NATURE'S HAND IN THE INVENTION OF WRITING

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The evolution of writing from tokens (images) to pictography, syllabary, and alphabet has remained an important aspect of study for several centuries (Schmandt-Besserat 2014, *The Evolution of Writing. International Encyclopedia of Social and Behavioral Sciences*. ed. James Wright, Amsterdam: Elsevier). Understanding the phenomena that drives change in a writing system can showcase differences across diverse cultures around the world. Selected graphemes from three ancient writing systems—Mayan hieroglyphs, Egyptian hieroglyphs, and Shang China's oracle bone script—demonstrate how ancient peoples based the characters of their writing systems on features from their physical environment and culture. Inventors of these writing systems across ancient civilizations drew upon elements in their physical environment to create visual representations of language, which became characters in their writing systems. Natural environments create constraints within which human cultures develop. Furthermore, culture itself influences the visual appearance of writing, so that writing systems reflect both their environment and culture in form and style.

Introduction

My first real footsteps into the past began when I took a class on the history of writing systems here at BYU–Hawaii. Learning about something as broad as ancient writing can be daunting, but it is also thrilling. As I studied about more and more civilizations and their cultures, I fell in love with the learning process

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and began to frequently ask questions. I noticed how diverse writing systems can be. Humankind has the natural ability to create, and writing provides a form of expression. As the Earth offers so much beauty and inspiration to its inhabitants, landscapes are often portrayed in artwork. Since writing systems are also a result of human ingenuity, I began to wonder if nature and the physical environment form a sort of constraint for the visual appearance of culture and writing, limiting the creative aspect but also acting as inspiration for those who used it to express themselves.

As I began to research this question, there seemed to be a lack of any attempt to find correlation between environment and writing appearance. The research closest to my question came from literary editor and author Andrew Robinson (2009) on the relationship between medium—the materials and methods used to deliver a piece of writing, such as the digital keyboard I used to produce this article—and orthographies—the conventional spelling system and characters that make up the writing itself. Swedish scientist Huidong Tian et al. (2017) performed in-depth studies into observing the relationship between climate and human populations and structure, noting how epidemics and other concerns were often the result of the location of a people, but there was little discussion on the alteration of writing under the same umbrella. Following the path laid by this research, I began to look for the connection from the characters themselves.

Despite the vast distances between civilizations and their respective writing systems, similarities in writing structure are apparent when two or more places are compared. "As in Egypt, among the Maya there was a strong linkage between text and picture, one providing a commentary on the other . . ." (Coe 2001, 8) and the modern historian gets a vague idea of the individual's experiences through time. Images from the daily life of an individual thousands of years ago are preserved in their writing—both the style and the words themselves. An ancient scribe creates a memory or a snapshot from their own time period, which reflects their distinct cultural habits.

Writing systems also preserve living cultures that adapt and respond to the environment. Horticulture and agriculture formed the economy, society, and the necessity for record-keeping—such as the need for keeping track of inventory after a harvest, which became a birthplace for writing (Wilken 1971: 432–448). Humans are subject to the world around them in its seasons, time, and behaviors. The natural environment provides the historian with a backdrop and new ways of understanding the emergence of a writing system, and writing provides a glimpse into a people's history and an insight into its future.

In this paper, the beginning eras of three distinct writing systems are explored. Mayan hieroglyphs come in complex shapes and appearances, and they originated in a busy tropical environment approximately 2,000 years ago.

Egyptian hieroglyphs come with a long history of evolution and use, spanning several millennia, but beginning as early as 3000 BC. Shang China's oracle bone script—an evolved form of Chinese character writing—is credited to begin around the same time as the Shang dynasty it is named after, in the eighteenth-century BC, over a millennium after the earliest characters likely surfaced. Egypt's dry landscapes stand distinctly apart from the rainforests of Mayan Mesoamerica, and the highlands of ancient China would have looked nothing like the deserts of Northern Africa. By exploring these particular writing systems from entirely different eras of Earth's history and with seemingly little in common, an idea of how writing became one of humanity's creative outlets starts to take form.

