

An imagery-based theory Chinese character information configuration

Abstract

Spoken language is the result of the natural evolution of humankind, while written words are more recent human inventions. Alphabetical writing systems use letters that are closely related to speech to record speech, and the relationship between the pronunciation and the meaning of the word is the result of arbitrary but commonly understood conventions. However, we do not know much about how ideograms came to represent meaning in written words. Chinese characters do not form an alphabetic writing system, and there is a lack of knowledge of the ideographic mechanism connecting the structure of a character and its meaning. We cannot even talk about the polysemy of Chinese characters and the mechanism of multi-character word formation. We analysed the relationship between the glyphs and meanings of nine thousand Chinese characters and found that the combination of elements in the glyph constructs certain imagery, and this imagery is a psychological representation of the experience informing the concept of the character, so the meaning and glyph of the characters are ideographically connected. Therefore, we hypothesize the idea of “character formation based on imagery”. We determine the imagery and system structure of these 9,000 Chinese characters, summarize the five cognitive models for combining these characters, and build the foundation for a “character formation based on imagery” theory. At the same time, these combination models are extended to multi-character words that combine various characters, and finally, we obtain the morphological ideographic mechanism of the Chinese writing system. The results reveal the ideographic mechanism of the dual-coded hierarchical combination that yields the internal configuration of Chinese characters and their imagery, provide new information about the explanatory nature of Chinese characters that directly represent knowledge, and help propose a guiding theory for character word formation in the Chinese writing system.

Keywords: Chinese characters, imagery, ancient culture, morphology, cognition.

1. Introduction

According to the literature¹², the extant writing systems in the world today can be roughly divided into alphabetic writing systems and ideographic writing systems. The coding of alphabetic writing systems uses the correspondence between letters and pronunciation, that is, the "graphemes-phoneme correspondence rule" to combine letters to record speech, so that there is an obvious parent-child relationship between speech and text. However, there is no such direct correspondence between Chinese phonetics and glyphs because Chinese characters do not directly express phonetics³, glyphs are not coded according to phonetics, and there is no parent-child relationship between spoken language⁴ and Chinese characters as in alphabetic writing⁵. Therefore, can we say that Chinese characters are ideographic? At present, it cannot be said for certain. Since the time of Xu Shen (許慎)⁶, Chinese character scholars have generally accepted and used the concept of pictophonetic characters, and pictophonetic characters accounted for more than 80% of Chinese characters. Thus, given the universal acceptance of character pronunciation, can we say that the form of Chinese characters is ideographic? If so, how do they express this attribute? Therefore, for nearly two thousand years, the research on Chinese characters has always lacked clarity on phonograms and ideograms.

Therefore, based on the firm belief that the glyphs in Chinese characters are by no means arbitrary coding, we must re-examine Chinese characters scientifically. First, we limit the research object to regular-script Chinese characters in order to research the synchronic plane because the diachronic change in glyphs involves the designer's cognition of their environment; otherwise, the structure of the Chinese characters will not change⁷. We cannot use intergenerational cognition to explain before and

¹ Sampson, Geoffrey, "Writing Systems: A Linguistic Introduction" (Stanford: Stanford University Press, 1985).

² Coulmas, Florian, "The Writing Systems of the World" (Oxford: Blackwell Publisher, 1991).

³ Xie Guoping (謝國平), "An introduction to linguistics" (Taipei: San Min 2016), 16.

⁴ From the geographical area where Chinese characters are used, there are at least seven dialects in the domain.

⁵ Ye Suling (葉素玲): "Text recognition" (文字辨識), "Language and Cognition" (Taipei : Nation Taiwan University Publishing Center 2009,08), 297.

⁶ Xu Shen (58-147) the compiler of the original Han dynasty dictionary "ShuWen JieZi" (說文解字).

⁷ Chinese characters from oracle, bronze, large and small seals and the current regular script characters.

after. This phenomenon can only be explained by the phenomenon itself. This is a scientific requirement. Therefore, the references to Chinese characters below indicate regular script glyphs.

Second, the shape of the ideograms we understand is designed based completely on the meaning of the word. If the Chinese character is an ideographic character, its configuration should also be able to explain the meaning of the character. here, we first assume that Chinese characters are ideograms⁸. Therefore, we decided not to consider the differences between the three components that form Chinese characters, namely, ideographic symbols, phonetic symbols and signs (symbols that are neither ideographic nor phonetic), which are generally considered in Chinese character textbooks⁹. In other words, they are all regarded as ideographic symbols. In this way, we can fully explore the possibility that Chinese characters directly represent meaning.

Third, in linguistics, the concept of “words” is used in every form of language. In spoken Chinese, “words” include the smallest independent units of phonetics and semantics. However, within the Chinese writing system, the concept of “words” needs special explanation because the basic units of the Chinese writing system are “square characters” or Chinese characters. Since Chinese characters record both pronunciation and semantics, they also convey the pronunciation and meaning of the characters. Therefore, Chinese characters also have the connotation of “words”. In the Chinese writing system, a word can be a single-character word or multi-character word. In terms of characters, a single-character word is a Chinese character, and a multi-character word is a combination of more than two Chinese characters. Today, an individual character in a multi-character word is a morpheme. Therefore, in the Chinese writing system, the greatest difference between characters and words is that each word may contain one or more Chinese characters. The most troublesome result is that there is no distinguishing mark between words, such as the spaces between words found in alphabetic writing systems. Therefore, we call

⁸ This hypothesis is based on facts because Chinese characters can be used in areas with different languages, such as Japan, Korea, Vietnam and other places.

⁹ Qiu Xigui (裘錫圭), “Summary of Chinese Characterology” (文字學概論), (Taipei: Wanjuanlou (萬卷樓) 1995), 2. 15-17.

character words in the Chinese writing system words, which include single-character words and multi-character words. It should be noted that the starting point of the morphology of the Chinese writing system is different from that of alphabetic writing systems. The former is rooted in the image behind the glyph formed by the characters, and the latter is rooted in the phonology of the letters. For a comparison of the two, see Table 2. We study how Chinese characters are constructed according to their meanings, why Chinese characters are constructed in such a way to characterize their meanings, and what the relationship between the meanings and shapes of the Chinese characters is; then, our findings are extended to multi-character words with various word combinations. If the ideographic mechanism of Chinese characters as single-character words can be studied, then the ideographic mechanism of multi-character words will be logical. This is a question of morphology in linguistics related to ideographic writing systems, although the answers thus far are still unsatisfactory.

Looking at history, after the publication of “Shuowen Jiezi” (說文解字) by Xu Shen in the Eastern Han Dynasty, a massive monument to Chinese characterology was erected, and no one has yet been able to surpass this monument. However, the monument has been standing for nearly 2000 years, and Xu Shen's theory of six principles cannot meet the modern requirements for scientific rigor. In the Song Dynasty, although there were some bright spots, such as Wang Anshi's (1021-1086) “Zishuo” (王安石：字說) and the contemporary Wang Shengmei's “Youwenshuo”¹⁰ (王聖美：右文說), these influential figures unfortunately did not systematically sort or empirically explore ideographic characters.

Modern research in the humanities, linguistics, cognitive linguistics, cognitive psychology, semiotics, linguistic semiotics, cultural semiotics, etc., has provided a theoretical grounding for us to study the relationship between the shapes and meanings of Chinese characters. Today, we see Chinese characters not only as a language but also as a phenomenon of human social behaviour, culture, and collective psychological cognition. Therefore, we study Chinese characters from the

¹⁰ Huang Dehuan (黃德寬), Chen Bingxin (陳秉新), “History of Chinese Philology” (Taipei: linkingbooks 2008), 117-121.

three perspectives of language, cognition, and culture and the relationship among them. At a linguistic level, words are only a kind of symbol of material intermediary, behind which lies the concept produced by the mind's understanding of the world; these cognitive contents are a reflection of the experience of cultural knowledge and natural common sense.

2. Fundamental

Let us imagine that at the beginning of Cangjie's¹¹ creation of Chinese characters, there were no characters, only spoken language. Language evolved naturally, but writing is an invention of human culture. In other words, there was already spoken conversation when writing was invented, and meaning can be expressed through spoken language. As far as Cangjie (倉頡) was concerned, if he wanted to invent written characters, the first thing he had to do was determine what to base them on to encode them so that they would convey the sound and meaning of the language. However, speech relies on the invisible sense of hearing and is limited to a specific time and space, meaning that it is fleeting. Meaning is the result of human beings interacting with the world and producing cognition. In other words, since this world is open to humans, we construct meaning through the perceptive process of recognizing, organizing, and understanding the sensations we receive from environmental stimuli. Knowledge is the key to perception¹². Perception is a psychological phenomenon of perceptual channels such as vision, hearing, touch, taste, smell, etc. However, cognitive psychologists generally value visual perception because visual perception is the most widely recognized and studied perceptual channel¹³. However, we do not perceive the external world with only our eyes; the brain tries its best to understand the stimuli that enter the eyes and fall on the retina¹⁴. Therefore, most people are more likely to raise the imagery of things in their minds to represent meanings when seeing than when hearing¹⁵, and this is usually reflected in the pictures that people imagine about things. According to experimental

¹¹ Legend has it that Cangjie invented Chinese characters. Here, the name Cangjie is used to represent all ancient individuals who designed Chinese characters.

¹² Robert J. Sternberg, Karin Sternberg, translated by Li Hongyi (李宏鑑), "Cognitive Psychology" (Taipei : Cengage Learning 2017), 82.

¹³ Same as above, 82.

¹⁴ Same as above, 83.

¹⁵ Same as above, 296.

evidence, the brain processes logographic writing (image) and alphabetic writing (sound) in different places¹⁶. Therefore, when human beings form an understanding of the environment to produce meaning, visual perception represents meaning more intuitively than other perceptions.

