

The Role of the “Reproduction” 乃 Character in Chinese Writing: 282 Characters and 59 Definitions

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How to cite this paper: Ball, J. (2023). The Role of the “Reproduction” 乃 Character in Chinese Writing: 282 Characters and 59 Definitions. *Open Journal of Modern Linguistics*, 13, 663-691.
<https://doi.org/10.4236/ojml.2023.135040>

Received: August 2, 2023

Accepted: September 25, 2023

Published: September 28, 2023

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Abstract

The acquisition of Chinese characters and their meanings poses a significant challenge for non-native speakers. This paper proposes that an aid to character comprehension is recognizing Chinese substructures, akin to using Latin roots when analyzing English. Specifically, this paper focuses on not just the radical (部首 bu4 shou3) which allegedly carries the character’s meaning, but also on the phonetic component (often generically referred to as 偏旁 pian1 pang2, though that term lacks specificity) which is alleged to only code for pronunciation. Our research shows that the phonetic component also codes for meaning, and this additional semantic information can be harnessed in order to more effectively retain vocabulary. HanziFinder, a first-of-its-kind search engine for Chinese Hanzi characters, was developed to investigate the potential meaning contribution of the phonetic component. The search engine utilizes a database of 88,884 Chinese characters from the HanaMinA typeface acquired freely from GitHub and then redrawn into searchable nodes and lines. From this database HanziFinder can assemble a list of characters containing a specific substructure which can then be sorted by meaning using definitions from Chinese Text Project and Wiktionary. This sorting reveals that characters with the same substructure often cluster around specific semantic themes, making this organization a predictive tool. A pie chart representation further illustrates the clustering phenomenon, enabling the quantification of a substructure’s weight in driving a character’s meaning. This study examined the character “to be, thus, so, therefore; then, only, thereupon; really, indeed; as it turned out, after all; namely; (literary) you, your, be, hence, but, surprisingly, unexpectedly” (乃) (shortened to “be” 乃) as an example, showing that a character containing 乃 had a 59% likelihood of having a meaning related to reproduction, a 24% likelihood of being associated with utility, and a 17% likelihood of having a meaning associated with

a punitive situation. Chinese writing exhibits a gestalt quality, where multiple substructures converge to collectively convey meaning. Consequently, the “ x , y ” strategy of using a radical and phonetic component together to narrow down meaning space is not robust enough. In this scenario, two different axes— x and y —work together to hew irrelevant possibilities, with x representing meaning, and y representing the pronunciation. Traditionally, in a “ x , y ” coordinate plane, x and y are equally weighted variables. However, in Chinese, the pronunciation component’s significance is devalued as it is considered solely phonetic. This devaluation is re-evaluated as this study finds correlations between structures, substructures, and meanings, suggesting phonetic components contribute meaning, just like radicals. The universality of certain symbols—such as the double-lobed structure of “be” (乃) in representing a pregnant female mammal’s body, female mammal breasts, and the concept of reproduction—resonates across several ancient written languages, emphasizing the significance of symbols in cultural propagation and survival. The author proposes that understanding such correlations could enhance literacy in Hanzi and perhaps other written languages.

Keywords

Ancient Egyptian Hieroglyphs, Anthropology, Bu Shou, Chinese, Chinese Characters, Chinese Writing, Chinese Written Language, Clustering, Database, Decomposition, Double-Lobed Shape, English, Female Breasts, Gestalt, HanaMinA Typeface, Hanzi, HanziFinder, Latin Roots, Legos of Linguistics, Mandarin, Meaning, Non-Native Speaker, Phonetic, Phonetic Component, Pian Pang, Pie Chart, Language Acquisition, Prediction Tool, Pregnancy, Pronunciation, Punitive, Quantifiable, Radical, Radical-Phonetic Components, Reproduction, Sumerian Cuneiform, Universality, Utility, Vocabulary Retention, 乃, 孕, 太太, 奶, 奶奶, 生殖, 繁殖

1. Introduction

The acquisition of Chinese characters and their meanings by the non-native speaker is a particularly onerous task. “While learning any language involves a great deal of effort, learning a character-based or logosyllabic language like Chinese can prove especially challenging for learners accustomed to syllabic writing systems such as English and German,” writes researchers at Montclair State University (Olmanson & Liu, 2018). Therefore, any insight into the learning of Hanzi—the Mandarin word for the Chinese written language—is a boon. One such insight is to recognize that Chinese has semantically meaningful substructures that play a role similar to that of Latin and Greek roots just like in English has Latin roots. In English, those Latin and Greek roots are really “the Legos of Linguistics”: meaningful subunits that can be assembled into a semantically meaningful unit that has a relationship to its subcomponents. “Bicycle” can be decomposed into “two circles” because “bi” in Latin means “two” and “cycle” is a “circle”—and that’s what a bicycle looks like. “Monarchy” can be broken down

into “one king” because “mono” means “one” and “arch” stands in for “king”—the king’s power arches over the populace. About 80% of Chinese writing is considered similarly decomposed. Hanzi already has two recognisable substructures: the first, known as the radical or “bu4 shou3,” contains the meaning; and the second, known as the phonetic component, does not have a particular name in Chinese, though it is often referred to as the “pian1 pang2” (which could mean either component, and thus is not specific ([Radical \(Chinese Characters\)](https://en.wikipedia.org/wiki/Radical_(Chinese_characters))), [https://en.wikipedia.org/wiki/Radical_\(Chinese_characters\)](https://en.wikipedia.org/wiki/Radical_(Chinese_characters))); the lack of a universally recognized term for the phonetic component of a Chinese character is part of the frustration when researching and discussing Hanzi). The phonetic component is often alleged to contribute no meaning to the character—but does it? And if so, how much? That’s what the invention of HanziFinder was set out to explore.

Using the first substructure search engine of Chinese characters, HanziFinder (pat. pending; patent application published July 2023), which my colleague Chao Xu and I built, we can make a list of characters containing a predesignated substructure from our database of 88,884 characters. By taking this list, and then acquiring definitions from Chinese Text Project and/or Wiktionary, we can sort these definitions by meaning. Characters containing a particular substructure have meanings that often cluster around a small set of themes. This clustering can be useful as a prediction tool. A pie chart of semantic probability for any one substructure can be created, visually demonstrating the clumping phenomenon. The “weight” of a substructure in driving the meaning of a character is quantifiable by comparing the meanings of many characters containing that substructure, clustering them by similarity of meaning, and then dividing the number of characters within each cluster by the total number of characters with meanings. (Characters without meanings are recorded but not included in the tabulation.) In the case of “be” 丩, a character containing this structure as a substructure has a 59% likelihood of having a meaning associated with reproduction, a 24% likelihood of having a meaning associated with utility, and a 17% likelihood of having a meaning associated with a punitive situation ([Figure 1](#)).

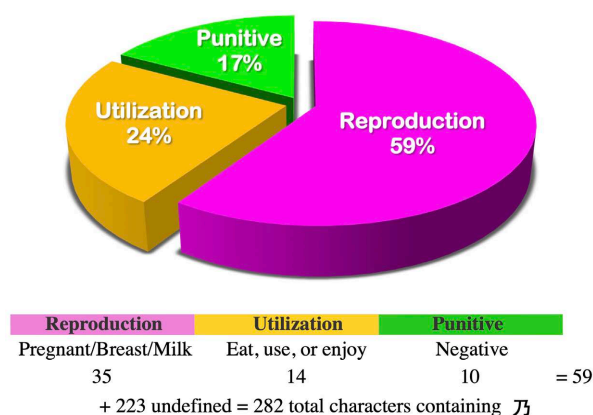


Figure 1. Pie chart of semantic probability for 丩-containing characters plus a breakdown of data.