Mayan Hieroglyphs in Their Early Stages, 100 BC–100 AD

The ancient Maya of Mesoamerica lived in stunning forests and tropical flora, what ". . . is considered today among the world's most biodiverse places . . ." (Ford and Nigh 2014: 87–106). This tropical climate inspired the Mayan scribes to start writing. Evidence for the environment's influence on Mayan culture is found in Maya iconography and epigraphy, as physical representations of its characteristics appear in the Maya's written symbols (Coe 2001, 8). Busy with diverse colors, sounds, and shapes, the environment is reflected in the people's complex and detailed writing system. The era of Mayan civilization from which their writing system emerged is known as the Classic period, and examples of the script appear to be dated no earlier than 100 BC (Saturno 2006: 1281–1283). The earliest forms of archaic Maya script, consisting of mixed logo-syllabic glyphs read in clockwise order, are found on excavated objects, carved into stone steles, and contained in codices made of fig bark paper (Vail 2006: 497–519). The characters number over 800 and can be combined to form any word or concept in the Mayan language (Coe 2001).

Animals and Landscapes

Many characters have more than one meaning or interpretation. To aid in the understanding of Mayan hieroglyphs, many of its logograms—signs or characters that represent a word or phrase and can't be sounded out—are accompanied by one or more symbols that represent its syllables, hence they are logo-syllabic (Coe 2001, 24). Animals unique to Central America, such as the macaw, the jaguar, and the leaf-nosed bat, occasionally have glyphs that represent them in Mayan writing using this structure. These glyphs become a combination of logographic and phonetic bases (Coe 2001, 129). The glyphs are not just abstract representations but show actual features of the animal. Several allographs for

FIGURE 1. **From left to right: Jaguar, macaw, and rain (Davies 2022).**

the macaw look like the head of the bird, complete with a curved beak shape and marks around the eyes to imitate its colored feather patterns (Fig. 1). The caiman alligator's and the jaguar's respective glyphs contain their distinct spotting, while the turtle has scaled plating. The glyph for the leaf-nosed bat contains accurate details, including large ears and a pointed nose. The complexity and ornate details of the glyphs make it easier to determine the animals they depict. Animals also appeared in glyphs with other meanings, such as the glyph for "child," which appears like a baby bird in the mouth of a larger bird. Ancient Mesoamerican landscapes are also featured in Mayan writing. Circular shapes are drawn into the character for "mountain," representing caves and sinkholes (Coe 2001, 127). A round, gridded shape in the "earth" glyph is also found in the "rain" glyph. Visited by frequent and powerful rainstorms, the Maya drew curved lines falling toward the "earth" in their representation of rainfall.

Natural resources were used in carving, colors, and cosmetics. The Maya had several minerals to choose from, including obsidian, granite, basalt and other volcaniclastic rocks, quartz, magnetite for black pigment, or limonite for yellow pigments (Wanyerka 2006). Quarries yielded large stela, or stone slabs, that Maya scribes carved with images of rulers and deities and inscriptions of dynasties and histories. Some of the stela still stand today, having preserved the Mayan glyphs through time.

Color and Materials

The Maya used colors in their representation of the cardinal directions: white—north, red—east, yellow—south, and black—west, while the center is represented in green. David Bolles (2021) suggests that these colors are based on varieties of corn. In a study on nearby Aztec culture that encompasses the Maya, Manuel Aguilar-Moreno (2007), associate professor of art history, goes further in-depth, suggesting that each color individually represents something: black for nighttime; red for vegetation, love, and fire; yellow for the sun and ripe corn; white for old age and rays of light; and green for water, jade, and turquoise. Assistant professor of Anthropology Alexandre Tokovinine (2012)

found examples of language originating from colors of the environment, such as the word *yaxha*, meaning clear/blue/green water, originated from Lake Yaxha. The lake's colors were also reflected in the wings of the quetzal bird. As the Mayan colors enter the language, they enter the writing system. In summarizing his thoughts, Tokovinine wrote,

> Color terms seemingly obtain certain iconographic correspondents . . . The other alternative—to refer to colors by the coloring of a glyph—is found only once, on the stucco façade of the Margarita Structure at Copan, where a *k'an* logogram is replaced by a generic shape painted yellow (2012).