Historically, in the early days of writing in both the East and the West, human beings used pictures to represent concepts. The existing evidence strongly suggests that text was not meant to express spoken language at the beginning; it arose from an interest in pictures and graphical representations¹⁷. These pictures have a communicative purpose. This writing system is called logographic writing. However, as complexity and abstraction increases, it becomes more difficult to express concepts in this way. In fact, modern Western philosophers have also tried to create objective characters that do not depend on any language. For example, Friedrich Ludwig Gottlob Frege published “Begriffsschrift” in 1897 in an attempt to create a set of characters that are completely dependent on vision and not dependent on any language. The system was useful in logic and philosophy, but it could not become a common language for the general public. Similarly, the Austrian philosopher Otto Neurath also tried to create a universal “isotype” with graphics, but it was also unsuccessful. The main reason was that words that do not rely on spoken language can only express some of the more common nouns. Once complex concepts arise, such words are helpless.

To solve the problem that abstract concepts cannot be represented by pictures, ancient Mediterranean people invented symbols to represent phonetics, and a sequence of pictorial representations of language was used to represent sequential syllables. This writing system is called syllabic and alphabetic writing. I. J. Gelb¹⁸ wrote that once this system was invented, the principle of phonetics spread quickly, and everything, no matter how abstract, could then be expressed in a text system.

Why did Chinese characters not turn to phonetic coding, however? In their early stage of development, a few iconic signs were also established; that is, after pictographic characters appeared, they continued to transform steadily towards the

¹⁶ George A. Miller, Translation by Hong Lan(洪蘭) “The Science of Word” (Taipei: Yuan-Liou Publishing, 2002), 79.

¹⁷ Same as above, 81.

¹⁸ I. J. Gelb, “A Study of Writing” (Chicago: University of Chicago Press, 1963).

ideographic. How did this occur? How did this help overcome the difficulty of using an image to represent complex abstract things?

To explore this problem, let us first review how concepts or meanings are formed in the human mind, which involves human cognition. We know that cognitive linguistics studies the formation of the human body's experience with the human conceptual system and reasoning is a core component¹⁹. Edmund Gustav Albrecht Husserl²⁰ said that primitive movements are the ancestor of all cognition. Cognition is the result of highly complex interactions among the body, brain, and environment. Many psychological experiments have established that language understanding is closely related to physical behaviour²¹. The famous neuroscientist and Nobel Laureate Gerald M. Edelman said, "The idea of thinking of meaning as an abstract symbol is one of the biggest fallacies in the history of science." This experience-based cognitive theory gives the concept of meaning a grounded foundation. At the same time, the evolution of the human brain makes it possible to perform high-level simulations of various actions of the human body, as well as the relative position of the human body in space, society, and other contexts. One of the results of this continuous evolution of cognitive stimulation is the formation of human consciousness, and language plays an important role in supporting this continuous evolution of simulation²². Wilson (Wilson, M. 2002) once concluded that cognition is produced by action, and memory can be developed to transform the actual interaction experience of the external world into a form that can be interpreted by the brain. These off-site situational cognitive activities are based on concepts related to the body's perception of movement, and many pieces of evidence show that we often perform off-site and non-real-time simulations of external situations. For example, "mental imagery" is a psychological simulation of external event operation. Embodied thinking may be the essence of human thinking²³. From the perspective of cognitive

¹⁹ Huang Xuanfan (黃宣範): "Embodied cognition" (棲於身的體現認知), "Language and. Cognition" (Taipei : Nation Taiwan University Publishing Center 2009,08), 344.

²⁰ Husserl, E. "Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy" (Boston: Kluwer Academic 1980).

²¹ Glenberg, A. M. & Roberson, D. A. "Symbol grounding and meaning" (Journal of Memory. Language 43, 2000), 379-401.

²² Huang Xuanfan (黃宣範): "Embodied cognition" (棲於身的體現認知), "Language and. Cognition" (Taipei : Nation Taiwan University Publishing Center 2009,08), 364.

²³ Same as above, 357.

psychology, cognition is generated by the human nervous system and various perceptual senses; it then enters into the conscious, encodes information and transfers it to memory, whence it is represented and organized in one's emotions to form knowledge. Thus, it goes on a journey from experience to knowledge. Therefore, the formation of a concept or meaning originates from the cognitive processes of sensing, perceiving, and experiencing.

In the formation of meanings and concepts, there are two issues that require attention: one is how these meanings or concepts are represented in our emotions. The other is how these meanings or concepts extend from direct experience to complex abstraction to the entire conceptual system. Regarding the first issue, cognitive psychologists generally agree that there are three ways knowledge is encoded and represented²⁴, that is, imagery, language (or other symbols), and propositions. Writing symbols were created in the era of Cangjie. Therefore, the coding form for representing knowledge was mainly imagery and propositions, with the latter being the product of the very developed and advanced logic.

Importantly, Shepard (1971) and other researchers put forward the hypothesis of functional equivalence in regards to the external representation of imagery, such as images and photos in books, and the internal mental representation that we care about, that is, mental imagery²⁵. This hypothesis argues that the representational form of imagery and the perceptual experience triggered by visual stimuli are functionally equivalent, even if the two (images and imagery) are not truly equal. Imagery is a specialized concept of cognitive psychology. It has been widely used in the fields of literature and art. It is a phenomenon of the conscious. It is an external scene that is recreated in the brain. It is different from objective existence. It is an imaginary experience that comes after subjective observation, and it is a combination of the subjective and objective.

Regarding the second issue, that is, how meanings or concepts extend from direct experience to complex abstraction to the entire conceptual system, the "conceptual

²⁴ Robert J. Sternberg, Karin Sternberg, translated by Li Hongyi (李宏鑑), "Cognitive Psychology" (Taipei : Cengage Learning 2017), 298-302.

²⁵ Same as above, 309.

metaphor theory" of cognitive linguistics provides a good explanation. George Lakoff and Mark Johnson said in "Metaphors We Live By" that the system of daily concepts is essentially metaphorical²⁶. They analysed embodied metaphors, from directly emerging concepts to metaphorically emerging concepts. They emphasized that the main function of a metaphor is to facilitate understanding and conceiving of one thing from the knowledge of other things. This metaphor of familiar things versus more abstract and complex things is the main way in which meanings or concepts are deepened and expanded, eventually accumulating to form a cognitive system; in other words, it is achieved from direct emergent concepts and metaphorical emergent concepts.

At this point, we return to the question of how Cangjie encoded characters. When Cangjie wanted to encode a known meaning or concept, he would ask where the concept or meaning to be encoded came from. He sought to return to the formation of the meaning or concept, that is, to the source of the experience established by the meaning or concept or the scene of the empirical situation where an event occurred; in such a way, the imagery of the situation would appear in his mind. Therefore, he needed to code according to this imagery because it could represent the target concept or meaning. This was the main way he encoded the meaning or concept (knowledge). For example, if he wanted to represent the concept of a "tree", he could draw a simple tree shape (木). If he wanted to represent the concept of a "person", he would draw the shape of a person walking sideways (人), and so on. These are the so-called direct emergence concepts. Therefore, to understand the configurational rationale of Chinese characters, the key is to determine the configurational imagery of the character. This configurational imagery relates to the meaning or concept of the character and, at the same time, is connected with the context of the subconscious experience. The imagery is essentially metaphorical or analogical. Therefore, the ideographic meaning of Chinese characters mainly helps complete the coding configuration through the mental representation of environmental cognition, that is, through imagery.

²⁶ George Lakoff & Mark Johnson, translated by Zhou Shizhen (周世箴), "Metaphors we live by" (Taipei : linkingbooks 2006), 9.

However, a limited number of simple things can be traced directly. How can more abstract and complex concepts be represented? For example, how can the concept of "more" be represented? Although "more" does not itself indicate a specific thing, it is applied to specific things. As a result, Cangjie seized upon the common imagery of concrete things that could represent the concept of "many": everything in the world is dark at night except the sky, which is full of stars. Therefore, the image of the night sky full of stars can represent the concept of "more" through metaphor. As a result, the concept of "moon" (月) emerges directly from this process. The slightly different form of this character, meaning "evening" (夕), conveys a slightly different concept, the light moon, meaning the twilight period; furthermore, an overlapping combination of two "evenings" (夕+夕) can represent aggravation. The light moon comes late at night. Thus, the character "多" is formed.

It can be seen from this that the development of Chinese characters can be divided into two stages: the first stage is when a small number of directly ideographic characters, that is, iconic characters, appeared. They are the result of directly mimicking the shape of specific objects, and they are directly emerging concepts. However, while there are few iconic signs that can be directly described, they can be used as imagery features, and the combination of several such features, especially combinations that comply with the cognitive principle, can represent more complex and abstract imagery. In other words, complexity can be represented by simple combinations, and complex conceptual imagery can be represented by combinations of simple imagery based on cognitive principles. As a result, the combination of a few iconic signs produces imagery features that form Chinese characters; thus, Chinese characters can continue to be extended and expanded. This is the second stage of Chinese character formation. As metaphorical concepts emerge in the second stage, they use iconic signs to generate imagery features. Under the guidance of the cognitive model, the relevant imagery features are combined to produce the imagery that gives Chinese characters meaning. This meaning is embedded in the shape of the character; that is, hierarchical components are combined with a few icons and are then formed into the glyphs that constitute Chinese characters. We consider this combination of characters and into multi-character words the third stage. Therefore, this combination process greatly improves the efficiency of symbols and can significantly affect the use and clarity of Chinese characters.

The above is an explanation of the ideographic mechanism of Chinese characters according to modern cognitive theory. Let us now look at how the ancient Chinese explained this phenomenon. In fact, the ancient Han people called the few iconic symbols “direct emergence-type concepts” (文) and considered “metaphorical emergence-type concepts” to comprise two classes (文 and 字). The image of “文” is described as “according to the pictograms of Fuxi (伏羲), to begin to draw gossip”, and the image of “字” is described as “like having children at home and multiplying”.

An important development in Chinese civilization was the measurement of the length of a shadow at noon with eight-foot bamboo poles²⁷. Because these data repeat every 365 days, the ancient Han people divided a circle into 365 equal pieces, marked the daily measurement of the noon shadows on each piece, and then connected these different-length pieces to form a scorpion. Thus, the Tai Chi figure (太極圖) was formed. The eight diagrams are designed based on these changes in time and circumstance. The legend was created by Fuxi (伏羲). The eight diagrams are formed by three components: 1. A symbol system composed of three layers of elements, 2. natural and human phenomena represented by symbols, and 3. meaningful explanations and judgements made by a saint about these corresponding natural and humanistic phenomena. In the Western Zhou Dynasty, based on the eight diagrams, 64 diagrams (周易) were formed to classify additional phenomena.