2. Methods

Our 88,884 characters came from the HanaMinA typeface found for free on GitHub. Using a drawing tool that Chao created, Meiqin Xia, Huimin Luo, and Wenqing Huang spent over a year's time redrawing this set of 88,884 characters into searchable nodes and lines. Quality control (which took another year) was handled by Iris Guo. Organizational help came from Maggie Li.

Once the database was created, the tool was refined by Chao to search these nodes-and-lines structures for target candidates. HanziFinder can assemble a list of characters containing a specific substructure. Using this list, definitions can be obtained from resources such as Chinese Text Project and Wiktionary. Using the definitions as the sorting criteria, similar themes are categorized together (as seen in the Data section below). A pie chart representation further illustrates the clustering phenomenon, enabling the quantification of a substructure's weight in driving a character's meaning.

The subjective nature of clustering definitions under an umbrella concept is recognized by this author, however, this clustering serves the purpose of creating a context with which the Chinese reader can recognize the related nature of such 乃-containing characters as, for example, “fatigue, paralysis of the foot” 疲, “late” 蕊, “slow” 纒, and “thick” 訥: all consequences of pregnancy. At the same time, these words could be considered negative or punitive, most assuredly because nature isn't equitable, and the brunt of reproduction is born by the female. In both cases—whether one argues for classifying these as reproduction-related as I have, or punitive (as one could reasonably argue)—the establishing of an overriding pattern where “structure equates to concept” facilitates vocabulary retention as well as anthropological research.

3. Chinese Writing Uses Two Coordinates to Hew Irrelevant Possibilities

Chinese writing is a gestalt: often two or more substructures coalesce into meaning. The radical–phonetic, or the “ x , y ” characteristic of Chinese writing, is a very rational strategy when attempting to narrow the semantic space of a character. If a person wants to mark a point in two-dimensional space, they will use a graph with two axes: x and y . The two numbers along those axes that correspond to that marked point in space are called “coordinates.” This “two-coordinate” method is used to pinpoint one location in two-dimensional space so that it can be reliably communicated to others. The strategy of using two coordinates to communicate one locus is logical; In fact, the same system is used in written language, but those two coordinates are: 1) the radical/determinative and 2) the phonetic/pronunciation. Chinese Hanzi, Ancient Egyptian hieroglyphs, and Sumerian cuneiform all employ this bipartite method (*Determinative*, <https://en.wikipedia.org/wiki/Determinative>).

Two different axes— x and y —work together to hew irrelevant possibilities. Two different channels for recording data allow their intersection to enhance the

limitations of written language, which can only be seen and not heard. Both semantic and sound data are encoded in these determinative/phonetic-based language scripts, but due to the proliferation of homonyms, a selection process occurs. Many choices with similar sound and tone often create confusion, so much so that a common method Chinese speakers utilize in order to hone in on a word is to use a commonly known form of the word that contains the character they mean, then the possessive 的 (de0), and then the exact character the person is talking about, i.e., “the ‘cow’s milk’ ‘milk’ [character]” “牛奶的乃。” The fact that this is necessary is indicative as to how many homonyms exist in Mandarin/Hanyu.

For example, the word “be” 乃 (nai3) is the same pronunciation as “milk” 奶 (nai3), and both contain “be” 乃 in their structures, possibly because a baby’s existence depends upon mother’s milk. If a mother dies, often the child does as well. This “be” 乃 structure is not considered a radical; perhaps because it serves as the phonetic; yet it is also found in the word for “pregnant” 孕. “Pregnant” 孕 is pronounced “yun4,” which is not the sound of either of its components: “be” 乃 (nai3) or “child” 子 (zi3). The fact that “be” 乃 is in both “milk” 奶 and “pregnant” 孕 bears analysis (Figure 2).

乃	奶	孕
“be”	“milk”	“pregnant”

Figure 2. The relationship between existence (“be”), “milk,” and “pregnant”—all aspects of reproduction—shows up in Hanzi.

The character “be” 乃 is like a radical in phonetic clothing, possibly because propriety dictates that we do not recognize the similarity between the shape of 乃 and the shape of the body of a pregnant female. The double-lobed 乃 has so many meanings related to procreation because the shape of a pregnant female mammal’s body and the shape of female mammal breasts are congruent, consequently one symbol can have multiple associations, especially when it comes to reproduction. The character 乃 resonates with many positive facets of pregnancy, including the 乃-containing characters “to be filled, curvaceous” 盈, “blessings, happiness” 衎, “outstanding” 隽, and “talented” 隹.

Though a standard “ x, y ” graph would bequeath x and y as having equal importance, in written language it would seem that the pronunciation component’s significance has been minimized. The fact that “be,” “milk,” and “pregnant”—all aspects of reproduction—share a similar component—乃—suggests that this 乃 structure has a relationship to reproduction, and, as such, has meaning, which is what defines a radical.

Recognizing the correlation between structures, substructures, and meaning could boost literacy in Hanzi because pattern creates a path to vocabulary retention. The fact that there appears to be more semantic information being com-

municated in a Hanzi character than is currently realized could be leveraged for the student’s benefit, and perhaps for the historian’s as well.

4. The Precursors to “Pregnant” 孕 Exhibit Consistency

On Hanziyuan.net, a Chinese etymology site, the precursors to “pregnant” 孕 (Figure 3) appear to be (from top to bottom): Oracle: a woman with an enlarged stomach—on close inspection, one can even make out that the baby’s head is in the downward position; Seal: a pregnant female mammal body with a baby coming out below; Liushutong (2nd century BC): (first two) unknown. The last Liushutong character resembles the Seal character. Both of them resemble the Hanzi character (simplified and traditional) for “pregnant” 孕 (Sears, <http://hanziyuan.net/#孕>).

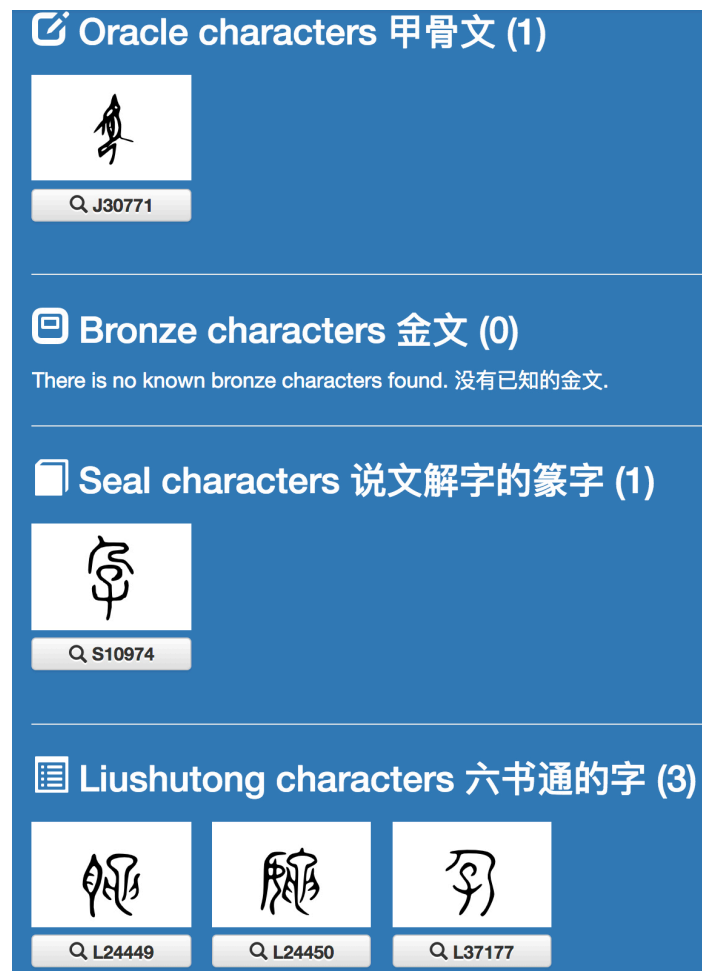


Figure 3. The precursors to “pregnant” 孕 on Hanziyuan.net.