Other color logograms come from unique Maya icons (Tokovinine 2012, 286).

A unique material available to Maya scribes was a blue-green dye now known as "Maya Blue." This color differs from any medieval paintings or other forms of art based in Europe or Asia and stays vivid through centuries in the extreme conditions of the rainforest. Although the origin of Maya Blue is contested, the paint is likely a combination of indigo and intercalated clay found in the Mayan environment (José-Yacamán et al. 1996: 223–225).

Old Kingdom Egyptian, circa 3300–2200 BC

Unlike the Maya, Egypt received little rainfall in its dry, arid deserts, so the people took advantage of the nearby Nile for their sustainability, dependent on its swells and currents. Droughts frequently affected agriculture, economy, and trade (Bell 1971: 1–26). Writing in Egypt and other parts of the Middle East developed in this environment. The ancient Egyptians created a unique writing system between 3300 and 3100 BC—perhaps inspired by Mesopotamia's Sumerian scripts nearby of a few centuries earlier (Farndon 2003, 16). Static and simplistic characters reflect the scarce plant and animal life. Traditional Egyptian writing employed both semantic principles—using meaningful grammatical marks—and phonetic principles that were pronounced out loud.

The original hieroglyphic system was based on pictorial representations of objects in the daily life of an ancient Egyptian, such as humans, animals, plants, or tools (Beylage 2018). Over time, many of the characters became abstracted or a hieratic style was adopted, but some still hold to their original shape. Though the number would fluctuate throughout Egypt's long history, traditional Old Kingdom Egyptian characters or graphemes numbered nearly 1,000 (Mattessich 2002: 195–208). These were originally used to record historical

events and honor deities but were later also used to express cultural artwork (Loprieno 1995, 12).

Culture and Religion

Afterlife was one of the Egyptians' emphasized ideologies; they carved most of their hieroglyphs into temples and tombs that reflect its importance. The glyphs detailed instructions to guide the soul in its journey toward the afterlife. For their royalty, they also frequently carved names and drew an oval shape around the characters known as a cartouche. Egyptians believed this would embody a person's identity and provide a form of protection. Subsequent generations that wanted rulers to be forgotten or lost would score out their names from their tombs (Duque-Domingo 2017, 589). Tutankhamen and Queen Hatshepsut stand as examples of this practice (Powell 2012). Since these carvings are placed in stone and are buried in tombs, the environment has preserved them well beyond their years. The name hieroglyphs—or "sacred carvings" in Greek—honors the Egyptians' own title for their writing, which is translated as "divine words," and their tradition that writing was a gift from the gods. Gods of Egypt came from intense observation of nature and embodied different animals (Newberry 1951: 72–74).

The Egyptians' color methodology is similar to the Mayan's. Ancient Egyptian language had four basic color terms for black, white, red, and green; all other colors were included in these umbrella categories. The people used color to represent various emotions and aspects of their environment. Black showcased the underworld or afterlife and came from the black mud around the Nile. White referred to all things luminous and pure. Red encompassed the sun, blood, fire, and the desert itself—full of life but also perilous. Green represented both vegetation and the ocean, along with the protection and sustenance they provided the people (Morgan 2011, 4).

Materials and Characteristics

Scribes also wrote on papyrus, leather, limestone, or pottery using a reed brush (stylus), as the tool was readily available in Eastern Africa and the Arabian Peninsula. A reed has a distinct wedge shape, which would influence the appearance of the hieroglyphs. Similarly, the Sumerians had previously created a writing system known as cuneiform, or "wedge-shaped," that also employed the reed brush, though they typically wrote on clay tablets (Robinson 2009, 23).