Why do we introduce the eight diagrams and the 64 diagrams here? Chinese characters are designed based on the same principles and methods. We provide a table indicating the correspondence between the eight diagrams and Chinese characters (Table 1):

Table 1 Comparison of the eight diagrams and Chinese characters

Symbol	Element	Combination	Quantity	representation	imagery	Meaning
Diagrams	Yao (2) (爻)	Gua (卦)	2 ³	Divinatory (卦爻辭)	Imagery of guayao	Meaning of gua
character	Icon (87) (字素)	Glyph (字形)	87 ¹⁰	Imagery- component	Imagery- glyph	Meaning of character

²⁷ Editor-in-chief of Wang Yunwu (王雲五主編), “a collection of books: Zhou Bi Suan Jing” (叢書集成：周髀算經), (Taiwan Commercial press, 65 臺灣商務印書館).

In “易傳·系辭上”:

書不盡言，言不盡意。然則聖人之意其不可見乎？子曰：聖人立象以盡意，設卦以盡情偽，系辭焉以盡其言²⁸。

The saint (Confucius 孔子) clearly distinguishes between the four concepts of “writing, talking, image, and meaning”. Written words cannot fully express spoken language, nor can spoken language fully express meaning; however, the saint adopted the same method as that used to form the eight diagrams. That is, he used images to express meaning. However, no one during the pre-Qin period discussed in detail why “images” can express “meaning”.

This question did not receive much attention until the appearance of Wang Bi (王弼 226-249 AD). Wang Bi wrote a famous passage on the “discrimination of language and meaning (言意之辨)” in “Summary Examples of Zhouyi : Mingxiang” (周易略例·明象)》, which incisively pointed out the recurrent relationships among “writing, images, and meaning”. He contributed to the development of this issue into the field of linguistics.

夫象者，出意者也。言者，明象者也。盡意莫若象，盡象莫若言。言生於象，固可尋言以觀象；象生於意，固可尋象以觀意。意以象盡，象以言著²⁹。

This passage from Wang Bi clearly shows that the function of writing is to construct “images,”. After the “images” are obtained, they can be used to understand the “meaning”. This passage qualitatively clarifies the progressive relationship among the three “writing, image, and meaning”. Wang Bi’s passage is important because in it, he explains the problem of representing abstract concepts because they are the result of generalization from concrete phenomena. Therefore, abstract concepts can be understood by extracting “images”. There is a connection between abstract concepts and their “images”. This relationship between image and meaning is the basis for the formation of Chinese characters.

In fact, Aristotle, who lived more than 500 years before Wang Bi, proposed the

²⁸ Kong yingda (孔穎達), etc., “十三經注疏釋” (Beijing : Zhonghua Book Company(中華書局), 1980, 82.

²⁹ Wang Bi (王弼), proofreading of Lou Yulie (樓宇烈校釋), “王弼集校釋” (Beijing : Zhonghua Book Company(中華書局), 1980, 609.

theory of knowledge sources. Aristotle believed that there are four modes through which people understand external things: 1. Origin, 2. material composition, 3. distinguishing characteristics, and 4. purpose or function. His subjective classification based on recognition demonstrates the process of knowledge systematization. The relationship between knowledge and its source, or the relationship between an abstract concept and its source, is precisely the relationship between “meaning” and “imagery”. In philosophy, this relationship is drawn between reason and sensibility. Therefore, the image of Chinese characters captures the visible image of the source of the meaning and follows this source to capture the concept’s invisible meaning. If this perceivable source is sufficiently indicated, people’s common experience can help them understand the intended abstract concept. Therefore, any cognitive experience, including common sense and knowledge of human-made cultural phenomena and natural phenomena, can be projected onto the content of the image. According to Zhou Yamin’s (周亞民) and Huang Juren’s (黃居仁) research on ideographic symbols in Chinese characters, the Chinese character families derived from each ideographic symbol form a small knowledge system, and this system is based on salience and relevance to human cognition. They found that such knowledge systems conform to the empirical framework of knowledge sources proposed by Aristotle. The cases they studied show that Chinese characters have a strong knowledge expression system that directly represents the cognitive model of human beings³⁰.

The above describes the basic principle of the formation of Chinese characters: a hierarchical combination of a few image elements to construct an image that can represent the meaning of the character. Therefore, we call this character formation method the “character formation based on imagery” method. Figure 1 is a schematic diagram of this hypothesized principle with imagery at its core.

³⁰ Huang Juren (黃居仁), “cognition from the perspective of vocabulary: the interest of the Semantic study of words”(從詞彙看認知：詞彙語意學研究的趣味), “Language and Cognition” (Taipei : Nation Taiwan University Publishing Center 2009,08), 222-223.

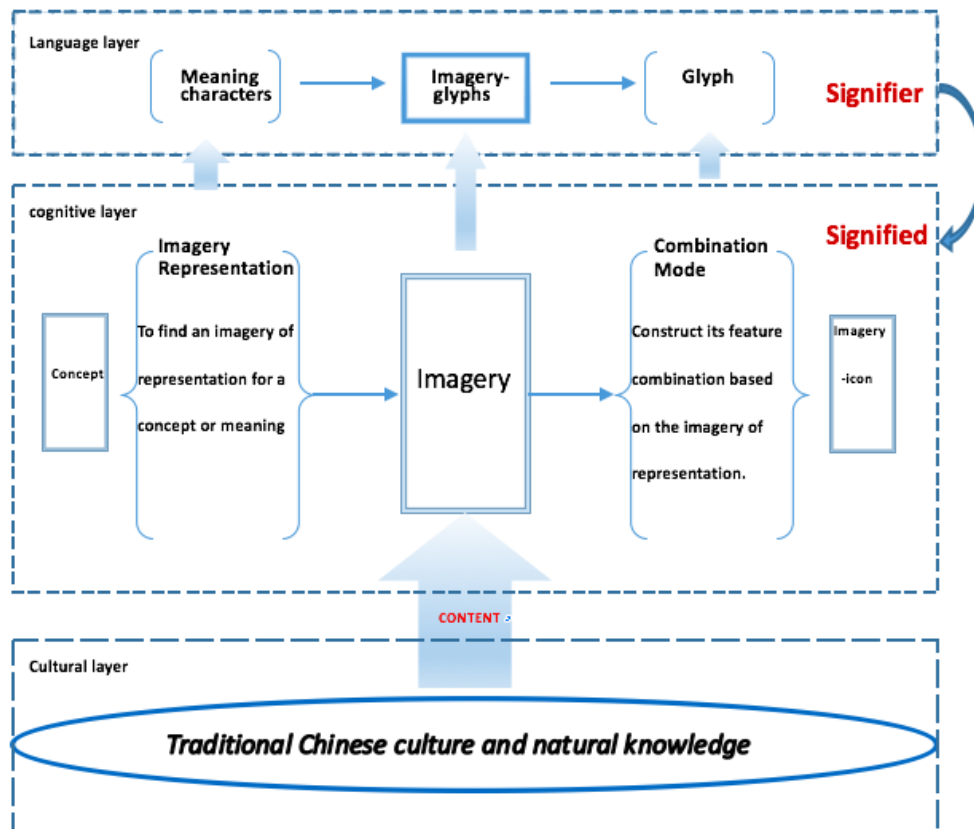


Figure 1 The basic principles of character formation

3. Character word system

We selected nine thousand Chinese characters³¹, disassembled and analysed them, and found that they had a hierarchical combination structure. They are formed through a process of hierarchically constructing imagery, and this imagery is a psychological representation of the experience situation that gives rise to the concept conveyed by the character. In other words, Chinese characters achieve their ideographic purpose through the empirical imagery related to the concept they depict. Therefore, our four major tasks in constructing the theory of “character formation based on imagery” were 1) determining the structure of the internal combination of Chinese characters, 2) summarizing the cognitive model of the internal combination of Chinese characters, 3) describing the character word system

³¹ These 9,000 common Chinese characters are mainly derived from the “Standard Font List of Common Chinese Characters” announced by the Ministry of Education in 1982 and the dictionary developed by editor-in-chief Wang Ning (王寧), “General Standard Chinese Character Dictionary” (Beijing: the Commercial Press, 2013).

from the internal components of the Chinese character to the combined characters, and 4) exploring the images of these nine thousand Chinese characters.

3.1 Terminology and structure

After we introduced the concept of “imagery” in the formation of Chinese characters, our view of the formation of Chinese characters underwent a fundamental change; that is, the formation of Chinese characters has been regarded as a carrier and representation of images. As a result, past concepts such as strokes and similar character components are no longer suitable for describing the configuration of the characters because they lack the “soul” of imagery. Therefore, we naturally ask the following about any configuration: How is the image formed by the specific configuration of components such that the image becomes both a distinguishing characteristic and a combination of various different components? Different “images” come from different configurations of the characters. A configuration and its resultant become an inseparable entity conveying the dual relationship between the signifier and the signified. This is the essence of the so-called dual-track configuration of Chinese characters.

Using the results of our dismantling and analysis of nine thousand Chinese characters, we propose a dual-track configuration with the three hierarchical structures of the upper, middle, and lower levels of Chinese characters. The glyph (signifier) is divided into three hierarchical levels: upper, middle, and lower portions that correspond with the "glyph, component, and icon". In terms of imagery (signified), these upper, middle and lower portions form the "imagery glyph, imagery component, and imagery icon". As a result, Chinese characters present a vertical three-level structure and a horizontal dual-track correspondence. Figure 2 is a schematic diagram of this three-level dual-track structure.

