the pregnancy of the King's consort, Wife Hao. [4] The prognostication reads: "The King, reading the cracks, said: 'If it be a 'ding' day childbearing, it will be good. If it be 'geng' day childbearing, it will be extremely auspicious.'" And the verification says: "'The birthing was not a happy event. It was a girl'" [3]. Gradually, the symbols written on the back of the oracle bones gave birth to the later recognizable Chinese scripts.

The first oracle bones were found in Anyang, near Yinxu, the ancient capital of the late Shang Dynasty, located in present-day Henan Province [3]. Shang Dynasty oracle bones include complete inscriptions, providing key information about how the script developed initially and the different topics that were involved in divine rituals during the Shang Dynasty. Since many oracle bones were excavated, the vast majority of the bones are records of the divination of the royal figures of the late Shang Dynasty or Yin Dynasty. A few also date back to earlier times in the dynasty or the beginning of the subsequent Zhou Dynasty.

The oracle bones from the Shang Dynasty allow us to gain a window into some of the earliest script styles in Chinese writing. The early script styles borrowed from the characters on the oracle bones, but later Chinese script styles progressed with the rise and fall of several different Chinese dynasties. Following the emergence of the earliest form of Chinese writing during the Shang Dynasty, bronze inscriptions began to appear during the Shang and Zhou (1046 – 256 B.C.) Dynasties [5]. The bronze inscriptions were characters inscribed on bronze objects and had developed to be more pictographic than the characters written on the oracle bones [1]. While the structure and style of the Shang oracle bone scripts was mostly preserved in the Shang bronze script style, some of the Shang bronze characters were even more complex for decorative purposes and conservative usage.

During the Zhou dynasty another style of script known as the Great Seal script began to flourish. The Zhou dynasty was divided into Western Zhou and Eastern Zhou. Western Zhou was historically before Eastern Zhou, meaning that the script style used during Western Zhou remained mostly consistent with the Shang scripts. However, with the emerging simplification and linearization of the characters, many characters were changing to more squared shapes from the round elements of the Shang bronze script style. This involved the forming of line segments with shorter length and more uniform width. Thus, the pictographic element decreased from this transition of script styles during the Western Zhou Dynasty and as a result the signs became more abstract.

The pictographic quality continued to decrease in the Eastern Zhou Dynasty, which was made up of two distinct periods: The Spring and Autumn Period (771 to 476 B.C.) and the Warring States Period (475-221 B.C.). The entire Eastern Zhou dynasty was fueled with political turmoil and disunity among the rulers. During the Spring and Autumn Period, the royal authority gradually lost its ruling power and over 140 vassal states emerged in the wake of the loss of political centralization. Conflicts between the states resulted in significant political turbulence. At the beginning of the Warring States Period, seven of the states came to dominate and declared independence from the ruling of the Zhou royal court. Besides incessant warfare, both the Spring and Autumn Period and the Warring States Period saw the rise of many great philosophers such as Confucius and Laozti as well as political and cultural reforms in each of the individual contending states. Thus, the Great Seal script was created by writers from various historical backgrounds and spoke different dialects [3]. The development of regional script forms diverged among the seven contending states and the practices in written language remained in disarray until the Qin Dynasty.

Eventually the Qin state was victorious since it conquered the other six contending states, leading to the establishment of the Qin Dynasty (211-207 B.C.). Following the conquest and unification of the empire, the first emperor of the Qin Dynasty unified the written script to a more simplified and standardized form called the Small Seal Script [5]. Abandoning the irregularities in the previous script styles, the Small Seal Script is characterized by balanced and well-spaced strokes for a broader and easier dissemination of learning.

However, the Small Seal Script was hard to be written efficiently and as a result it declined during the Han Dynasty (206 B.C.-220 A.D.). During the Han Dynasty, a script tradition known as the Clerical Script replaced the Small Seal Script. The Clerical Script was significant in transitioning the Chinese characters to a modern version. Increased curved and broken strokes became the characteristic of the Clerical Script style. Besides simplification of certain complex characters into more recognizable and easily written forms, the later mainstream scripts remained mostly unchanged compared to the Clerical Script [5].