The Egyptian character for *akhet*, or "horizon," appears like the valley of a mountain with a sun overhead. The sun character itself appears in the logograph for "time," as the Egyptians used nature to represent the passage of time

FIGURE 2. **From left to right: horizon, phonetic letter "m," and eternity (Faulkner 1962).**

(Faulkner 1962) (Fig. 2). The Egyptians also used animals in their writing. The owl, in Old Egyptian, was used for the alphabetic sound "m" and thus fairly frequently used. Owls symbolized death and mourning, so they were applied as both a phonetic sound in writing and a symbol of the afterlife. They were often included in related words and found in tombs. Lions directly drawn as their own symbol show some of the more detailed visual aspects of Egyptian writing (Faulkner 1962, 28).

Oracle Bone Script of China's Shang Dynasty, Beginning 1766 BC

"China has a long history of recording political events and natural disasters" (Tian et al. 2017). Their detailed and unbroken line of records have a lot to offer modern historians. During the first half of second-century BC, an urban civilization emerged in Northern China complete with wheeled vehicles, bronze working, and a writing system now known as oracle bone script. The people enjoyed advanced agricultural techniques and used tamped earth to build walls and foundations (Young 1982, 311). Anthropologist Kwang-chih Chang (1976) claims that the term, "Shang," holds several meanings but in general refers to the kingdom that flourished under the second dynasty of Chinese literature's historical period.

The Shang experienced large differences in temperature throughout the year; warm, long summers, and cold, snowy winters. Climate affected several aspects of life in ancient China, from food taste to economic collapse. Colder winters directly led to a higher transmission of diseases, and indirectly led to drought, famine, and wars (Tian et al. 2017). Highly dynamic weather patterns made changes in lifestyle a frequent occurrence, for example food availability and business markets changed often. Unstable conditions may have contributed to the highly religious values of the people that lived through them. Religion, in many societies, is seen by anthropologists as a reconciliation between humankind and the forces of nature and human life, and religious activity tends to increase during less prosperous times (Frazer 1890).

FIGURE 3. **From left to right: elephant, mountain, and turtle (Yuwen 2020).**

Religion and Medicine

The highly developed religion of the Shang is traditionally believed to have begun around 1766 BC with the dynasty itself. Elaborate mortuary rituals and a detailed sacrificial system, which may have been around for centuries longer, became customary for the Shang in their worship of ancestor spirits (Smith 1961, 144). The people used cattle scapula and tortoise shells for divination—inscribing questions onto the surface before burning them and interpreting the cracks that appeared (Zong 2017). The visual appearance of the cracks evolved into writing and recording, and various characters in the script look just like what they depict, becoming distinct and abstracted logographic characters over time. Some 3,000 unique characters have been discovered on bronze emblems, bamboo booklets, and oracle bone inscriptions, providing information on lineage, families, historical events, and centers of manufacture (Young 1982, 312). As the Shang began to record information outside of divination, they created other characters based on their environment, completing the first full writing system east of the Indus Valley (Zong 2017).

Landscapes

The original oracle bone character for *rén,* "human," appears like the side profile of a person standing in a hunched position with arms extended forward. The *shan* "mountain" character looks like a drawing of a mountain range with three peaks. The *yuè* "moon" character has a crescent shape, and the *yu* "rain" character looks like drops of water descending from a line at the top of the figure. The shape of a rice field during the Shang dynasty was carved into a grid-like pattern to allow irrigation, so the character for *tian* "field" is a foursquare grid. Animals that the Shang associated with also appear in oracle bone script. The *xiang* "elephant" has a long trunk, legs, torso, and a tail (Fig. 3). The *gui* "turtle" is drawn with a head, legs, tail, and circle for a shell. The "sheep" character has the curved horns of the Himalayan mountain goats and sheep that the

Shang domesticated (Jing 2008). Chinese mythology appeared in the writing system, such as the *fenghuang* bird, which extends outward with the appearance of wings. The extra lines in the figure likely came from the cracks of divination and are kept to illustrate the bird's power and honor (see Chinese Scripts 2022).