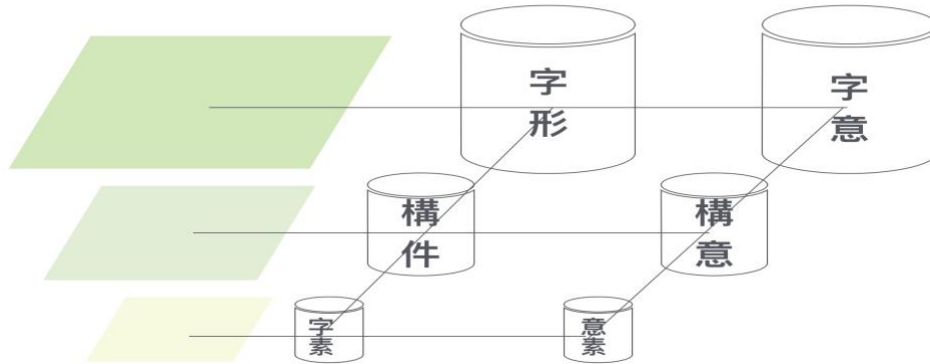


Figure 2 Three-level, dual-track structure.

Table 2 Three-level, dual-track structure

3 LEVEL	CONFIGURATION	IMAGERY
I	字形 glyph	字意 imagery glyph
II	構件 component	構意 imagery component
III	字素 icon	意素 imagery icon

The glyph is the shape of the Chinese character, which is a kind of writing stroke based on specific material formed by square written characters. The glyph corresponds to an imagery glyph, which is the image formed by Chinese characters. The glyph is also a signifier, and the imagery glyph is what is signified in the upper level of the character; thus, the glyph carries the imagery glyph in the body of the character. A glyph contains the imagery glyph, which indicates the purpose of the Chinese character because only imagery glyphs can explain the intended meaning, and imagery glyphs bridge the glyph and its meaning. If a glyph has any function, then its only function is to represent the imagery glyph. Therefore, the glyph and the imagery glyph are two inseparable aspects of a mental concept.

It should be noted that imagery glyphs and the meaning of Chinese characters are two completely different concepts. The former is the empirical imagery associated with the meaning of the character and is the basis for construction of the glyph; the latter has morphological meaning or is a morpheme. Glyphs and imagery glyphs are philological concepts, and the meaning of a character is a linguistic concept. Imagery

glyphs appear in Chinese characters, and the meaning of the characters is used to determine the syntax of the written language. Therefore, the imagery glyph is the mechanism by which the character glyph is expressed.

The glyph and the meaning of the characters are linguistic phenomena in Chinese writing and also part of objective reality, which we can look up in the dictionary. We cannot create phenomena, but we can understand and describe them. Imagery glyphs are originally images describing the relationship between glyphs and the meaning of characters, but they are lost after the meaning is standardized because they are not directly used in written language. Once the automatic connection between the glyph and the meaning of the character is established in human consciousness, the meaning of the character becomes “cumbersome” and is lost. Today, when we study the relationship between glyphs and meanings, we inevitably find the “bridge” that connects them, that is, the imagery glyph.

The writing that is handed down in the world is constructed through combining elements; that is, a few elements are combined with each other, sometimes forming multi-level combinations. Chinese characters are no exception. Most Chinese characters are composed of internal components, which is not difficult to see. In fact, traditional Chinese character studies also recognize this and call this limited element “文”; the characters formed by the combination of “文” are called “字”. Therefore, this combination has inevitably come to form a character word system that includes the glyph system and its imagery system. Thus, the glyph is the result of the combination found in the lower layer, and the imagery glyph is the result of the combination of images in the lower layer. In this way, there must, logically, be some basic elements in the whole system, and the whole character word system is the result of the combination of these basic elements.

The so-called basic elements are elements that cannot be divided. A basic characteristic of glyphs is that incongruous shapes can no longer be separated, nor can the shape of the smallest image. We call such small shapes icons, and we describe them as imagery icons here. Therefore, the icon corresponds to the imagery icon; the icon is the signifier, and the imagery icon is the signified, thus forming the lower level or element level. The icon carries the imagery icon; the icon is the carrier, and the imagery icon is the body. Icons are iconic symbols or pictographic characters.

Similarly, imagery icons are directly emerging concepts that describe shapes, such as "人, 木, 日, 月". These few icons and their imagery icons are combined hierarchically to construct the entire character word system.

The component is an intermediate part with its own image that does not include the icon and the glyph. This image is called the imagery component. The component corresponds to the imagery component; the component is the signifier, and the imagery component is the signified, thus forming the middle level or the structure level. A component is a combination of icons or other components. It can be created through the combination of multiple levels until it forms a glyph. Similarly, an imagery component is a combination of imagery icons or other imagery components. The imagery component can be created through the combination of multiple levels until it forms an imagery glyph. Between icons and glyphs, there may be many combinations, and each of these is called a level or plane. Each level or combined plane is called a glyph byte. The corresponding combined imagery component is called an imagery byte. Some of the icons are Chinese characters, and most of the components are also Chinese characters. In other words, a Chinese character can be an icon or component of other Chinese characters.

The shape of a characters affects its imagery. The imagery glyph is the result of the continuous combination and construction of the imagery from the imagery icon to the layered imagery component. For example, the structure of the character "構" is shown in Figure 3.

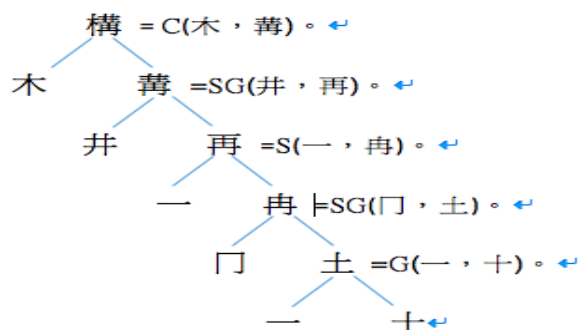


Figure 3 The structure of the character "構"

The character "構" uses only five icons (十, 一, 冂, 井, 木) and its imagery icon. From the combination of these five layers, five glyph bytes (土, 冉, 再, 蕒, 構) and the character "構" are formed. Here, in addition to "構" and icons, there are components. The imagery glyph of "構" is “such as the wooden pole truss above the wellhead.” This character uses the contextual imagery of digging a well to metaphorically represent the meaning of the character "構", and it also includes ambiguity. Of course, this imagery is very clear to one who is familiar with the traditional work of digging. Each glyph byte corresponds to its imagery bytes, and the imagery glyph is constructed by stacking layers of imagery bytes according to a certain combination model.

It can be seen from this that the icon can be added layer by layer through this hierarchical combination; that is, the icon can appear on different levels. Similarly, imagery icons can be added layer by layer and may appear at different levels. Each combination forms glyph bytes and imagery bytes. Therefore, the imagery glyph realizes the multi-layer combination of the imagery bytes through the multi-layer combination of glyph bytes and, ultimately, completes the construction of the imagery glyph. The result is a new image that constructs the meaning of a new character, and the new glyph forms this new image.

Here, we can also see that the glyph, component, and icon of the character are dominant; that is, these elements can be observed, while the imagery glyph, imagery component, and imagery icon of the character are hidden and merely exist in our brains. One of the tasks of this work is to uncover these hidden elements scientifically. Thus, we have made a rough comparison between the alphabet writing system and the Chinese writing system, as shown in Table 3:

Table 3 Comparison of the alphabet writing system and the Chinese writing system.

Chinese writing	icon	imagery icon	imagery bytes	imagery glyph	meaning of the character	character word
Alphabet writing	alphabet	phoneme	syllable	word sound	morpheme	word

We are curious how these very limited imagery icons can be combined to form a

variety of different imagery glyphs. This combinatorial model issue is discussed below. Complex and diverse images can be constructed through the combination model.

3.2. Combination models

In terms of form, Chinese characters are composed of combinations of elements, the purpose of which is to construct imagery glyphs. However, a question remains as to how two or more imagery icons (or imagery components) can be combined in any plane. That is, what is the relationship between the new image after the combination occurs and the individual images that compose the overall image? How can they be combined to construct new images? What is the mechanism of their combination? Our research has found that the ancient Han people used existing imagery to combine and construct new imagery through the combination of icons or components to form new components or glyphs. For example, "土" is a combination of "一" and "十". Both "一" and "十" are icons. What concept results from "土", a combination of "一" and "十"? It turns out that the imagery icon of "一" is "the initial world of Pangu (盘古) in the egg." This is the initial state in which heaven and earth are inseparable. Here, "一" is in the lower portion of the image and generally represents the earth. The imagery icon of "十" is "after Pangu's death, his body transformed into all things and formed a complete earth", so these two separate imagery jointly construct the imagery glyph of "土", which can also be translated as "a large portion of Pangu's body transformed matter on the surface." Here, we are most concerned with the relationship between "一" and "十" and what the rationale for combining is. After much research on imagery glyphs, we identified five combination models, namely, the conceptual model, metaphor model, gestalt model, schematic script model, and declension model. The first four models are cognitive models, as they are based on cognitive principles, while the last corresponds to the principle of glyph transformation. These five combination models comprise the ideographic mechanism of Chinese characters. Through this mechanism, the imagery glyph of Chinese characters is constructed to represent the meaning of the characters. This theory of Chinese character ideology is called the "character formation based on imagery" hypothesis.

3.21 Conceptual model

Humans interact with the environment to generate cognition. Language is a simulation of this kind of cognition. It conveys concepts by recreating a sensory experience. This kind of cognition first involves the classification of the world; a general idea or a category is used to describe concept, and a character word is the symbolic written name or label for that concept. A concept is a basic unit of symbolic knowledge, and it is a tool for understanding the world. For example, the phrase “the birth of the world” symbolizes the event of human beings becoming distinguished from the chaos of indiscriminateness; various categories have since emerged, thus forming a world with distinct species. From this perspective, the evolution of civilization is the evolution of a classification system. Humans organize many concepts through classification. A category is a hierarchy of concepts, and it includes various members, so the concept is a hierarchical structural system. Both the conceptual system and the character word system have the same hierarchical structure. Humans use this classification to understand their experiences.