At the end of the Han dynasty, Regular Script began to take shape and reached maturity during the Tang dynasty (618-907 A.D.). Since then, the script remained unchanged until the 1950s, when the government of People's Republic of China introduced the standardization of the simplified Chinese characters in order to increase literacy [3]. And between the emergence of the Clerical script and the 1950s, two other script styles were developed, including the cursive script and running script [1].

III. THE PRINCIPLES OF CHINESE WRITING

Despite the long history of the development of the different scripts in the Chinese writing system, the basic principles of the system remained relatively consistent. As a result, understanding and deciphering the ancient characters are far less difficult than deciphering the Mayan scripts. We can arrive at a better understanding of the history and

function of the script by looking at the different types of signs that were employed in the writing system. In the following section, I explain the development of the script by looking at several different types of signs that the Chinese writing system has used throughout its long history.

In its earliest forms during the Shang Dynasty, the Chinese script had developed into a highly sophisticated system, which employed five types of signs. The signs used in the system included pictography, ideography, suggestive compound, variation on compounding of two or more radicals and more complex developments. Some of the inscriptions were pictographic, composed of realistic representation to depict an object, such as trees and rivers [6]. These pictographic components can still be seen on the simplified scripts the Chinese use in contemporary writing. For instance, the character "tián" 田, meaning "field", is a bird's eye view of a divided field; and the character "mén" 門 or "door" resembles the shape of two swinging doors. However, after the script underwent many stylistic developments, some characters of their pictographic origins became hard to interpret as the object it originally represented [6].

The second type of character or sign that is found in the earliest inscriptions is what scholars call an ideogram. This type of sign is composed of indicative sign components. Simple ideographic characters can also be representational as they are extremely self-explanatory. For example, the characters for "one", "two", and "three' are "yī" 一,"èr" 二 and "sān" 三 respectively [7]. Each of these characters consist of one, two and three strokes, which indicates their internal meaning. A more complex example is the word "rèn" 刃, meaning knife edge. The character is consisted of a mark and the word for knife: "dāo" 刀. Combined together, the mark " 丶 " pointing at the sign for "knife" 刀 suggests "knife edge" 刃. On the basis of ideography, suggestive compounds is a concept added to more complex ideographs [7]. An more complex example can be seen in the traditional modern Chinese character "zhòng" 眾 or "plurality of people", which consists of three identical stick-figure pictographs with the character "rén" 人 or "man" and a pictograph of the sun or "rì" 日 above. Therefore, the Shang scribes were able to depict a plurality of people with the combination of three people working under the sun [7].

Building upon the idea of compounding, scribes also developed what is called compound representational. This involves varying the compounding radicals to the indicative pictograph. In modern Chinese, the phonetic value "ch'ing" 青, which alone represents "green", has different meanings when grouped with different signs. Combined with 日 or the "sun" sign, the character 晴 has the meaning of "clear sky" while is still pronounced as "ch'ing". When combined with the 氵 or the "water" sign, the character 清 then refers to "clear water" but still with the same phonetic value /ch'ing/ [8].

There are many other examples of compound representational in modern Chinese. For instance, the phonetic value "yuán" 元 has different meaning from "currency" or "factor" when grouped with different signs.

When combined with the sign 辶 with the meaning of "moving" or "traveling", the character 远 means "far away" and is pronounced as /yuan/. And combined with the sign 囗 which has the meaning of "boundary", the characters 园 refers to "garden" and is also pronounced as /yuan/.

Beyond the use of compound, the Rebus principle or phonetic loan provides another way to create complex Chinese characters. On the basis of having pictograms as graphic representations of a meaning, a process of phonetic extension was developed to create new characters from a pictograph to a separate character with the same phonetic value but different meaning. This is the rebus character. For example, the early character of mǎ 馬 or "horse" derived from a pictogram of a horse. However, there is another similar sounding character mā 媽 or "mother" as the phonetic value of the "horse" character was extended to the character for "mother" [3].

The rebus principle can also help create characters to represent abstract concepts that can't be expressed with pictographs by borrowing phonetic values to write a homophonous or nearly homophonous character. Each abstract word corresponds to an existing pictographic character. A Shang example would be the word "yi" which means "also". However, it is difficult to express the abstract concept of "too" in pictographs. Thus, the Shang ideograph for "armpit" which has the same sound "yi" is used to represent the abstract "yi" [8].