The character “female” 女 signifies for key characteristics known to be under female providence: “milk” 奶 and “pregnant, to conceive” 媿 (an older character). Pregnancy often results in a baby. Therefore, this “pregnant” 孕 concept can logically be used with the traditional “fish” 魚 radical found in the

character “small fish, spawn, or roe, frog group” 鯢 (Sturgeon, <https://ctext.org/dictionary.pl?if=en&char=鯢>). “Fish” 魚 plus “pregnant” 孕 means “roe.” (There is no precursor listed for 鯢.) The literal translation “fish pregnant” logically equates to “fish eggs” because women and other female animals carry eggs/ovum.

5. Noah’s Ark Is the World’s First Sex Education: 2 by 2, Male and Female

Human survival was based upon recognizing the importance of reproduction. The first book of the *Bible* is *Genesis*, and it is about generating more. One of the first stories is Noah’s Ark, which is the world’s first sex education: two by two, male and female. A less specific version of this story is from the *Epic of Gilgamesh*, which is 2500 years older than the *Bible*. The importance of owning breeding pairs was propagated via written language. The Noah’s Ark story wouldn’t have had as much staying power if the line had been single file.

An Ancient Egyptian hieroglyph meaning “pregnancy/birth” (Figure 4) employs a substantially similar structure to the Hanzi character for “pregnant”: 孕 (Gardiner, 1927).

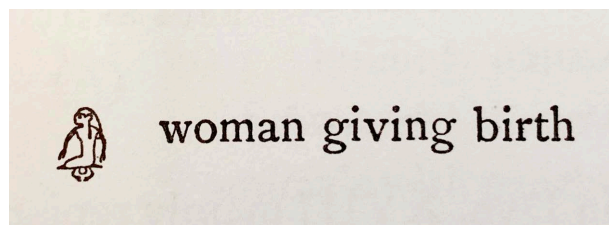


Figure 4. Ancient Egyptian hieroglyph for “woman giving birth.”

Both depictions—Ancient Egyptian and Chinese—show the body of a woman with a child coming out of her conceptual bottom. The Ancient Egyptian character for “pregnant woman” (Figure 5) depicts a woman with a slightly larger stomach, especially as compared with the woman giving birth above (Gardiner, 1927).

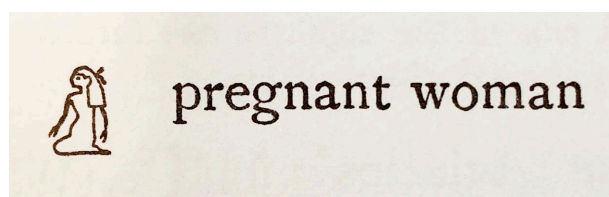


Figure 5. Ancient Egyptian hieroglyph for “pregnant woman.”

By contrasting two ancient languages—Chinese Hanzi and Ancient Egyptian hieroglyphs—one can recognize the universality of a double-lobed shape such as 乃 representing a pregnant female mammal’s body, while at the same time also representing both breasts filled with milk, and female mammal breasts in general.

6. A Pregnant Female Is the Rate-Limiting Step toward Building a Civilization

Farms and harems are both breeding prisons: one male, many females. Both situations allow for the production of abundance. When humans recognized the importance of pregnant female mammals to a tribe's survival, they used this information pictorially. Ancient depictions of women giving birth have been found in Egypt (**Figure 6**)

(<https://www.alamy.com/stock-photo-hieroglyph-of-woman-giving-birth-at-the-temple-to-crocodile-god-sobek-21978365.html>) and Italy (**Figure 7**) (<https://www.eurekalert.org/news-releases/713951>).

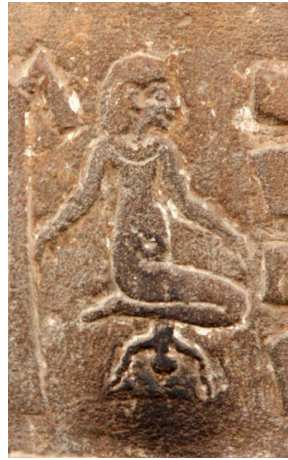


Figure 6. Ancient Egyptian depiction of a woman giving birth to a child at the temple to Sobek, the crocodile god, at Kom Ombo in Egypt, circa second century BCE.



Figure 7. Mugello Valley Archeological Project, which oversees the Poggio Colla excavation—a 2700-year-old Etruscan settlement in Italy—found this small fragment of a ceramic vessel which depicts a woman giving birth to a child. This depiction is circa 600 BCE.

Literate humans belong to a fertility culture. We celebrate birth. In the Chinese word for “good” 好, we have the wedding of “female” 女 and “child” 子 together in one character, but their close association conveniently changes the mean-

ing of “female” into “mother” and depicts “mother and child.” Context is everything in Chinese. When “female” (which is anachronistically also used for animals other than human) is next to “child,” the meaning of this character is “good,” ostensibly because everyone knows in a culture which is focused upon fertility, fecundity, and procreation, that “mother” plus “child” is “good” (Figure 8).

好 = 女 + 子
 “good” “female” “child”

Figure 8. In Hanzi, “good” 好 is composed of two pieces: “female” 女 and “child” 子, which magically turns “female” into “mother.”

The ubiquity of this Chinese character “good” 好 is evident in that it is the “how” in “knee how,” (ni3 hao3) which means “Hello” 你好. Every time Chinese speakers greet each other, they are basically saying, “You mother and child,” which magically turns into “You good.” This phrase has become so commonplace, it is no longer a question. It is assumed you are good. It is assumed that the combo of mother-and-child is good because if fertility weren’t the focus of every successful civilization, those civilizations would not have been successful.

The 120 billion people who have been born on this earth (<https://www.prb.org/articles/how-many-people-have-ever-lived-on-earth/>) require the existence of a lot of mothers and offspring, which also necessitates an exponentially large amount of sexual intercourse between female and male humans. The image of “mother and child” is more prominent than other images of fertility because society has deemed it more pleasant to see the result of sexual congress than its enactment. Consequently, “Mother + child = good” is a universal motif. This specific duo is found not just in Chinese and the East, but also in the iconography of Isis and Horus of Ancient Egypt (Figure 9) (<https://www.metmuseum.org/art/collection/search/570684>), and Mary and Jesus of Christianity (Figure 10) (<https://www.flickr.com/photos/adavey/3424334012/>).

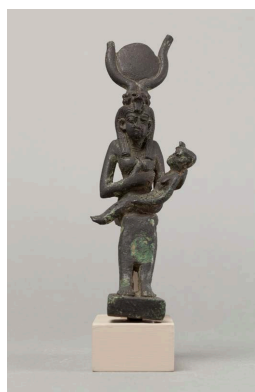


Figure 9. Isis and Horus, 664-30 BCE.



Figure 10. Mary and Jesus as depicted on a painting in a 13th century Ethiopian Christian Orthodox church.