There are many theories about classification and concepts, and in modern times, many of these have developed into prototype theories. The key component of a prototype is its most characteristic attribute. When we explored imagery glyphs and imagery components, we found that the ancients mastered the essence of classification and concepts. When two imagery types are combined to construct new imagery, there are many combination models for conceptual relationships, such as [category + feature]. Therefore, we call this model a conceptual model. For example, the characters "桃, 柚, 梅, 棠, 梨, 楓" are generally called pictophonetic characters in Chinese character textbooks. In these characters, "兆, 由, 每, 尚, 利, 風" are phonetic symbols, and they are used to distinguish the names of various fruit trees³². We are not opposed to this interpretation, but we are more concerned with the interpretation of the meaning of characters, although the pictophonetic characters also represent “trees” here. Let us look at the character "桃". In our research, the imagery glyph of "兆" is "burning oracle bones for divination, cracks like splashes of water." The character is derived from the practice of divination and includes the image for "symptom". Therefore, the imagery glyph of "桃" is "fruit

³² Wang Ning (王寧), “Lectures on Chinese Character Configuration” (Taipei: San Min 2013), 41.

trees that bring signs of spring", in which "木" is the category and "兆" is the characteristic. This interpretation can be confirmed by many literary works in Chinese culture, where peach blossoms are used to symbolize love between men and women because they herald the arrival of spring. Another example is the character "楓". "風" is what causes the maple leaf to turn red. Maple leaves turn red rather than yellow like other leaves, so this is a prominent feature of maple trees. Therefore, "風" is a character referencing this feature (maple leaves turning red). This example conforms to one of the four models of knowledge sources proposed by Aristotle. The pronunciations of "楓" and "風" are the same, and some pictophonetic characters are similar to or the same as their phonetic symbols³³. Our explanation for this is that the phonetic symbols are Chinese characters and are pronounced according to the local dialect; as a result, the pronunciation of some pictophonetic characters and their phonetic symbols may be similar or the same, or this may just be an epiphenomenon. Explanations of phonetics and ideographics may consider these to be mutually inclusive, but they do not need to be mutually exclusive, as they belong to different categories of language.

If the propositional representation is used, the conceptual model should be:

Chinese character = C (category, feature)

Here, C is a conceptual model, which means that there is a conceptual relationship between categories and features. Therefore, the propositional representation of "桃" can be written as:

桃 = C (木, 兆)

3.22 Metaphorical model

Language is the process of reconstructing a sensory experience, and the world as

³³ Zhou Youguang (周有光), "The pronunciation of Chinese characters can be checked here" (漢字聲旁讀音便查) (Jilin: Jilin people's Press 1980). The statistical results indicate that 39% of the phonetic transcriptions of modern Chinese characters are correct.

depicted through in language is a conceptual world that has been reorganized and interpreted. This process of experience reconstruction is metaphorical. In ancient China, it was common to use metaphors in literary works, such as "The Book of Songs". However, since George Lakoff & Mark Johnson proposed the conceptual metaphor theory, we have become aware that metaphors are based on cognition and are thus everywhere. The conceptual metaphor theory assumes that metaphors are a cognitive phenomenon; they appear in language, and they have a cognitive basis. The conceptual metaphor connects two conceptual domains: the source domain and the target domain. A conceptual domain is a collection of semantically related essences, characteristics, and functions. The source domain usually consists of concrete concepts, such as cash, while the target domain involves abstract concepts, such as time. The conceptual metaphor theory assumes that we use the source domain to understand the target domain. For example, when we say, "time is money", we use money as the source domain to explain time. Similarly, when we talk about time or money by saying "flower time or flower money" (花時間, 花錢), it is because we understand that a "flower" is a phenomenon marked by rapid decay. Therefore, we use "flower" as the source domain for "quickly spent" to illustrate the target domain of the rapid loss of time or money. Here, "flower" changes from a noun to a verb to describe the dynamic of being "flowerlike".

There are many studies on metaphorical theory, including on the reasoning behind using source domains and target domains and on the relationship between the two. However, the metaphorical relationship between the source domain and the target domain exists in the combination of two in Chinese characters to construct new imagery. We call this metaphorical model of [target domain + source domain] the composition of imagery glyphs or imagery components. For example, in the characters "坡" and "咚", "皮" and "冬" are used as the source domain to metaphorize the two target domains of "土" and "口", with the resulting imagery glyph that the ground (土) is like skin and the sound (口) is like winter hitting ice. Of course, the metaphor here is also used as a feature, combining with "土" and "口" in a conceptual model. This combination of multiple models is called a compound model. If propositional representation is used, this metaphorical model can be expressed as:

Chinese characters = M (target domain, source domain)

Here, M is a metaphorical model, which means that there is a metaphorical relationship between the target domain and the source domain. Therefore, the propositional representation of the character "坡" and "咚" can be written as:

坡 = CM (土, 皮)

咚 = CM (口, 冬)

The imagery glyph is the imagery of Chinese characters, and its function is to metaphorically map the meaning of the Chinese character. In other words, familiar imagery is used to metaphorize the abstract and universal meaning of the characters. For example, in the character "權", the literal imagery glyph (imagery) depicts a bird's nest in a tree in the wild. Approaching the bird's nest will cause one to be overwhelmed by one's biological instincts. Therefore, this metaphor can represent concepts such as power and measurement. Similarly, the character "歡" indicates the mother bird returning to the nest and the young birds each opening their mouths to greet her, which is a metaphor for the mood the birds are experiencing at the moment. A bird's nest imagery component (glyph) from "權" can be combined into the imagery glyphs such as "灌", "權", "歡", "罐", "觀", "驢", "勸", "顛", "鸛", "矚", "謹", "鐘", "璣", "攏", "懼", "懼" and "燿". The character's utility and efficiency are evident.

3.23 Gestalt model

Gestalt theory was developed in Germany in the early 20th century. The main argument behind gestalt psychology is that the whole is greater than the sum of its parts. That is, the best way to understand a psychological phenomenon is to see it as an organized and structured whole. According to this view, much linguistic information is incomplete, and this information needs to be filled in by human's innate gestalt ability. When humans observe and perceive the objective world, they always involuntarily allow their subjective experience to inform their understanding, linking the characteristics of seemingly unrelated things to achieve a grasp of the overall object. Similarly, human beings do not passively accept language. Readers will unconsciously assign their own experience to words, organize the relationship

between words and sentences in their own way, and grasp the connotation of the work's semantics as a whole. Gestalt psychology also believes that the various images stored in the brain in the form of information are mental images produced from observation and reading. The function of such images is to improve the person's ability to make discoveries. As a product of the imagination, this process requires the storage of mental images. It cannot arise out of thin air. The theory of "character formation based on imagery" we put forward also uses the gestalt principle to conduct a comprehensive investigation at the three levels of language, cognition, and culture. In other words, we start with human cognitive instincts and cognitive rules to understand the formation of a character's meaning and its structural imagery representation as a result of the interaction between humans and the external world; finally, we consider the cultural background to integrate these components into a whole concept. Gestalt theory is one of the ideographic mechanisms of Chinese character formation.

Even though the integrity of this kind of gestalt effect is limited to the composition of the imagery glyph, a considerable number of Chinese characters are combined using the principle of gestalt cognition. That is, two or more imagery components or imagery icons together represent the overall imagery of something. The basic model is [feature + feature]; therefore, we call this model the gestalt model.

For example, the character "火" is a combination of "人" and "灬". Its imagery glyph is "light and flames that make people sweat profusely." Here, "人" (people) and "灬" (sweat) are both features, and together, they point to the unstructured shape of an alternative thing, namely, the concept of fire. Another example is "畚", which is a non-character component; its imagery component is a square upper portion with a symmetrical container (簋) containing millet and other ancient grains below. It is composed of "一," "口," and "田", all of which are characteristics of "畚": "一" signifies a symmetrical lid, "口" signifies the opening of the container, and "田" signifies the food in the container. Another example is the character "𦘔", which is a combination of "爪", "尸", "尸", "勺" and "𠂔", in which "爪" represents a claw, "尸" represents a body, "勺" represents the handle of a hand-held object, and "𠂔" represents dynamic movement. They are combined into a single character that represents the imagery glyph of "two monkeys picking lice off each other". "爪", "尸", "尸", "勺" and "𠂔" are the constructive features.

If you use the propositional representation, this gestalt model can be represented as:

Chinese character = G (feature, feature)

Here, G is the gestalt model, which means that there is a gestalt relationship between features. Therefore, the propositional representations of the two characters "火" and "爲" can be written as:

火 = G (人, 丷)
爲 = G (爪, 尸, 尸, 勺, 灬)

The conceptual model and the gestalt model both have image features, but what is the difference between the two? The imagery glyph in the conceptual model is the same as its components. However, the imagery glyph in the gestalt model has no categorical relationship with its components; instead, there are characteristic relationships. For example, the concept of "身" has no categorical relationship with the components "自" and "才". "楓" and "木" are similar.

3.24 Schematic script model

Cognitive psychologists discovered that schemes are a representational method useful for studying how the human mind organizes concepts to form knowledge. We should consider the other information contained in a given concept, especially by thinking about the relationship between that concept and others and the relationship between the attributes of the concept. We may thus gain a better understanding of the meaning extracted from the concept. Therefore, schemas are a mental structure used to organize knowledge, creating a meaningful structure organized into different concepts³⁴. For example, the schemas that characterize decline in traditional Chinese culture relate to scenery such as dusk, autumn, and the West. Schemas are higher-level cognitive mechanisms than prototypes. They involve

³⁴ Robert J. Sternberg, Karin Sternberg, translated by Li Hongyi (李宏鑑), "Cognitive Psychology" (Taipei : Cengage Learning 2017), 365.

a wider range of aspects and contain more depth, involving concepts such as language, physical perception, and literary memory. Schemas are like a kind of background knowledge and are prone to stereotypes.

A script is a specific kind of schema that contains information about events occurring in a specific order. The script contains pre-set values for the expected actors, scenes, and sequence of events. These pre-set values are combined to form an overview of the event³⁵.