In addition to the rebus principle, semantic-phonetic compounds attributes to the fifth type of signs developed by ancient scribes. Semantic-phonetic or logo-syllabic compounds refer to the combination of a semantic and a phonetic(rebus) compound. In the past, semantic extension represents the process of having additional fragments extended to a character with similar meaning to change its morpheme. But in modern Chinese, the morphemes only differ as they pronounce different tones rather than having difference in the composition of the characters [7]. One example would be the character 磨, which has different meanings depending on its pronunciation. When the character 磨 is pronounced as mò, it becomes a noun and means "the mill"; but when pronounced as mó, the character becomes a verb and means "to grind" [1].

After understanding the concepts of semantic and phonetic compound, we can analyze semantic-phonetic compounds. In general, semantic compound suggests clues to the meaning of the semantic-phonetic compound, and phonetic compound indicates the pronunciation of the semantic-phonetic compound. Specific examples include hé 河 or "river", hú 湖 or "lake", liú 流 or "stream", chōng 沖 or "surge", and huá 滑 or "slippery". These characters all contain the left radical of 氵, indicating semantic meaning of "water". The right side components of these characters hints pronunciation. For instance, the character 胡 is pronounced as hú, indicating the identical pronunciation hú for 湖. However, the character hé 河 has different pronunciation as its left radical. In this case, the addition of a phonetic indicator serves to distinguish between ambiguous characters that could be mixed up. Therefore, in general, the phonetic indicator does not

determine the pronunciation, but only hints to the phonetic value of the semantic-phonetic compound [6].

IV. MAYA WRITING

The Maya civilization was a significant indigenous society of Mesoamerica, known for its sophisticated writing system and astronomical and mathematical achievements. The civilization's mathematical and astronomical advances also influenced the development of an advanced calendar and religious worldview [3]. The region in which the civilization flourished was concentrated in southeastern Mexico, all of Guatemala and Belize, and the western portions of Honduras and El Salvador. Aside from volcanic mountains, most of the Mesoamerican region is filled with a rain forest, which is comprised of tropical trees and a variety of plants. The major elements of the Mayan civilization were concentrated in the center of the Maya landscape. The Mayan people constructed their major architectural accomplishments in the dense jungles. Such accomplishments included temples, ceremonial sites, and pyramidal mounds. The Maya highlands are located in the northern area of the Mayan civilization, including the mountains and valleys in Mexico, Guatemala and Honduras. The Mayan lowlands are found in the northern part of the Mayan area, including the Yucatan's peninsula, which borders parts of Guatemala and Belize. The lowlands consist of vast rainforests and savannas with lakes and rivers, providing the Mayan civilization with fertile soil and waterways as vital forms of transportation [9].

Scholars divide the history of Maya civilization into three periods: the Pre-classical period (2500–1200 BCE), the Classical period (1500–600 BCE), and the Post-classical period (600 BCE–200 CE). During the Pre-classical period, the Mayan civilization began to rise as they developed agriculture based upon the cultivation of squash, maize and beans. The middle and late Pre-classical periods marked the rise of the first Mayan kingdoms. The first dynastic Mayan kingdoms formed during the Classic period, most notably the Tikal dynasty and the Kaan or Kan (Snake) kingdom [10].

Beginning with the Classical Period, each independent Mayan city had a ruler who was in charge of a specific region. The Mayan civilization reached its height during the Classic period in terms of population size and achievement in arts, architecture, and writing. During the apex of the Maya empire, Tikal was an influential city, thriving as an important urban center for the Tikal kingdom. It is now an archaeological site, containing the largest number of vast pyramid temples and palaces where researched have found hundreds of the tombs of Mayan kings and queens [11]. Other important sites reflecting the pinnacle of Mayan civilization are Caracol, Palenque, Kaminaljuyu and Copan [11]. The Mayan civilization, however, quickly declined after 900 CE. During the Post-classic period, several Mayan cities such as Chichén Itzá, Uxmal, and Mayapán in the Yucatán Peninsula revived and flourished after the sudden decline.

The Post-classic period, however, was interrupted by the Spanish invasion in the 16th century. The Maya people survived while the Mayan civilization vanished after encountering the Spanish. With the mission to spread Christianity, Bishop Diego de Landa destroyed most of the Mayan cultural legacies, including the Mayan codices and images [3]. Most of the Mayan features were eradicated by the Spanish inquisitors, thus making the Mayan culture hard to recover and the Mayan hieroglyphs difficult to decipher.