For thousands of years we have revered mothers, so it is consistent to see the profile of a pregnant mammal's body in the structure of “be” 乃, “milk” 奶 and “pregnancy” 孕. In fact, there is a similarity of structure in words related to reproduction in other ancient languages. In Ancient Egyptian, the character for “milk” includes double lobes reminiscent of the capital letter “B” rotated 90 degrees counterclockwise. In writing, structure seems to matter more than orientation, and here is a good example. This depiction of “milk” in Ancient Egyptian hieroglyphs (**Figure 11**) most likely shows mammaries, even though Egyptologists characterize a single “mound” as “a loaf” of bread (Gardiner, 1927: p. 27).



Figure 11. Ancient Egyptian hieroglyph for “to make milk”; /ir/ means “to make”; the two “loaves” (breasts?) represent the /tt/ sound of “milk.”

The sound /tt/ means “milk” in this word (“ir” means “to make”) and is represented by the double half circles (Gardiner, 1927). That half circle (the alphabet’s capital “D” rotated 90 degrees counterclockwise) was the sound /t/, which was the feminine ending for all female mammals in Ancient Egyptian (**Figure 12**) (Gardiner, 1927). Female humans were conflated with female mammals in written language, which is why I designate “female mammal” as opposed to “female human.”

This female /t/ signifier shows up in Hebrew as well in phrases that reference females, such as “Bat Mitzvah,” which is a female rite of passage, versus the more well-known “Bar Mitzvah” for males. A single /t/ or hump might stand for “female” in Ancient Egyptian and Hebrew, but two “T’s” or two humps seem to stand for reproduction-related words more consistently. Sometimes just doubl-

ing the character is enough to suggest breasts, as in the Hanzi word for “tits” 咪咪.

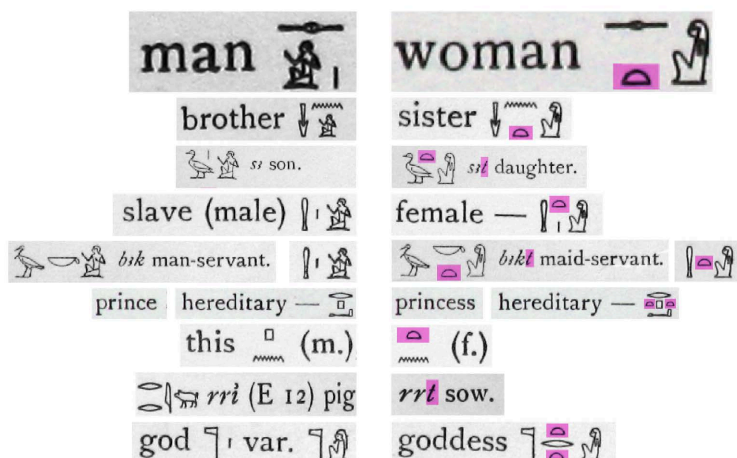


Figure 12. Male counterparts to female versions lack the /t/ ending (noted in pink) which is represented in Ancient Egyptian by the shape that looks like one breast—although goddesses and princesses get two!—and is used to signify for females, including sows, an animal that cannot make bread but does have teats.

In Hebrew, 𐤀𐤀 means “nipple.” Words with double “T’s” have a great deal of resonance with female mammaries: “teats” and “tits” in English, *tetas* in Spanish. In Chinese, the word for “Mrs.” is 太太 (*tai4 tai*) and it looks like two protrusions. One 太 means “extreme,” so this word is literally “doubly extreme,” which is what the breasts of a wife generally were in a time before birth control. The word 奶奶 (*nai3 nai*) means “grandmother,” specifically one’s “father’s mother.” Both 𐤀𐤀 and 太太 appear to emulate female breasts symbolically. On the other hand, 奶奶 is literally “milk milk,” so this suggests “female breasts” in a more conceptual (though still double!) way by orally and semantically acknowledging one’s father’s mother as having nourished two generations (**Figure 13**).



Figure 13. The power of two: the same repeated symbol—particularly if those symbols jut out—suggests breasts because breasts come in twos and they hang off the body in a cantilevered way.

In every ancient written language, a special character denotes “female” because females have value due to their procreative nature. There are a variety of ways to signify for “female,” but double “humps” have metaphorically represented “fecundity” for a long time. Four different written languages have double-lobed structures with reproduction associations: Chinese, Ancient Egyptian, Thai, and

Sumerian. “Be,” “milk,” “pregnant,” “mother,” and “child” are all the results of sex (Figure 14). Chinese also has the character for “mother” 母 not included here because its orientation is not identical, but one can still see the double boxes, both with dots. The dots could signify for “working breasts” (similar to 太太) because “working breasts” define a “mother.”

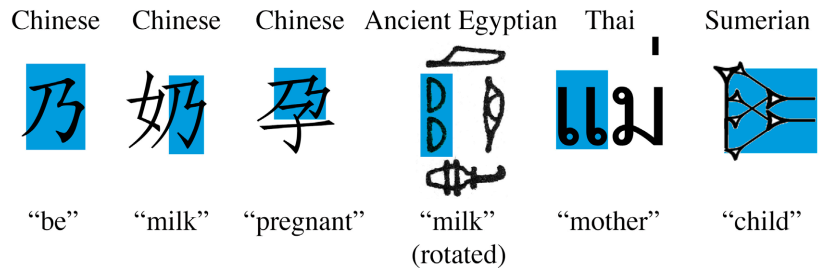


Figure 14. Six representations of four different written languages that depict an aspect of reproduction with a double-lobed structure.

7. Eyes and Breasts Are Both Targets

Symbols are the vehicles that allow the propagation of a culture. A vehicle carries cargo. That cargo can be meaning. The imprinting on the brain of a shape-to-meaning relationship creates a pattern. That pattern emerges from structures that are important to humans. For example, the words related to sight show similarity because most humans have two eyes, so the concept of seeing is represented bilaterally (Figure 15).

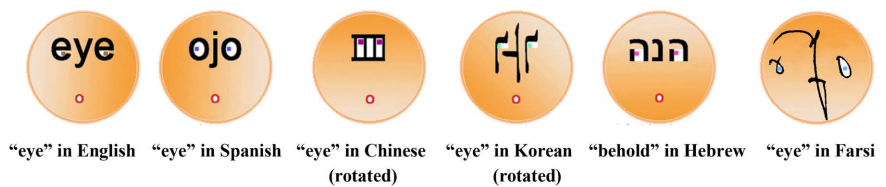


Figure 15. Words for “eye/ behold” in six written languages show similarity in that they all depict a face. Six languages, none considered related, yet the concept of seeing is depicted with the same caricatured bilateral symmetry—note the features all bias to the left. Humans are significantly more alike than we realize.

Eyes and breasts are both targets, a dot inside a circle. Humans are drawn to circular targets because they might be full of substance—fluid that could aid our survival in a time of uncertain water resources. The two breasts of our mother as she feeds us from them is the first positive experience an infant has after emergence. The universality of two circles as enticing to humans is *impregnated* in language because that attraction equated to human survival. Our existence is predicated upon females becoming mammas, and those mammas’ mammaries becoming full of milk; therefore, double-lobed symbols representing motherly shapes are recreated in written language.