The reason we introduce the knowledge representation of schemas and scripts here is because the imagery glyphs of many Chinese characters reflect specific historical events or cultural situations. For example, the imagery glyph of “知” is “to understand the military message conveyed by Maodun’s (冒頓) vocal arrows.” This references a Mongolian named Maodun who invented an arrow that makes a sound as it travels through the air. He used this arrow to command his cavalry, as they would understand the information transmitted by the sound the arrow made. There are also many imagery glyphs that describe operations. They are all presented in schemas or script structures related to actions and backgrounds. As another example, the two characters “我” and “找” are mainly composed of “扌” and “戈”. How does “手” holding “戈” represent the imagery glyph of “我” and “找”? This requires a return to the ancient battlefield in the cold weapon era when two armies fought each other in chaos. Currently, we cannot experience what the mood is like in a face-to-face melee on an ancient battlefield, but we are familiar with the feeling of distinguishing one group from another, for example, on the football field or basketball court, where distinguishing clothing is worn to mark the two sides. Similarly, distinguishing military uniforms were worn on the ancient battlefields. This marker indicates that the bearer should be “skipped”. Therefore, if two opponents share the same marker, they are on the “我” side; otherwise, the battle will continue (找).

We call this kind of action image using background knowledge the schematic script model. If propositional representation is used, this schematic script model can be expressed as:

³⁵ Same as above, 367.

Chinese character = S (action, background)

Here, S is the schema script model, which means that the relationship between the action and the background is the schema. Therefore, the propositional representation of “知,” “我,” and “找” can be written as:

知 = S (口, 矢)

我 = S (找, 丿)

找 = S (扌, 戈)

3.25 Declension model

The declension of Chinese characters refers to the non-combination of various Chinese characters, that is, when the form of Chinese characters changes and results in a direct change to the original imagery. The first four combination models are composed of two or more components and their imagery components to construct new imagery. These imagery components are combined with the components from the imagery icon layer by layer until the imagery glyph is completed. The combination of Chinese characters refers to the combination of more than one configuration in a certain plane space. However, the declension model involves a change to the shape of a single glyph or component to achieve a change in the imagery glyph or imagery component. For example, the character "才" is formed by excluding the right hand of "木", thus signifying that a tree has become usable for construction after the branches are removed, and the wood is cured. Another example is the character "夬", which is formed by excluding one vertical line on the left from the character "夬". The imagery glyph of "夬" means that an adult is whole inside, while the incomplete "夬" indicates incompleteness and gaps. These examples all use physical alterations to change the final imagery. Therefore, we call this phenomenon the declension of the Chinese character configuration. Imagery components or imagery glyphs generated in this way follow the declension model.

If propositional representation is used, this declension model can be represented as:

Chinese character = D (component, deformation)

Here, D is the declension model, which means that between the component and the deformation is the declension relationship. Therefore, the propositional representation of "才" can be written as:

才 = D (木, - J)

Additionally, because there are seven forms of declension, the declension symbol must be added before the declension component in propositional representation. According to our empirical research, there are few declension Chinese characters (less than one hundred), but they still play an important interpretive role in the production of imagery glyphs.

The above five combination models, including their compound modes, occur in each combination plane. The configuration of Chinese characters first requires the combination of icons and then the combination of components; finally, the glyphs of the character are produced. The creation of each new character and its imagery is constructed by combining existing shapes and imagery according to the combination model. In this way, new words continue to appear.

However, the internal space of Chinese character boxes is limited, the number of characters is constantly increasing, and the internal structure of some Chinese characters is unbearably swollen, which makes both writing and remembering difficult. Therefore, further ways to combine Chinese characters are being developed; that is, the development of single-character words into multi-character words. In this way, the number of characters written, created, and read can be somewhat controlled. The formation of characters and words follows a similar route, and the combination mechanism is the same. Modern words are integrated into existing concepts conveyed by Chinese characters and then unified. However, the combination of characters in a multi-character word is not a combination of imagery glyphs. It is a combination of the meanings of Chinese characters, and the relationship of these characters still utilizes the four combination models (with the exception of the declension model). Multi-character words may be simple or complex, but we can still predict the meaning of the character word from the

meaning of the Chinese character. For example, "車頭," "車頂," "車窗," "車門," "車椅," "車燈," "車尾," "車體," and "車胎" are still conceptual models. "火箭" is a gestalt and metaphor model. "革命" is a schemas model. "字詞" is the gestalt model.

For binding words (連綿詞), such as 葡萄, 蜻蜓, 蝌蚪, and 蚯蚓, although no single character carries the full meaning of the word, each character contains an imagery glyph because the characters have a configuration and must have an imagery glyph or imagery component. In short, when a Chinese character completes a configuration and forms an imagery glyph, it has an ideographic connection with the meaning of the Chinese character; after the imagery glyph completes its mission, the imagery glyph can be withdrawn from the written language. Therefore, the smallest unit of meaning in written sentences can only be a character word; that is, the meaning of a written language can only be constructed by combining the meanings of character words.

3.3 Character word system

The Austrian biologist Ludwig von Bertalanffy gave the following definition of a concept in the early twentieth century: "the totality of various components (elements) that are in a certain mutual relationship with the environment³⁶." A simplified way of phrasing this is that certain kinds of things are related to each other and are formed a certain orderly whole in order to achieve a goal. From the synchronic and historical perspectives, all character words have their own structural elements, and these elements have their own combination levels and combination models so that the inside of characters and the spaces between characters are neither isolated nor scattered. Rather, they are interrelated, forming an orderly system. The Chinese character words system is exactly like this: the icon and imagery icon are the basic internal elements, and through their mutual combination, various components, imagery components, glyphs, and imagery glyphs are formed. After the imagery glyphs are used to indicate the meaning of the characters, the characters are further combined to form the entire character word system. The goal behind the structure of this character words system is to represent the meaning of the character

³⁶ Ludwig von Bertalanffy, "about general system theory", "German philosophy Weekly 1945".

words. After our analysis of nine thousand Chinese characters and the examination of their imagery, we decided to describe our theory on this character word system as the theory of “character formation based on imagery”.

Here, we discuss the internal order of the system and the connectedness of various character meanings. Let us first look at the configuration of Chinese characters. Icons form the first-level character set. The batch of new characters or non-character components generated by the combination of icons is called the second-level character set. The third-level character set is generated by combining members of the first-level character set and members of the second-character set. By analogy, the fourth-layer set, fifth-layer set and on To the tenth-layer set are generated. Of course, each combination is completed according to the combination model.

If one were to represent this concept with a mathematical set, assuming the first-level set is A, let $n \in N$, $a_n \in A$, $a \subseteq A$. N is the number of icons, a is a subset of A, and a_n is a certain icon. Then, $A = \{a_n, a\}$.

Next comes a one-time combination (flat combination) of icons, which is represented by $a_n \wedge a$, where “ \wedge ” is the symbol for combination and is also a byte of the symbol for characters, which indicates that a certain icon and the subset of the A are mutually connected through their combination and that the subset a may be one or more icons.

Then, the second layer B means: $b_x \in B$, $B = \{b_x : = a_n \wedge a\}$

The third layer C means: $c_x \in C$, $C = \{c_x : = b_n \wedge b \cup b \wedge a\}$

The fourth layer D means: $d_x \in D$, $D = \{d_x : = c_n \wedge c \cup c \wedge b \cup c \wedge a\}$

The fifth layer E means: $e_x \in E$, $E = \{e_x : = d_n \wedge d \cup d \wedge c \cup d \wedge b \cup d \wedge a\}$

The sixth layer F means: $f_x \in F$, $F = \{f_x : = e_n \wedge e \cup e \wedge d \cup e \wedge c \cup e \wedge b \cup e \wedge a\}$

The seventh layer G means:

$$g_x \in G, G = \{g_x : = f_n \wedge f \cup f \wedge e \cup f \wedge d \cup f \wedge c \cup f \wedge b \cup f \wedge a\}$$

The eighth layer H means:

$$h_x \in H, H = \{h_x : = g_n \wedge g \cup g \wedge f \cup g \wedge e \cup g \wedge d \cup g \wedge c \cup g \wedge b \cup g \wedge a\}$$

The ninth layer I means:

$$i_x \in I, I = \{i_x : = h_n \wedge h \cup h \wedge g \cup h \wedge f \cup h \wedge e \cup h \wedge d \cup h \wedge c \cup h \wedge b \cup h \wedge a\}$$

The tenth layer J means:

$$j_x \in J, J = \{j_x : = i_n \wedge i \cup i \wedge h \cup i \wedge g \cup i \wedge f \cup i \wedge e \cup i \wedge d \cup i \wedge c \cup i \wedge b \cup i \wedge a\}$$

These mathematical expressions clearly show the following: 1. Any level of the entire character word system is the result of the combination of the previous level. That is, the whole character word system is expanded at each layer by icons. 2. The more such combinations there are, the greater the possibility that new combinations can be formed. 3. The entire character word system expands through flat combinations and hierarchical combinations. Most Chinese characters are hierarchical, and most multi-character word combinations are linearly arranged. 4. The internal members of the entire system are connected according to the combination model, showing a net order. 5. Our research identified that the highest level of Chinese character combinations is ten.

Let us examine this subject from the perspective of imagery. We already know that the construction of images underlies the combination of configurations. The combined components themselves produce images, and the components' images are combined as the characteristics of the images merge. The components construct new images based on the combination model. These new images are the imagery byte and imagery glyph. Therefore, the combined image not only stipulates the configuration but also determines the imagery byte and its glyph byte and the imagery glyph and its glyph. Image combination not only generates new components of the system and makes the connection and ordering of the system components possible but also produces the unity of the system configuration and image. Character formation based on the imagery of cognitive experience is the key feature of the character word system. In terms of the combination of characters, a plane combination is one in which the imagery glyph and its glyph are combined at the same time, or it refers to a combination realized within a hierarchy. Hierarchical combination means that the imagery glyph and its glyph need to be realized at multiple levels. When many characters are combined to generate multi-character words, the number of Chinese characters in the character word system tends to stabilize. Currently, the system only needs to use old character combinations to form new character words. This has considerable advantages over the alphabetic writing system because the whole character word system is convergent, while the alphabetic

writing system is divergent³⁷.

The rigor of the character words system can be observed from the following aspects: first, from the ratio of the number of icons to the number of commonly used Chinese characters. The lower the ratio is, the stronger the icon's structure is and the stricter the character word system is. This means that the number of icons should be reduced as much as possible. According to our research, the current number of icons and their corresponding imagery icons is 87, while the number of commonly used Chinese characters is slightly less than 10,000, and the number of multi-character words exceeds one million. Therefore, the icons are very concentrated, have great utility in forming characters, can continue to be used in the system without creating new characters, and constitute the entire character word system.