Color and Materials

The remains from oracle bone script come in shades of red or black. The Shang used materials available to them to create dyes for calligraphy and carving. The red pigments are typically made of cinnabar, while the black appears to be mixed inorganic crystals and/or organic materials such as blood (Britton 1937, 3). The characters commonly contain sharp corners and lines that make them distinct from more stylized writing like Mayan hieroglyphs. This may be a result of oracle bone script originating from naturally formed cracks and human carvings before evolving into more curved form through the growing practice of calligraphy. Further abstracted characters from oracle bone script still appear today in Chinese *hanzi*, and some still resemble their original form (Chang 1976).

Conclusions

Despite the vast differences in location between these societies, some similarities can be found in cultural ties. All three civilizations—Maya, Egypt, and Shang China—had cities divided into five regions that conformed to the cardinal directions: north, south, east, west, and a center where all elements connected. Each division of the city served a different purpose (Young 1982, 311).

All of these cultures relied on aspects of their environment coupled with human ingenuity to create elaborate writing systems for the purposes they needed. Different environments require different responses, as agriculture and climate affect the daily lives of individuals and societies. Writing systems were invented for various purposes, and their use evolved over time with the changing needs of the people who wielded them. In this way, the natural environment creates a backdrop within which human cultures develop, and writing systems reflect both their environment and culture in form and style. Humankind has a natural, innate creativity expressed in writing.

Further studies would be possible with numerous other writing systems to choose from across a biologically and culturally diverse world. How environments and climate change affected the alteration of writing systems over time would also be a fascinating topic of exploration, as the history of a writing system itself can offer insights into the life of the people who used them. Writing systems did not spontaneously materialize and then remain static and

unchanging, but were developed over time. Cultures without writing systems also incorporated their environment into their language, history, and storytelling. In the modern world, the digital environment acts as a sort of constraint for the expression of culture and writing, as well as an inspiration for its form—continuously altering how it is used in our daily lives. Nature's hand in various aspects of human culture is a broader topic of study that would encompass far more than what can be accomplished in this paper alone. Understanding nature's influence in writing will offer an image of humanity's creative history as well as its future.

REFERENCES

Aguilar-Moreno, Manuel
2007 *Handbook to Life in the Aztec World*. Oxford, UK: Oxford University Press.

Bell, Barbara
1971 The Dark Ages in Ancient History I: The first Dark Age in Egypt. *American Journal of Archaeology* 75 (1): 1–26.

Beylage, Peter
2018 *Middle Egyptian: The writing system and its transliteration*. State College, PA: Penn State Univ. Press.

Bolles, David
2021 Relationships between the world directions, the calendar, prognostications, and the Mayan deities. In *David's Books*. http://davidsbooks.org/www/Maya/WorldDirections.pdf.

Britton, Roswell S.
1937 Oracle-bone color pigments. *Harvard Journal of Asiatic Studies* 2 (1): 1–3.

Chang, K. C.
1976 *Early Chinese civilization*. Cambridge, MA: Harvard University Press.

Chinese Scripts.
2022 *Traditional East Asia*. Lansing, MI: Michigan State Univ. http://projects.leadr.msu.edu/traditionaleastasia/items/show/38.

Coe, Michael D.
2001 *Reading the Maya glyphs*. London: Thames & Hudson.

Davies, Diane
2022 Educational resources on the Maya. Maya Archaeologist. https://www.mayaarchaeologist.co.uk/.

Duque-Domingo, Jaime, Pedro Javier Herrera, Enrique Valero, and Carlos Cerrada
2017 Deciphering Egyptian hieroglyphs: Towards a new strategy for navigation in museums. *Sensors* 17 (3): 589.