In Chinese, the structure of “be” 乃 resembles the alphabet’s capital letter “B”—and this bears analysis, as well as the fact that “B” starts many words re-

lated to reproduction, such as “baby,” “breast,” “bosom,” “boob,” “breed,” “bride,” “brood,” “bear,” “beget,” “biology,” “bud,” “birth,” “blossom,” etc. (Figure 16). We can see how Hanzi has a relationship to other ancient languages. Could Chinese and English also have similar structures that share congruent meanings? Symbols are simplified shapes that can conflate multiple meanings. Experts tell us, the letter “A” was also the head of a cow; the letter “G” was a throwing stick. But when they say the letter “B” is a house, they are not realizing that “house” is synonymous with “female mammals” because that is where female mammals were kept because they were valuable. It is not a stretch to think that the capital “B” is a picture of a pregnant female mammal and specifically a female human (the bottom of the “B” is always bigger than the top as a pregnant female human would be). A pregnant female human is two humans in one, therefore, two bulges. It is also not a stretch to think that the letter “B” is a picture of life-giving female mammal breasts, which also come in twos. No matter what, the letter “B”—as second in the alphabet—is all about the number “two.”

Figure 16. The similarity between “be” 乃 and the alphabet’s capital B is not only one of structure but also one of meaning: reproduction.

The prefix “bi” means “two together,” as in “bicycle,” “bilateral,” “bicentennial,” and “bite.” The prefix “di” means “two apart,” as in “divorce,” “divide,” “divvy,” “dialogue. Capital “D” utilizes only one of “B’s” lobes. “D” is half of “B.” “D” is “B” divided into two because “D” is about division. In fact, “D’s” structure is so equivalent to “half” of a whole that “D” is a half of a circle. Right there in the shapes of the letters are clues to the meanings of the words in which they reside: for example, “biology” is “life” because two individuals, in most cases, must come together in order to conceive.

The alphabet, like Chinese Hanzi, can be analyzed structurally for meaning. Using both structure and anthropology together—another “*x, y*” strategy—one can decode written language for its underlying patterns, patterns conferred upon written language by the human focus on reproduction. These patterns based upon fertility could be harnessed for better vocabulary retention in all languages. In addition, the contribution female mammals have made to human existence and civilization—all the way down to the physical forms of our written scripts—should be recognized.

8. The Data

The logical relationship in meaning between words that share a common Hanzi substructure can be seen in the sorted-by-meaning list below of characters containing 乃.

Number	Unicode	Character	Definitions	Commentary
1	\U4E43	乃	be; to be; then; really, indeed; as it turned out, after all; namely	“Be” is existence. Reality precedes the abstract. The reality is that sex, “as it turns out,” causes pregnancy. Existence comes through the bodies of females. This character depicts both a pregnant female body and female mammary glands simultaneously. We are mammals because we drink milk from the mammary glands of females who are mammas. The ubiquity of this “be” 乃 character shows that mammas of all species are conflated, and the idea of “pregnancy” and “birth” extends to fish—鯽, birds—隼, trees—朶 and more.
2	\U5B55	孕	be pregnant, pregnancy	Most likely a depiction of a pregnant female with offspring emerging from her bottom. This relationship of offspring emerging from a mother is visible in “cluster of flowers” 朶 as if the flowering “tree” 木 was born from “be” 乃. “Ear of grain” 秀 is another kind of offspring, but this version with “grain” 禾 on top of “be” 乃 is at the peak of its flowering.
3	\U36BA	嫗	(non-classical form of 孕) to be pregnant; to conceive	The addition of the female radical 女 clarifies that child-birth is a female activity.
4	\U5C15	尗	small (used in place names)	Could this represent birth, similar to 孕 and 嫗? Babies are small humans, so logically they might represent the concept of something “small” emerging from the mother’s bottom.
5	\U5976	奶	milk; woman’s breasts; nurse	Metonymy tells us that a symbol can have more than one meaning. “Be” 乃 is both a depiction of a pregnant woman and a depiction of breasts, which is why this is “woman’s breasts” fronted by the female radical 女. This character also means “mistress” as in “二奶.”
6	\U4C46	鯽	(same as 鱒) small fish, spawn, or roe, frog group	Literally “fish” 鱼 “pregnant” 孕 = “fish eggs” or “roe” 鯽.
7	\U76C8	盈	“to fill; to be full of; to be filled with; to have a surplus; to have excess; (of a person’s body, or handwriting) well-developed; full-grown; shapely; curvaceous; plump; (obsolete) vigorous; exuberant; (literary) to reach; (literary) to increase; (obsolete) proud; arrogant; a surname.	“An allofam is perhaps 孕... as well as 填...” (Schuessler, 2007). Not hard to see the fertility/reproduction aspect of this character.
8	\U6C16	氖	neon	There is no ancient record of this character which is “gas” 气 plus “be” 乃. “Well-developed; full-grown; shapely; curvaceous; plump...” 盈 females are like neon lights to men: they both attract the eyes. Consequently, they were historically sequestered because they were easily stolen due to their value.

9	\U579C	堞	heap; buttress; battlements	Females attract males, as does abundance, consequently this necessitates the need to protect ones' asses and one's assets. "Earth" 土 (a wall) protecting "a cluster of flowers" 朵 describes a fortress. "Buttress," "fortress," and "address" end with the feminine "-ess" ending as they are structures which protect females. Females and buildings are synonymous because females are so valuable due to their reproductive capabilities that they must be safely contained so that no one can steal them. A pregnant women's body is also the <i>buttress</i> for the baby, a word that appears to have both "butt" and "ess" (ass?) in it as a kind of reclarification.
10	\U8EB1	躲	hide; avoid	"Body" 身 plus "a cluster of flowers" 朵 which really depicts a pregnant tree. Pregnant animals sequestered because they are so valuable and vulnerable. The baby is also hidden in the mother's uterus because that is a void.
11	\U96BD	隹	superior, outstanding, talented	"Bird" 隹 plus "be" 乃 suggests a pregnant bird, which means eggs. "Don't count your chickens before they hatch" tells us how important those eggs were. A bird that lays eggs is outstanding because it is producing. This 隹 character is a variant of 雥 which looks like a "battlement" though the bottom is allegedly an archery "bow" 弓 (in an unusual rotation). Battlements and bows are historically needed to protect female animals. This kind of protection has a strong association with characters containing "be" 乃; for example, "battlement" 堞.
12	\U347A	隹	(a variant of ["talented, capable; handsome"] 俊) superior, handsome, refined, eminent	A "bird" 隹 plus "be" 乃 suggests a pregnant bird, which means eggs. "Person" 亻 suggests a possible owner of the bird, which suggests a landowner, and therefore "eminent." Society finds eminent men "handsome."
13	\U3766	窠	to accumulate; to amass; to store up, superior, handsome, refined, eminent	This suggests a hen house ("bird" 隹 plus "be" 乃 suggests a pregnant bird, which means eggs) kept under a "roof" 宀. Metaphorically this means "acquisitions."
14	\U3689	蓊	(corrupted form) to make a profit on sell and buy; the profit in business, (interchangeable 贏) a [sic] over plus [sic]; gain; profit; abundance	Abundance is equated with the pregnant female body. Perhaps 蓊 is related to 芻, which has no listed meaning but is a variant of 沽 and means "buy and sell; inferior in quality." Inferior because there's a surplus?
15	\U6736	朵	cluster of flowers; earlobe.	A "cluster of flowers" is an "abundance" of flowers. Flowers have reproductive associations. This appears to literally depict a pregnant tree.