Second, the fewer image combination models there are and the simpler the combination is, the more rigorous the character word system is. Image combination determines the configuration of the combination. We found only four cognitive models for this process. The declension model is an additional but unrelated model. Finally, the more important the combination is, the more the character word system resembles a network and the more rigorous the system is. The combination of planes reflects the uniqueness of the system and how difficult it is to alter the network. The more complex the system is, the less rigorous it is.

After the initial appearance of iconic signs, single-character words and then multi-character words are formed, illustrating the expansion process of the entire character word concept system. This process coincides with changes in the thinking and cognition of the entire Chinese nation. We asked above how these meanings or concepts extend to complex abstractions and even the entire conceptual system through simple direct experience. Now, we can conclude that the iconic signs that appeared first were the first category of written language created, and the lower-level categories are expanded from this initial category. This process is completed through the conceptual model. Then, the categories are expanded; that is, when the existing categories are no longer sufficient, new categories (new concepts) are created through the gestalt model. The gestalt model only recognizes features,

³⁷ Since alphabetic writing systems use phonetics, new concepts require different sounds. Additionally, because the written words should not be too long, it is difficult for compound pronunciations to be understood.

regardless of category, and can create new categories or new concepts. In the end, even these characteristics cannot be grasped, so the metaphor model, which creates new representations of things using familiar things, appears. As a result, a writing system is realized through accumulation and expansion.

4 Norms, methods and results

The foregoing are all theoretical hypotheses about “character formation based on imagery”. These are not so much theories as they are a description of the actual phenomenon of writing, because the glyphs, meanings and sounds of Chinese characters have already been established. We cannot change them. We are just explaining the relationship between the glyphs and meanings of Chinese characters. However, this explanation is still incomplete. We lack an understanding of the images and configurations of Chinese characters. Therefore, one of our tasks is to determine unknown images and configurations and apply them according to the methods mentioned above so that Chinese characters and the whole character word system become real ideograms.

4.1 Norms

We know that the glyph carries the imagery, and the imagery determines the style of the glyph. After clarifying the task of exploring images, we must also establish some scientific norms for exploring images. It is impossible to guess imagery glyphs, imagery components, and imagery icons. Thus, we should set identification standards or norms for exploring these images. Therefore, to comply with scientific norms, we formulated four necessary conditions or principles that cannot be violated when speculating about images. They are the principles of consistency, objective configuration, interpretability and Chinese cultural common sense. Without these principles, the entire character system could not be established.

4.11 Consistency principle

The principle of consistency means that a certain imagery icon, imagery component or imagery glyph must have the same imagery across the entire Chinese character system. Because the system is the result of the repeated combination of icons, including their combined components, each imagery icon and imagery component must be consistent in its imagery regardless of how many times it is repeated; that is, the imagery should be stable. In other words, an imagery component, viewed horizontally, should maintain consistent imagery with other Chinese characters containing the component. Within a Chinese character, that imagery component should also maintain the same imagery as components on the upper level that are organized in the same plane. However, the imagery component comes from the combination of imagery components or imagery icons at the lower level. In this way, an imagery component maintains consistent imagery with the upper, lower, in-plane and other Chinese characters and ultimately contributes to the imagery glyph as it relates to the meaning of the character. From the symbolic perspective, a paired signifiers and signifieds, whether they are part of other symbols or in Chinese characters, should maintain the consistency of the signifier and signified. This is the case for imagery components, and it is the same across all layers, including every imagery icon, so as to maintain the consistency of the imagery across the entire Chinese character system. Therefore, only by ensuring the omni-directional consistency of the imagery can the whole system be closely connected and comply with scientific and systematic norms. At the same time, this is also necessary to avoid the of "vulgarization" of imagery glyphs and to ensure efficiency in learning Chinese characters. For example, "良" is composed of the icons "日" and "衣". The imagery icons represent the sun and walking on both feet; together, they represent "Kuafu (夸父) chasing the sun to Yugu (a prehistoric boundary or limit)". This is mythical imagery. Travelling west, Kuafu meets a high mountain (in traditional Chinese geography). When combined with other characters, such as "根", "即", "既", "艱", "良", "垠", "很", "恨", "狠", "限", "垠", "退", "莨", "痕", "眼", "硯", "根", "跟", "銀", "簋", "齷", "諛" and "琅", this character plays the same "initial" role.

4.12 Objective configuration principle

The principle of objective configuration has two requirements. On the one hand, an

imagery glyph or imagery component must be composed of an imagery component or imagery icon. In other words, it cannot be separated from its imagery component or imagery icon and subjectively talk about the imagery component or imagery glyph. For example, the imagery glyph of "意" cannot be separated from the imagery glyphs of "音" and "心"; it is the result of their joint construction according to the appropriate combination model. Similarly, the imagery glyph of "音" cannot be separated from the imagery glyphs of "立" and "日". The imagery glyph of "心" cannot be separated from the imagery icons of "乚" and "彡" but is formed by them.

On the other hand, the imagery glyph, imagery component, and imagery icon are presented with their carriers, and the combination of imagery is also a combination of configurations. Regular script glyphs are already standardized, and using more, less, or arbitrary movement to increase or decrease the size of strokes is unacceptable. Because these script glyphs represent underlying imagery, any irregular shape changes will destroy the imagery and their construction and affect the consistency of the system. Therefore, the principle of objective configuration again refers to taking these regular script configurations as objective phenomena themselves; changing them will result in a change of rationale.

4.13 Interpretability principle

Interpretability mainly refers to the analysable interpretative relationship between an imagery glyph and its meaning. Specifically, the imagery of a Chinese character (imagery glyph) has a cognitive and empirical representational connection such as the conceptual, metaphorical, gestalt, and schematic models that determine the meaning of the character it refers to. This representational connection indicates the interpretability of the imagery glyph and the meaning of the character.

We know that there are three main forms of mental representation in human brains regarding elements of the external world: imagery, text, and propositional form. Since alphabet writing systems are phonetic, there is an arbitrary relationship between phonetics and the objects represented by different words. Therefore, from the perspective of cognitive psychology, mental imagery and text are two opposite types of representation (dual-code theory): the former is an analogy or metaphorical relationship, while the latter is an arbitrary relationship (or a conventional

relationship). The former is more specific, and the latter is more abstract. However, Chinese characters are different. Chinese characters are ideographic, and this attribute is achieved through imagery. This imagery is the basis for Chinese character configuration coding. The five combination models we have compiled are the result of combining and constructing this imagery and the result of constructing a glyph. Therefore, Chinese characters are empirically connected with the meanings of their components through cognitive representations such as concepts, metaphors, gestalts, and schemas. This kind of connection is the imagery representation of concepts that originate from humans' experience in various situations. The ideographic relationship between a glyph and its meaning within Chinese characters is not an arbitrary relationship; the glyph itself contains rich cognitive information, which represents the experience it evokes and therefore its meaning. This is a unique ideographic characteristic of Chinese characters, differing greatly from alphabetic writing systems. Chinese characters require the double-code unification of the imagery formed by various meanings and the symbols encoded in the imagery. This double-code unification relationship indicates interpretability. For example, the configurational imagery of the character "水" (water) is "the swaying of a fish-hook causes water to ripple." This configuration of "水" is empirically connected with the concept of "水", which is comes across as more emotional than the phonetic code for "water". Because experience with water is a common experience, it has universal resonance, thus lending itself well to understanding the meaning of the characters it helps form. This is the greatest advantage of the direct representation of ideographic characters from experience. If someone has this experience, by following this code, understanding the meaning of a character is a natural process. The interpretability of Chinese characters is the basic principle of the theory of "character formation based on imagery".

4.14 Cultural common sense principle

Cognitive theory forms the theoretical basis of the theory of "character formation based on imagery", but the content of the imagery comes from observations of traditional culture and common sense. After all, people develop concepts through interaction with the environment through their physical and mental perceptions. The representation of the concept forms language, and language and action together

form culture. Language, cognition, and culture jointly support the theoretical framework of the theory of "character formation based on imagery". The historical and cultural context in which Chinese characters were developed can testify to the imagery we are exploring here. At the same time, it can also provide a basis for understanding the meaning of characters. This kind of ideographic connection with empirical common sense conveys rich knowledge, thus producing a very empirical writing system.

These four principles are the necessary conditions and criteria for identifying imagery glyphs, imagery components, and imagery icons. Although not all images that meet these conditions are revealed through such a search process, if this principle is met, various images can be identified, and the one with the greatest explanatory ability can be determined. However, meeting these necessary conditions can testify to the scientific nature of the Chinese character system.

4.2 Methods

Exploring imagery glyphs, imagery components, and imagery icons requires actionable strategies and methods. Overall, we adopt a "reverse engineering" strategy: a strategy for tracing the cause through the results. That is, the known meaning of a character is used to explore the imagery glyphs and components until the imagery icon appears. Of course, these explorations must follow the four norms of imagery. However, we mainly use four methods.

One is to follow the component analysis or structure analysis commonly used in linguistics; it is used to find elements, hierarchical relationships, and structural patterns. We use this method to make sense of the three-level two-code structure of Chinese characters.

The second method is induction. This method takes advantage of the configuration and polysemy of Chinese characters. These characteristics lead to the appearance of many related Chinese characters and meanings, which allows us to induce images from them. In other words, a given component will appear in many different Chinese characters in the Chinese character system, and most of these different Chinese

characters are polysemous, so the meanings of these many characters can be compiled to summarize the imagery component; in turn, this imagery can explain the meaning of the characters. In fact, modern lexical semantics uses a massive corpus and numerous retrieval tools to complete statistical induction to study semantics. However, we mainly use this method within Chinese characters. Extracting the imagery components and the imagery glyphs from the multiple meanings of many related Chinese characters is the creative highlight of our research method.