Ever since, the Mayan civilization was almost lost and remained obscured to Europeans and Americans with the prejudiced notion of the Mesoamerican culture and its indigenous inhabitants. However in 1839, two archaeologists—John Lloyd Stephens and Frederick Catherwood—explored a total of 44 Mayan sites and documented the ruined cities from Copan to Chichen Itza [12]. In order to rekindle interests in the lost Mayan civilization, Stephens wrote stories in several of his publications accompanied by Catherwood's illustrations and lithographs [13]. The detailed archaeological accounts and the meticulous drawings brought international attention to the Mayan civilization. Consequently, efforts to decipher the Mayan writings also received world consciousness.

Before the Mayan script was developed, writing systems already appeared in the Olmec heartland in the southern coast of the Gulf of Mexico, the Oaxca Valley, and the highland valleys of the Alta Verapaz in Southern Guatemala [14]. During the late Pre-classic Period (400 BCE–100 CE), Mesoamerican civilizations began developing their writing systems including the Zapotec and Epi-Olmec scripts. More Mesoamerican scripts were then derived from these major writings.

Since the rediscovery of Maya civilization in the past century, scholars have become increasingly aware of the vast extend of evidence for Maya writing. Early traces of the Mayan hieroglyphic writing system dating back to the Late Pre-classic Period (400 BCE–100 CE). Such evidence is documented at San Bartolo, a small Mayan archaeological site located in northeast of the Department of Petén in the Municipality of Melchor de Mencos, northern Guatemala. The Mayan site consists of a pyramid complex and many buried rooms. The evidence for writing appears in a column of ten hieroglyphs painted on plastered fragments in the pyramidal structure called Las Pinturas "The Paintings." The text on the column exhibits early versions of some syllables and AJAW, a sign for lord or ruler in the Maya symbol [14].

The remaining Mayan hieroglyphs are difficult to read or decipher, however, because they date to centuries before most of the other Mayan texts discovered by archaeologists. David Stuart, Schele Professor of Mesoamerican Art & Writing at the University of Texas at Austin, claims that the discovered Mayan hieroglyphs are probably captions for the figures they accompany [15]. Stuart also noticed that the glyphs were early versions of the later discovered Mayan texts and the pictorial elements of the Mayan script with a glyph suggesting a hand holding a brush. Based on the glyphs' resemblance to the Epi-Olmec script during the Late Pre-classic and Early classic periods, Stuart inferred that a sophisticated Mayan writing system was developed hundreds of years earlier than previously thought before the discovery of the site [15].

Beyond the inscriptions from San Bartolo, the story of decipherment really begins with the Maya Codices and the so-called de Landa alphabet [3]. Of the existing Mayan codices, the Dresden Codex is the oldest and most complete

Mayan hieroglyphic text. It is a presentation of the Mayan calculation of prediction of solar eclipse, the movements of Venus, and other astronomical calculations. It was a divine calendar filled with illustrations of the gods, goddesses and many spiritual animals captioned by the Mayan glyphs written besides their portraits [3]. The codex was one of the most important primary sources in the decipherment of the Mayan Hieroglyphs.

The de Landa alphabet helped with the realization of the phonetic elements in the Mayan hieroglyphs. Written by the 16th-century bishop of Yucatán, Diego de Landa, the de Landa alphabet was included in the Yucatán's Relación de las cosas de Yucatán which contains the Mayan religion, culture and language system. The alphabet was a list of Mayan glyphs and Spanish letters phonetically corresponded. Yucatán's alphabet appeared instrumental to the decipherment of the Mayan hieroglyph [3].

With the legacy of de Landa's alphabet, the actual decipherment of the Mayan hieroglyph began in the 19th century. Between 1839 and 1842, American lawyer and travel writer John Lloyd Stephens and English artist Frederick Catherwood traveled together to explore the ruined Maya sites in Belize [14]. Their reports on the Maya remnants was recorded in their work: Incidents of Travel in Central America, Chiapas, and Yucatan and Incidents of Travel in Yucatan. Their efforts sparked the general interest in the Mayan civilization.