16	\U79C0	秀	ear of grain; flowering, luxuriant; refined, elegant, graceful; handsome, superior, (literary) to grow, to bloom, (of crops) to produce ears.	Abundance, flowering, and grain are all associated with reproduction, an activity that is revered in a fertility culture like a patriarchy. The connection between the structures of “earlobe” 朵 above, and “ear of grain” 秀 is that they are inverted vertically with a nearly similar character—“tree” 木 or “grain” 禾, respectively. “Ear” is the offspring of the plant.
17	\U44B3	菜	(same as U+6736 朵) a flower; a cluster of flowers; a bud, lobe of the ear	Flowers and buds have reproductive associations.
18	\U82BF	芎	grass which has been cut and regrown; wild grass	Fecundity. “Again” 仍 plus “grass” 艹.
19	\U4127	秝	a kind of grain	Grain has reproductive associations. It is the seed that starts the process anew.
20	\U4ECD	仍	yet, still, as ever; again; keep-ing [sic], continuing	Females having babies is a continuing universal reality, especially considering that 子 is, by default, “male,” and the instigator of reproduction. (Women can die from one time of having sex due to hazards of childbirth, so they do not drive the birthrate.)
21	\U83BB	蕊	late	“Late” has strong associations with fertility because childbirth is unpredictable and often deadly. In this character, there is a barrier 匕 to the opening 口. (For the association of “barrier” with “spoon, knife” 匕, recognize that a knife is a weapon.) “Weeds” or “grass” 艹 also seem to block the way.
22	\U7593	疒	fatigued; (Cant.) paralysis of the foot	Fatigue and foot paralysis happen when a woman gets pregnant.
23	\U42FC	縵	slow; leisurely, to delay; to slacken, silk ribbons	“To fill, full...etc.” 盈—the right side of this character—would make one slow, most likely because one is pregnant or a fatigued new mother. “Silk ribbons” signifies for females, babies, and sex. They also could reference female foot binding, which also made women slow.
24	\U46AE	訥	thicker, heavy, still; yet	Pregnancy involves getting thicker and heavier.
25	\U793D	礻	blessings, happiness	Blessing are given and happiness is felt when a woman gets pregnant <i>after</i> the “social custom” 礼 (“cult” 礻) of marriage. When the sanctioned union produces offspring, the reigning culture adds another convert.
26	\U643A	携	lead by hand, take with; carry	A “bird” 隹 plus “be” 乃 suggests a pregnant bird, which means eggs. The radical being “hand” 扌 logically equates to “carry.” This is the action one takes with a child or subordinate.

27	U3A57	携	(non-classical form of 攜) to lead by the hand, to conduct to; to take with	As seen with the previous character, a “bird” 隹 plus “be” 乃 with a “hand” 扌 equates to “carry.” With the addition of the “mountain” 山 which suggests a location—this refines 携 “to lead by the hand” into 携 “to conduct” to a place.
28	\U8A98	诱	persuade, entice, induce; guide	“Entice” is “spoken” 言 “blossoming” 秀 and suggests seduction, which directly relates to procreation.
29	\U8BF1	诱	persuade, entice, induce; guide	The simplified form of 诱. “Entice” is “spoken” 讠 “blossoming” 秀. “Entice” implies “lure,” which is a common technique used to impregnate a woman.
30	\U20BA8	奶	(Cant.) to tie, tow; bring along	To tow along, like a child, especially attached to a breast, which seems to be what this represents.
31	\U47AC	透	(same as 透) to pass through, to let out; to let through	Like a baby or a penis through a vagina. “Menstrual cycle” 月经 is literally “monthly pass through,” so this sets a precedent for “pass through” having a relationship to female genitals. Reproduction is the quintessential metaphor.
32	\U900F	透	penetrate, pass through	To pass through: like a baby or a penis through a vagina.
33	\U3A15	搥	to shoulder; to take on the shoulder; to take upon oneself	“Hand” 扌 plus “well-developed” 盈 is “to shoulder.” The shoulder is near the breast. Mothers shoulder responsibility because for millennia we did not know who the father is (and really still don’t unless the persons in question undertake DNA testing).
34	\U36C6	嫫	to speculate; to conjecture; to assume; to make an intelligent guess; to fathom, (of a woman) beautiful, used in girl’s name	Speculating whether a woman is a virgin? Whether she can produce children? Whether she is pregnant? Whether the child’s father is known? This character could also be sorted in the “Punitive” category, except that its definition includes “beautiful.”
35	\U37A7	峒	(ancient form of 會) to meet, to gather, to be able, to understand	Two representations of high places: mountains and breasts, like the Grand Tetons. High places are where people gather to discuss news, like births and deaths, because it is safest as it is easy to see if strangers approach.
36	\U3D6C	媪	Used in a person’s name	Possibly recognizing the significance of birth and fullness to existence, hence, “be” 乃 is recorded in a name.
37	\U93B8	鏊	engraving tool; carve, engrave	A mother has been “engraved” by a male’s semen. The metaphorical nature of Hanzi illustrates this with the character for “man” 男 which has “power” 力 on the bottom. “Power” 力 is “knife” 刀 with a better handle.
38	\U954C	鏊	engraving tool; carve, engrave	A mother has been “engraved” by a male’s semen.

39	\U7D89	绣	embroider; embroidery; ornament	Embroidery uses a sharp needle. Considered women's work, it is often done for weddings, baby showers, and for pay. The characters 糸, 纟, 纟, 纟, 絲, 丝 all mean "silk."
40	\U7EE3	绣	embroider; embroidery; ornament	Embroidery uses a sharp needle. Considered women's work, it is often done for weddings, baby showers, and for pay.
41	\U3C8C	犒	Dog's hair	There are two parts to this character: "hair" 毛 and "be" 乃. There are two words in the definition: "hair" and "dog." This means that "dog" and "be" 乃 are synonymous. Likening a pregnant or nursing women to a dog is not uncommon; i.e., the phrase "son of a bitch," implies that the mother is a dog, typically because the father is unknown. The data show that "be" 乃 can accompany "female" in "milk" 奶; "child" in "pregnant" 孕; "tree" in "cluster of flowers" 朵; "grain" in "blossoming" 秀; "bird" in "outstanding" 隹; and "gas" in "neon" 氛. "Be" 乃 ultimately means "to produce," be it child, seed, or light.
42	\U3EB1	玁	a kind of jade	"Again" 仍 plus "jade": such an abundance of jade that the ubiquity cheapens its value. Just another piece of jade... Interesting that "jade" also means "a worthless horse," "disreputable woman," and "flirtatious girl."
43	\U7407	琇	coarse variety of jasper or jade	"King" 王 is sometimes substituted for its superstructure "jade" 玉. "Blossoming" 秀 seems to confer a non-positive association, hence "coarse."
44	\U3EEA	璩	a kind of jade (same as 璿璣) fine jade	"King" 王 is sometimes substituted for its superstructure "jade" 玉, no doubt because the king owns all the wealth. "Bird" 隹 plus "be" 乃 suggests a pregnant bird, which means eggs. Could jade be the "king's eggs" in the same way that a pearl is an oyster's metaphorical egg?
45	\U3B41	杙	a kind of tree, a kind of lumber used to stop a carriage	"Wooden rammer or pestle, place" 杙 is synonymous with 構 (even though 構 does not have a meaning attached to it). They both—杙 and 構—have phallic associations, which makes sense given the relationship that "be" 乃 has to reproduction.
46	\U6979	楹	column, pillar; numerary adjunct	Another phallic association that functions as a base to a building, creating a container, similar to a mother's womb. A measure word ("numerary adjunct") is a kind of base within the sentence, a noun which facilitates counting in a time of abundance (one loaf of bread, one drop of blood, one ounce of strength, etc.).
47	\U9F10	鼐	incense tripod	"Large, three-legged bronze caldron [sic]" 鼎 plus "be" 乃 suggests that the "be" 乃 component adds the sense of odor to this tripod. Males are aroused by the smell of females.