Farndon, J.
2003 Egyptian writing. *Ancient History*. Great Bardfield, UK: Miles Kelley, 16.

Faulkner, Raymond O.
1962 *A concise dictionary of Middle Egyptian*. Leuven, Belgium: Peeters Publishing.

Ford, Anabel and Ronald Nigh
2014 Climate change in the ancient Maya Forest: Resilience and adaptive management across millennia. In *The Great Maya droughts in cultural context: Case studies in resilience and vulnerability*. Boulder, CO: Univ. Press of Colorado, 87–106.

Frazer, James George
1890 *The golden bough: A study in comparative religion*. London: Macmillan and Co.

Jing, Yuan
2008 The origins and development of animal domestication in China. Beijing: The Institute of Archaeology, Chinese Academy of Social Sciences. http://www.chinesearchaeology.net.cn/uploads/soft/Chinese%20Archaeology/8/The%20Origins%20and%20Development%20of%20Animal%20Domestication%20in%20China.pdf.

José-Yacamán, M., Luis Rendón, J. Arenas, and Mari Carmen Serra Puche
1996 Maya blue paint: An ancient nanostructured material. *Science* 273:223–225.

Loprieno, Antonio
1995 *Ancient Egyptian: A linguistic introduction*. Cambridge: Cambridge University Press.

Mattessich, Richard
2002 Oldest writings and inventory tags of Egypt. *Accounting Historians Journal* 29 (1): 195–208.

Morgan, Lyvia
2011 Enlivening the body: Color and stone statues in old kingdom Egypt. *Notes in the History of Art* 30 (3): 4–11.

Newberry, Percy E.
1951 The Owls in ancient Egypt. *The Journal of Egyptian Archaeology* 37:72–74.

Powell, Barry B.
2012 *Writing: Theory and history of the technology of civilization*. New York: John Wiley and Sons.

Robinson, Andrew
2009 *Writing and script: A very short introduction*. Oxford, UK: Oxford University Press.

Saturno, William A.
2006 Early Maya writing at San Bartolo, Guatemala. *Science* 311 (5765): 1281–1283.

Schmandt-Besserat, Denise
2014 *The evolution of writing. International encyclopedia of social and behavioral sciences*. ed. James Wright. Amsterdam: Elsevier.

Smith, Howard D.
1961 Chinese religion in the Shang Dynasty, *Numen* 8 (2): 142–150.

Tian, Huidong, Chuan Yan, Lei Xu, Ulf Büntgen, Nils Stenseth, and Zhibin Zhang
2017 Scale-dependent climate drivers of human epidemics in ancient China. *Proceedings of the National Academy of Sciences USA*, 114 (49): 12970–120975, https://doi.org/10.1073/pnas.1706470114.

Tokovinine, Alexandre
2012 Writing color: Words and images of colors in classic Maya inscriptions. *RES: Anthropology and Aesthetics* 61:283–299.

Vail, Gabrielle
2006 The Maya codices. *Annual Review of Anthropology* 35:497–519.

Wanyerka, Phil
2006 Obsidian as an example of natural resources utilized by the Maya. *Maya Archaeology,* https://www.maya-archaeology.org/mayan-anthropology-ethnography-archaeology-art-history-iconography-epigraphy-ethnobotany/minerals-obsidian-artifacts-belize-mexico-guatemala-honduras.php.

Wilken, Gene C.
1971 Food-producing systems available to the Ancient Maya. *American Antiquity* 36 (4): 432–448.

Young, L. M.
1982 The Shang of ancient China. *Current Anthropology* 23 (3): 311–314.

Yuwen, I.
2020 Carving civilization into stone and the "Chinese Rosetta Stone." *Juliosong,* https://blog.juliosong.com/writing%20system/Chinese-Rosetta-Stone-part3/.

Zong, Li
2017 *A legacy of elegance: Oracle bones collection from the Chinese University of Hong Kong*. Hong Kong: Chinese University of Hong Kong Press.