While searching through the archives at the Royal Academy of History in Madrid in 1862, a French clergyman named Charles Etienne Brasseur de Bourbourg discovered Bishop Diego de Landa's Relacion de las cosas de Yucatan. When he realized the potential importance of the a section in which de Landa reproduced an alphabet of the mysterious Maya hieroglyphics, he published the manuscript in a bilingual Spanish-French edition in 1864 [14].

In 1876, Leon de Rosny used the Landa alphabet to decipher the Mayan glyph for 'turkey' in the Madrid Codex [3]. Comparing the glyph in the Codex with the Yucatec Mayan word for 'turkey', he hypothesized that the glyph is read as cu and boldly proposed that the entire Mayan writing system was phonetic. However, such conjecture was rejected by the leading Mayanist Sir Eric Thompson, who claimed that Maya writing is "not syllabic or alphabetic in part or in whole" in 1972 [16]. Thompson believed in a logographic explanation of the glyph. For instance, a glyph for 'dog' would be a logographic composition of the signs 'ribs' and 'death' in Thompson's view [3].

During this time, many scholars tried to apply the de Landa alphabet to the Maya glyphs directly and failed to produce sensible readings, thus asserting that Maya writing could not be phonetic. Several successes in applying logograms for calendrical signs in the Relacion to the Maya glyphs also prompted the scholars to discredit the phoneticism theory [14].

The argument that Maya script is purely logographic was eventually challenged by Yuri Knorozov, a researcher from the Institute of Ethnology in Leningrad in 1952. While studying the writing systems that have been deciphered, Knorozov proposed that the Maya writing system was a combination of logograms and phonetic signs [14]. He proposed an alternative way of interpreting the Maya glyph for 'dog'. Knorozov suggested that the dog glyph reads as tzul, as he noticed the right part of the glyph resembles to a symbol in Land's alphabet and has a Ycatec word 'tzul' corresponds to the meaning of dog [16]. Using the same process, Knorosov was able to decipher several glyphs and his work was recognized by some young Mayanists.

In 1981, Yuri Knorosov's phonetic decipherment was taken to a further step by the 15-year-old Mayanist David Stuart. Stuart unlocked much of the complexity of the writing system by arguing that Maya glyphs could be written in multiple ways with different symbols representing the same sounds or polyvalence. Building on Knorosov's recognition of the phonetic component of the Mayan script, Stuart also demonstrated that the way that two syllables are put together changes the sound of a glyph. His discovery enabled scholars to decipher more Mayan texts which were previously considered undecipherable [16].

V. THE PRINCIPLES OF MAYA WRITING

Researchers now understood that there were phonographic and logographic characters mixed in the Mayan writing system. Mayan script's individual characters could be written in various ways and were often mixed together, thus making it difficult to identify a one-to-one correspondence between a sign and a sound. For instance, there are five possible ways to represent the word jaguar in Mayan writing, with multiple combination of phonography and logography: one version of a wholly logographic glyph, three versions of logographic and phonographic mixtures, and another version of wholly phonographic glyph [3].

With the arrival of decipherment, scholars gained the ability to see the different types of signs the system employed. The Compound glyph is one type of sign in the Mayan writing system. For the purposes of saving space or having diversity in texts, Mayan scribes sometimes write the same word with different character compositions. For instance, there are five ways to write Chum tuun, which means "stone setting" and refers to the start of the 360-day period. To avoid repetition and increase visual aesthetics, the scribes would use different signs for an equal phonetic compound. For some cases, a glyph can be rearranged into a simpler form to save writing space. This can be seen in an example of the metaphorical death of the king of Yaxchilan and his mother is written in two different ways but with the same meaning: one arranged with two glyph blocks and another arranged with one compressed glyph block [14]. Recognizing the multiple ways that Mayan scribes used the signs gave scholars a deeper appreciation of the complexity of the system.