48	\U3DEA	燒	(a variant) fat; rich, a stew of fish	Could this be egg soup? Or milk metaphorically? For sure it has a fishy odor, which men associate with women.
49	\U442A	膾	(same as standard form 膾) fat; rich, a stew of fish	Could this be egg soup? Or milk metaphorically? For sure it has a fishy odor, which men associate with women.
50	\U6254	扔	throw, hurl; throw away, cast	What often happens when there is abundance, be it eggs or offspring. Abundance creates waste.
51	\U83A0	莠	weeds, tares; undesirable, evil	“Grass” 艹 plus “grain” 秀 is uncontrolled growth, hence bad.
52	\U8DE5	蹂	stamp feet	“Cluster of flowers” 采 plus “feet” 足 equals “stamp,” which is a violent act.
53	\U5234	剁	chop by pounding, mince, hash	“Cluster of flowers” 采 here could mean herbs, seeds, grains, plus “knife” 刀 equals “hash.”
54	U+22B46	擄	to draw out; to levy; to strike	“Blossoming” 秀 plus “hand” 扌 equals “to draw out.” “Milking” is a metaphor for bleeding or fleecing. To milk the populace by levying a tax.
55	\U4BEE	髡	disheveled hair	“Hair” 髟 plus “be” 乃 suggests that “be” 乃 equates to “disheveled.” The state of motherhood?
56	\U6224	馱	to infringe a trade-mark; to pledge an article	Surplus creates trade violations? To infringe is negative.
57	\U92B9	锈	rust, corrode	Rust, iron oxide, is metaphorically metal sprouting: “Blossoming” 秀 plus “metal” 金. Rust and blood are both red due to their iron content. During a non-pregnant woman’s monthly menstrual cycle, she passes blood. Could this be why there is an association between 尼 and 泥? Nuns have no sex, therefore no babies, and consequently regular menses. Mud and blood had a similar appearance to the writers of Hanzi.
58	\U9508	锈	rust, corrode	Oxidation out of control, destroying something valuable.
59	\U414E	稊	different; to distinguish	In a homogeneous society, “different” is perceived as negative.

60	\U8FB8	迈	No definition given
61	\U69DC	携	No definition given
62	\U843E	蓋	No definition given
63	\U5C77	岫	No definition given
64	\U76C1	盈	No definition given
65	\U3B46	采	No definition given
66	\U91E2	釧	No definition given
67	\U6305	探	No definition given
68	\U827F	苜	No definition given
69	\U5C2E	楸	No definition given
70	\U6E8B	湓	No definition given
71	\U5500	诱	No definition given
72	\U36E2	媵	No definition given
73	\U5903	夙	No definition given
74	\U35E1	葩	No definition given
75	\U870F	蛭	No definition given
76	\U446E	躲	No definition given
77	\U6857	樑	No definition given
78	\U25FF0	綵	No definition given

79	\U2870F	鄱	No definition given
80	\U24720	犄	No definition given
81	\U26A0B	舩	No definition given
82	\U22480	𠄎	No definition given
83	\U25B38	筴	No definition given
84	\U21986	𨔵	No definition given
85	\U200AA	𠄎	No definition given
86	\U2CE75	齧	No definition given
87	\U25FF1	綵	No definition given
88	\U23AC9	𠄎	No definition given
89	\U2C9A0	𠄎	No definition given
90	\U279C7	𠄎	No definition given
91	\U2CA38	邈	No definition given
92	\U219BA	宀	No definition given
93	\U27664	祿	No definition given
94	\U2A737	保	No definition given
95	\U22629	悻	No definition given
96	\U2CA44	邈	No definition given

97	\U21554	𠂇	No definition given
98	\U267BE	𠂈	No definition given
99	\U2C6B9	𠂉	No definition given
100	\U2800A	𠂊	No definition given
101	\U2901F	𠂋	No definition given
102	\U2B0B2	𠂌	No definition given
103	\U28E10	𠂍	No definition given
104	\U28E33	𠂎	No definition given
105	\U2B844	𠂏	No definition given
106	\U2B850	𠂐	No definition given
107	\U21994	𠂑	No definition given
108	\U2AE28	𠂒	No definition given
109	\U24537	𠂓	No definition given
110	\U21DB2	𠂔	No definition given
111	\U213A0	𠂕	No definition given
112	\U21CAA	𠂖	No definition given
113	\U200B1	𠂗	No definition given
114	\U20C46	𠂘	No definition given

115	\U2822F	𠂙	No definition given
116	\U2A951	𠂚	No definition given
117	\U2BCAC	𠂛	No definition given
118	\U28983	𠂜	No definition given
119	\U2BA74	𠂝	No definition given
120	\U21B58	𠂞	No definition given
121	\U25231	𠂟	No definition given
122	\U2701F	𠂠	No definition given
123	\U2BE6D	𠂡	No definition given
124	\U25A6F	𠂢	No definition given
125	\U2AFB7	𠂣	No definition given
126	\U28A59	𠂤	No definition given
127	\U21241	𠂥	No definition given
128	\U27223	𠂦	No definition given
129	\U24188	𠂧	No definition given
130	\U24184	𠂨	No definition given
131	\U2B85D	𠂩	No definition given
132	\U22AE1	𠂪	No definition given

133	\U2BB67	埠	No definition given
134	\U2C93B	玃	No definition given
135	\U21EA1	嶮	No definition given
136	\U247E3	猛	No definition given
137	\U2C3A8	甌	No definition given
138	\U25BF0	筵	No definition given
139	\U29F96	鼻	No definition given
140	\U2B8C2	儼	No definition given
141	\U23145	昞	No definition given
142	\U2BDB5	𠄎	No definition given
143	\U2A70C	𠄎	No definition given
144	\U21EA6	𡗗	No definition given
145	\U23C7D	𠄎	No definition given
146	\U2C194	殍	No definition given
147	\U25F8B	𠄎	No definition given
148	\U2760C	𠄎	No definition given
149	\U2C695	𠄎	No definition given
150	\U29EAB	𠄎	No definition given

151	\U2CC61	颯	No definition given
152	\U26C06	蓋	No definition given
153	\U27924	𠄎	No definition given
154	\U2C52C	笏	No definition given
155	\U2C761	𠄎	No definition given
156	\U225B1	𠄎	No definition given
157	\U200AB	𠄎	No definition given
158	\U27226	𠄎	No definition given
159	\U28E43	𠄎	No definition given
160	\U29DB9	𠄎	No definition given
161	\U2B12E	𠄎	No definition given
162	\U21978	𠄎	No definition given
163	\U217DA	𠄎	No definition given
164	\U29712	𠄎	No definition given
165	\U21ECE	𠄎	No definition given
166	\U27EDE	𠄎	No definition given
167	\U22481	𠄎	No definition given
168	\U2675A	𠄎	No definition given

169	\U7493	璫	No definition given
170	U+367F	穢	No definition given
171	U+2E081	禍	No definition given
172	U+2DB2E	穢	No definition given
173	U+2008D	𠂇	No definition given
174	U+2008F	𠂈	No definition given
175	U+20090	𠂉	No definition given
176	U+2CF05	𠂊	No definition given
177	U+2CF0E	𠂋	No definition given
178	U+200EF	𠂌	No definition given
179	U+2B896	𠂍	No definition given
180	U+20251	𠂎	No definition given
181	U+2A741	𠂏	No definition given
182	U+2042C	𠂐	No definition given
183	U+206D8	𠂑	No definition given
184	U+20BF7	𠂒	No definition given
185	U+20BF9	𠂓	No definition given
186	U+2D268	𠂔	No definition given