Phonetic complements are another type of Mayan sign that links the glyphs with phonetic values. Phonetic complements are phonetic symbols used to suggest the certain pronunciation of polyphonic logograms. In order to distinguish some logographic signs with ambiguous readings, the Mayan scribes would insert a phonetic complement to indicate the correct reading. For instance, one of the versions of the jaguar glyph consists of a phonetic complement and logogram. The phonetic complement acts as a prefixed syllable, suggesting the sound /ba-/. And the logogram

BALAM itself is pronounced as /balam/ [3]. Therefore, it is clear that the phonetic complement corresponds to the first syllable of the logogram. Phonetic complements can also be placed as the suffixed syllable. For another version of the jaguar glyph, a phonetic complement with the sound m(a) is added to the logogram BALAM with the function of a suffixed syllable, suggesting that the logogram's reading ends with -m.
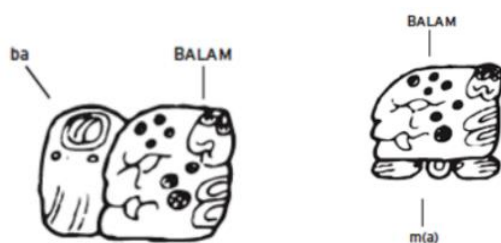

Fig. 1. Logogram BALAM.

The complexities of the Mayan script is due to its polyphonic and homophonic features, making the Mayan glyphs difficult to decipher. As another type of signs in the system, polyphony or homographic refers to the different sounds for one sign. The result is that some words are read differently and have different meanings although written in the same way. In the Mayan writing system, the sound values /tuun/ and /ku/ can have the same writing forms. In contrary, homophony means that words with different spellings and meanings can have the same pronunciation. The Mayan glyphs for snake, four and sky are all pronounced as /chan/ but are spelled very differently. Their meanings are also very different from each other despite having the same pronunciation [14] In short, every homophonic pairs is pronounced the same way, while every polyphonic pairs is spelled in the same way.

Having developed a sophisticated writing system, the Maya employed their writing in a variety of contexts and organized the media the hieroglyphs were written on based on writing purposes. Evidence of Maya writing is found on a number of different media. This evidence suggests that writing served a number of functions, including public display, ritual information, and history records. The preferred mediums of writing for Mayan scribes were stone monuments, ceramics, codices, and other portable artifacts.

Monumental inscriptions are one of the primary types of Mayan writings. Writing found on monumental inscriptions mostly conveys historical information, focusing upon important events and the history of Maya dynasties. Momentous events of the elite Mayans and royal activities are all recorded in the public art. Inscriptions on stelae and altars are more visible to the public, therefore these texts primarily records significant events and issues that the public should be informed [14]. Particularly, both Linda Schele and David Stuart mentioned that having Mayan signs to record dedicatory rites was a widespread pattern found on monumental architectures. These reference usually contains a verb with a smoke sign ending in -ch, a specific location and the name of the individual who dedicated or was buried in such location [17]. These dedicatory texts may vary in their expression, but ultimately they are extremely useful for

scholars to understand the monumental structures [17]. In comparison, inscriptions on carved lintels, panels inside temples and other restricted areas are specific to a range of audience, thus the text mainly contains exclusive and limited information [14].

Tikal is the longest-lived and one of the largest Classic Maya sites, accordingly it contains some of the most important monuments and inscriptions for understanding the Mayan culture. Tikal contains the earliest dated monuments than other Classic sites, and can be traced back to as a prototype of monumental inscription by other famous Mayan sites including Palenque, Piedras Negras, and Copán [14].

The inscriptions from Piedras Negras, a ruined city of the Mayan civilization known for its output of sculptures, is an example of the historical purpose of monumental inscription. When Tatiana Proskouriakoff noticed the repeated pattern of certain Mayan glyphs from monuments to monuments, she discovered that the glyphs records the births and deaths, ascensions, captures, parentage information associated with the Mayan rulers' lives. Proskouriakoff came to the conclusion that the inscriptions on the monuments represented the history of Piedras Negras [14]. Then, later in her work "An Album of Maya Architecture", Proskouriakoff conjectured a similar historic purpose for the monumental inscription of Copán Hieroglyphic Stairway, and that the glyphs were created to reflect the history of Copán and exploits of the rulers [14]. As one of the largest Mayan sites that has produced many hieroglyphic inscriptions and sculpted monuments, Copán contains a Hieroglyphic Stairway which has the longest known Maya text inscription from ancient Mesoamerica [11]. After understanding the chronological arrangement of the glyph stones, scholars realize that the inscription records the official history of Copán's rulers and previous important dynastic events, giving scholars the opportunity to examine Copán's political and religious ideology.