187	U+2BADF	𠂕	No definition given
188	U+21079	𠂖	No definition given
189	U+2D31F	𠂗	No definition given
190	U+2A8CD	𠂘	No definition given
191	U+2A8DC	𠂙	No definition given
192	U+2D469	𠂚	No definition given
193	U+2BC15	𠂛	No definition given
194	U+21955	𠂜	No definition given
195	U+21957	𠂝	No definition given
196	U+219FF	𠂞	No definition given
197	U+21A4D	𠂟	No definition given
198	U+2BD1F	𠂠	No definition given
199	U+2D524	𠂡	No definition given
200	U+2BD7F	𠂢	No definition given
201	U+21FAB	𠂣	No definition given
202	U+224F5	𠂤	No definition given
203	U+2260F	𠂥	No definition given
204	U+2277C	𠂦	No definition given

205	U+2D773	慍	No definition given
206	U+2293B	儀	No definition given
207	\U5444	𪛗	No definition given
208	U+2BF7E	撻	No definition given
209	U+22E49	擷	No definition given
210	U+2D9BB	盥	No definition given
211	U+232ED	曠	No definition given
212	U+23300	曦	No definition given
213	U+233FB	朶	No definition given
214	U+2341F	朶	No definition given
215	U+23428	朶	No definition given
216	U+234B4	𪛗	No definition given
217	U+2DA8F	𪛗	No definition given
218	U+2357C	朶	No definition given
219	U+23717	𪛗	No definition given
220	U+23903	𪛗	No definition given
221	U+23B81	𪛗	No definition given
222	U+23CB8	𪛗	No definition given

223	U+23D5B	透	No definition given
224	U+2405B	澗	No definition given
225	U+2C285	焯	No definition given
226	U+2C286	焯	No definition given
227	U+2C294	焯	No definition given
228	U+2449F	燂	No definition given
229	U+2AEAB	𪛗	No definition given
230	U+24979	𪛗	No definition given
231	U+2AF2F	𪛗	No definition given
232	U+24BEA	𪛗	No definition given
233	U+2DEB9	勇	No definition given
234	U+2DED0	𪛗	No definition given
235	U+2AF69	𪛗	No definition given
236	U+2B7AF	盈	No definition given
237	U+2B7B0	盈	No definition given
238	U+253D7	𪛗	No definition given
239	U+2E01E	𪛗	No definition given
240	U+2E073	𪛗	No definition given

241	U+2566F	禍	No definition given
242	U+2567E	禡	No definition given
243	U+25681	禡	No definition given
244	U+256A3	禡	No definition given
245	U+2E0BC	𪗇	No definition given
246	U+2E0C4	稌	No definition given
247	U+257C4	稌	No definition given
248	U+25881	𪗇	No definition given
249	U+258E7	𪗇	No definition given
250	U+25903	𪗇	No definition given
251	U+2C5C5	𪗇	No definition given
252	U+2612D	𪗇	No definition given
253	U+263C1	𪗇	No definition given
254	U+2E2E3	𪗇	No definition given
255	U+26655	盼	No definition given
256	U+2B1E3	𪗇	No definition given
257	U+2B1F5	𪗇	No definition given
258	U+26B98	𪗇	No definition given

259	U+2C77D	𪗇	No definition given
260	U+26F67	𪗇	No definition given
261	U+27045	𪗇	No definition given
262	U+2C7D2	𪗇	No definition given
263	U+272B1	𪗇	No definition given
264	U+27698	𪗇	No definition given
265	U+27922	𪗇	No definition given
266	U+2792A	𪗇	No definition given
267	U+27945	𪗇	No definition given
268	U+27970	𪗇	No definition given
269	U+288A0	𪗇	No definition given
270	U+28A0D	𪗇	No definition given
271	U+28B7D	𪗇	No definition given
272	U+28D37	𪗇	No definition given
273	U+28E73	𪗇	No definition given
274	U+2E978	𪗇	No definition given
275	U+28FAB	𪗇	No definition given
276	U+29276	𪗇	No definition given

277	U+2949C	頽	No definition given
278	U+983A	頽	No definition given
279	U+2EA86	驕	No definition given
280	U+2EAC4	髻	No definition given
281	U+2A06E	鵠	No definition given
282	U+2A439	黠	No definition given

9. Conclusion

Hanzi Finder, a Hanzi substructure search engine, is a tool that can help analyze the influence that component structures have in determining a Chinese character's meaning by finding all characters that contain a particular component. Comparing the definitions of characters that have the same components facilitates the clustering of meanings into categories which can serve as prediction tools. Using reproduction as the orienting theme for such categorizations may seem subjective, but considering that replicating is of prime importance to the human animal based upon the eight billion people currently living on this planet, analysis using an anthropological angle seems rational. Recognizing the role that sex and reproduction play in language could be an aid to literacy.

Acknowledgements

I would like to thank my HanziFinder business partner Chao Xu who helped me make a Hanzi substructure search engine (<http://www.HanziFinder.com>); my translator and interpreter Maggie Li; the three researchers who helped us redraw the 88,884 characters: Meiqin Xia, Huimin Luo, and Wenqing Huang; and the researcher who handled quality control: Iris Guo. I would like to thank Github for the HanaMinA typeface of 88,884 characters, which we redrew as accurately as possible. I would like to thank Chinese Text Project (<https://ctext.org>), Chinese Etymology (<https://hanziyuan.net/>), Wiktionary, KTdict C-E, and Pleco for characters and definitions. I would like to thank Catherine Farris for her "Gender and Grammar in Chinese: With Implications for Language Universals" paper. I would like to thank David Moser for his "Covert Sexism in Chinese" paper and his useful insights on this paper. I would like to thank Dr. Zhenhai Shen, Dr. Yina Sun, Dr. Zhongping Mao, Dr. Siwen Wang, Goodwin Law Firm (especially Flora Zhang and Joel Lehrer), and all my Chinese teachers from Tutoring, Prep-ly, Verbling, and Italki. I would like to thank my daughter Jordan Varney, who is

a word person. I would like to thank my son Dalton Varney and his partner Sarah Dahm for their support. I would like to thank my husband Dr. Michael Varney for his continuous support.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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- Sturgeon. <https://ctext.org/dictionary.pl?if=en&char=無字>

Supporting Information

Online:

- HanziFinder (<https://www.HanziFinder.com>)
- Chinese Text Project (<https://www.ctext.org>)
- Chinese Etymology (<https://hanziyuan.net/>)
- Wiktionary (https://en.wiktionary.org/wiki/Wiktionary:Main_Page)
- KTdict C-E (iPhone app)
- Pleco (iPhone app)
- OriginOfAlphabet (<https://www.OriginOfAlphabet.com>)
- Mandarin Online Tools (<http://www.mandarintools.com>)
- Oxford English Dictionary online (OED.com)
- Pennsylvania Sumerian Dictionary (<http://psd.museum.upenn.edu>)
- Hebrew and Greek lexicons (via Strong's Concordance online)
<https://www.alamy.com/stock-photo-hieroglyph-of-woman-giving-birth-at-the-temple-to-crocodile-god-sobek-21978365.html>
- <https://www.eurekalert.org/news-releases/713951>
- <https://www.metmuseum.org/art/collection/search/570684>
- <https://www.flickr.com/photos/adavey/3424334012/>

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