Comprising an important majority of media which contain Mayan hieroglyphs, Maya ceramic and stone vessels are characterized by a repetitive sequence of glyphs, called the Primary Standard Sequence (PSS). These texts were usually written on the rim of the vessels or were written diagonally across or vertically along the columns on the vessels [14].

In 1971, Mayanist Michael Coe noticed a distinct pattern in the order of Mayan signs which primarily appear on vessels [3]. Naming this pattern the "Primary Standard Sequence", Coe's suggested that the texts were relevant to Mayan religious rituals and mythical adventures, similar to the texts in the Egyptian Book of the Dead [15]. However, the sequence on the vessels has different meanings as Coe suggested. Scholars have been able to decipher more of the glyphs because the increased availability of ceramics allowed for a more refined understanding of the sequenced texts. It became clear that the glyphs indicate the properties of the vessel, such as the method of adornment, the class, what the vessel contains, and sometimes the artisans or owner of the vessel [17].

The PSS thus becomes a complex name-tagging medium with a basic structure of a possessed noun and a personal name. An example of the PSS has a first glyph known as the "Wing-Quincunx" and has a phonetic value y-uchi'ibil,

indicating that the vessel is a "drinking cup". The three following glyphs refer to the name of the Early Classic ruler of Palenque [15]. Another example of the Primary Standard Sequence can be recognized on a Maya ceramic vessel from Rio Azul, Guatemala. This PSS also begins with a Wing-Quincunx glyph with the phonetic decipherment of uch'ibi, which means "to drink" in Cholan Mayan. The phonetic value of the subsequent glyph is ca'ca'u(a), indicating that the content of this vessel was cacao, which was a type of beverage made from cacao beans or dried ground bean and were drank to celebrate feasts [3].

Codices form another important source of information about Maya writing. Unlike the inscriptions on monumental architecture or ceramic vessels, texts on the codices mostly relay calendrical prophecies, divinatory almanacs, astronomical tables and other ritual information [14]. The existing codices include the Dresden Codex, the Paris Codex, the Madrid Codex, and the Grolier Codex. The Dresden Codex is believed to be survived for the longest, dating as far back as the Late Postclassic period [18]. Portable artifacts, such as shell, bone and jades, also contain minor inscriptions. These texts often simply state the owner of these artifacts, thus having a similar purpose of name-tagging as some glyphs on the vessels.

VI. CONCLUSION

As one of the major signs of civilization, writing made solutions to many of society's problems possible. The invention of writing systems is thus considered an extraordinary cultural achievement which allowed the record of the history of humankind for advanced civilizations. Being privileged to live in a literate society, it is crucial to understand the consequences and functions of writing that fundamentally shape the world today. In fact, the creation of a writing system for both the Mayan and Chinese cultures was sparked by attempts to supply practical needs. For instance, early Mayan hieroglyphic inscriptions were used as captions to the important figures in the murals in San Bartolo. And in Oaxaca and on the Gulf Coast, the earliest writing were evolved from simple calendrical and iconographic signs [1]. For ancient China, the earliest function of writings emerged to fulfill divinatory purposes by engraving writings on turtle plastrons and on ox scapulas as attempts to communicate with the dead ancestors for the Shang king [2].

As writing systems became more advanced with the development of civilizations, writing conveniently fulfilled more needs, such as spreading cultural influences, providing means of memory support, expanding communicative range, reifying languages, and realizing aesthetic needs [1]. Out of all the functions of writing, the ability to regulate social conduct and exert political power formed a substantial function of the technology and can be seen in both the Chinese and the Mayan cultures. Early scripts were complex and difficult to master, thus, were only understood by an elite of intellectuals. For the Mayan, the hieroglyphs were mostly dedicated to recount the deeds of their kings and were strictly limited to a small group of high-ranking people in the Pre-classical period [11]. And in ancient China, the domestic responsibilities of women were strongly embedded in the tradition that most women were illiterate and were banned from reading and writing. It was commonly believed that women should solely focus on domestic affairs while the men assertively manage their public duties. Thus, literacy became a powerful tool for intellectuals to display their social position and extending their power over other human beings [1]. In general, as literacy became increasingly available to more people, however, such phenomena not only led to intellectual development, but also to a greater civilization and culture for the masses [1].

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Yi Chen wrote the paper and had approved the final version.

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