Of course, an inductive process must conform to the four principles of conjectured images, among which the search from culture is the most critical. For example, if we want to determine the imagery component for "𦰇" on the right side of the character "漢", we need to find the characters "漢", "難", "艱", "嘆", "歎" and "嘆" within the system (nine thousand commonly used Chinese characters) because these characters all contain "𦰇". Then, based on all the meanings of these characters (including their polysemous meanings), the imagery of "𦰇" can be summarized as a raft: an aquatic bamboo raft that is made by inflating animal skins and is popular in the Hanjiang River Basin (漢江) in Northwest China. Of course, this raft must conform to the four principles of speculative imagery mentioned above. It must not only conform to historical facts but also explain the numerous meanings of the aforementioned characters and conform to the imagery component of the lower portion on its own: "革夫". From this example, we can see that the imagery glyph being explored is empirically backed cultural imagery, and it contains rich content references. At the same time, the imagery is also drawn from a summary of the multiple meanings of many related Chinese characters. Therefore, the imagery of the character formation can explain its polysemous character meaning. For example, the character "漢" means "a raft surrounded by waters". Although this imagery directly reflects the waters of rivers, it is also a geographical concept; thus, the people in this area are called 漢人 (the Han), and the language used by these people is called 漢語 (Chinese). The characters used are called 漢字 (Chinese characters). Because the founder of the dynasty was a figure from this area, this character was designated the name of the dynasty (漢朝 Han Dynasty). Thus, we can examine the nine thousand regular-script Chinese characters to determine their previously unknown imagery components using this induction method. Therefore, this is a massive, complicated, and long-term task that requires patience because it affects the whole body of Chinese characters and requires constant adjustment.

Third, many Chinese histories, such as "Shuowen Jiezi", the "Kangxi dictionary" and other historical documents, have become classics. Some predecessors have interpreted them, even re-annotating the classics. If some existing explanations conform to the abovementioned four principles for inferring imagery, we may wish to use them. Thus, literature analysis is the third of our four research methods.

Fourth, Chinese characters are ancient characters, like antiques, and they thus have historical textual value. Therefore, understanding various historical and cultural contexts and events through textual research is another way to explore imagery glyphs, imagery components, and imagery icons. The textual research method is our final research method. For example, when we understand the structure and performance of the Guqin (古琴), it is not difficult to imagine the imagery of the "彳山攴" component in the characters "徽", "徵", "微" and "儷": the wonderful fingers touch silk strings on the Guqin Yuesan (古琴岳山). After exploring this imagery component, this series of imagery glyphs ("徽", "徵", "微" and "儷") can be easily broken down into parts.

4.3 Results

To explore the imagery glyph, imagery component, and imagery icon of the Chinese character system, including the components and the icons that carry them, we selected nine thousand commonly used regular-script Chinese characters as a fully objective and generalizable representatives for the system³⁸. We disassembled and analysed them one by one. Fortunately, these nine thousand Chinese characters have acquired imagery glyph, including imagery components and components, imagery icons and icons from the character word system. These information data about Chinese characters are original, effective and complete. This is the biggest result of our research.

³⁸ Cheng Chin-Chuan(鄭錦全 1998) examined various classic works, history books, and dictionaries in the article "Understanding Language Cognition from Measurement" and found that different authors used no more than 8000 morphemes and non-derivative words.

There are 87 icons and imagery icons, they form the entire character word system like DNA, which shows that this system is very dense and efficient. The highest level of component combinations is ten. Table 4 shows the hierarchical distribution statistics of these nine thousand Chinese characters. Table 4 shows that most Chinese characters appear in the fourth and fifth layers. These are as many as eight thousand Chinese characters in the sixth level. These nine thousand Chinese characters are constructed and arranged in layers, providing a natural order for learning Chinese characters, and imagery glyphs and imagery components provide the basis and norms for memory coding. In addition, we also calculated statistics on the distribution of the five combination models within the formation of nine thousand the imagery glyphs, as shown in Table 5. Of course, some combinations are compound combinations, that is, two or more combination models work together. Table 5 shows that the conceptual model and the metaphor model are most prevalent. The regular script system and ancient Chinese character system are shown in Table 6. The number of imagery glyphs and their components and the number of imagery components of the nine thousand Chinese characters are very large, so here, we show only 25 characters and 25 icons in Table 7.

Table 4 Statistics on the hierarchical distribution of nine thousand Chinese characters.

Icon	Level	Level	Level	Level	Level	Level	Level	Level	Level
1	2	3	4	5	6	7	8	9	10
87	297	1244	2606	2589	1339	671	103	108	33

It can be seen from Table 4 that most Chinese characters appear in the fourth and fifth levels, and 90% (eight thousand) appear on the sixth level.

Table 5 Statistical distribution of the five combination models within the formation of nine thousand the imagery glyphs, including compound combinations.

C	D	G	S	M
5578	90	2247	1446	4040

Table³⁹ 6 Comparison between the regular script system and other Chinese character systems.

text type	total counted	icon	average icon
Oracle released	1380	412	3.3
Qinjian sampling	1773	361	4.9
Shuowen Jizi	10422	414	25.05
Regular script	9032	87	103.82

Table 6 shows that the regular script system is more systematic than the “Shuowen Jizi” (說文解字) system.

Table 7 25 characters and 25 icons, including their imagery.

Icon	Imagery icon	Chinese character	Imagery glyph	Component	Imagery component	Component	Imagery component
丶	突出之點	丁	上壓下頂(打木楔)	一	盤古在卵內的世界	丿	刀鉤利器
丨	上下貫通	卜	灼龜甲通天地	丶	突出之點	丨	上下貫通
丿	刀 鉤	乞	受壓而屈身脆地	人	側走之形	乙	受上壓而屈(曲)
丿	刀痕 標示	作	如工匠之人	人	側走之形	乍	布手知尺(工匠)
口	象人張嘴	中	如投壺不偏	丨	上下貫通	口	象人張嘴
宀	覆蓋	家	養豬營生之戶	宀	屋頂	豕	野豬
夕	張嘴	豕	地下的家	丶	突出之點	家	豬營生之戶
尢	象腳跛曲脛	心	圓形充血器官	乚	象彎曲圓形	彳	三點水(液體)
乚	象彎曲圓形	欠	元氣不足張嘴出氣	夕	張嘴	人	側走之形
ナ	左手 上肢	友	彼此舉手相揖(禮)	ナ	上肢	又	象叉手舉臂做揖
入	象木楔形	內	如楔進來	入	象木契之形	冂	範圍
人	側走之姿	士	「推十合一」者	十	盤古化萬物完備大地	一	盤古在卵中初始世界
亼	兩個	玉	王者腰佩帶突出物	王	聖人日中測影參透天地人	丶	突出之點
片	劈薄木(竹)	前	雙腿被斬無以邁進	亼	兩個	刑	斬腿之刑
日	象太陽	明	如日月之清亮	日	太陽	月	條形臘肉。月亮
女	象多姿姑娘	肅	如竹簡書寫戰戰兢兢	𠂇	串在一起的竹簡	手	手握器具而動
山	象高峰並列	仙	山上修道之人	人	側走之形	山	象高峰並列

³⁹ In Table 6, except for the data on regular-script Chinese characters, the data come from Wang ning’s (王寧) “Lectures on Chinese Character Configuration” (Taipei: Sanmin 三民 2013), 18.

木	象樹形	札	卷起之木片(竹簡)	木	象樹形	乚	象彎曲圓形
爪	象鳥獸腳指	奴	如役使操勞之女傭	女	象多姿姑娘	又	象叉手舉臂做揖
目	象眼睛	看	舉手遮光放眼望去	手	上肢	目	象眼睛
皿	象容器	血	祭祀薦牲流出之液	皿	容器	丩	刀痕
辰	分流 支流	脈	體內之血液支流	月	象條形臘肉	辰	支流
豸	長脊獸	臼	象雙手(爪)捧杵舂米	爪	象鳥獸腳指	爪	象鳥獸腳指
豕	野豬	豪	有財富之大宅戶	高	象古城門樓	豕	野豬
乍	布手知尺	怎	如工匠心生疑惑	乍	布手知尺	心	圓形充血器官

5 Conclusion

Regular-script Chinese characters have been used for nearly two thousand years, but theories on the development of Chinese characters are both younger and insufficient. Unlike with the theoretical development of alphabetic writing systems, with Chinese characters, we cannot tolerate incomplete ideographic explanations. For this reason, we propose the theory of “character formation based on imagery”. After we explored the imagery glyphs of nine thousand Chinese characters, the results support the theory. The results reveal the ideographic mechanism of the dual-coded hierarchical combination that yields the internal configuration of Chinese characters and their imagery, provide new information about the explanatory nature of Chinese characters that directly represent knowledge, and help propose a guiding theory for character word formation in the Chinese writing system. The results have also become a new topic for linguistics, which is based on the phonetic alphabet writing system. Therefore, the results have theoretical value, and became the interpretable basis of the theory of “character formation based on imagery”.

The results described an imagery-based theory of Chinese character information configuration, which is a novel approach to understanding mental representations of the ideographic text, such as Chinese. This new approach directly reflects the mind, that is, it directly connects meaning with the empirical imagery that represents its meaning. Therefore, the theory of “character formation based on imagery” provides a wealth of information for studying the mind, as well as an empirical scene for

understanding the meaning of Chinese characters. For example, how to understand the concept of “數” (number). We can understand “數” from the imagery glyph reflected in the configuration of this character. The imagery glyph of “數” is “to count the amount of goods in the female slave basket”. It reflects that the concept of “數” arises from the measurement behavior of transported goods. In addition, these nine thousand Chinese characters are constructed and arranged in layers, providing a natural order for learning Chinese characters, and imagery glyphs and imagery components provide the basis and norms for memory coding. Therefore, this approach of mental representation has practical value for understanding and learning the meaning of the characters.

A good theory should be able to explain more phenomena. The resulting theory explains why the same components appear in different Chinese characters. It also explains the ideographic relationship between the meaning of a character and its glyph, especially when polysemy appears. It explains the phenomenon of the multi-character word-formation process. It also shows the cognitive process of how concepts go from concrete to abstract. The theory provides a type of writing representation based on humanity’s visual experiences in addition to its vocal and hearing abilities. This provides possibilities for universal communication in the future.

Importantly, our exploration of imagery glyphs, imagery components, and imagery icons is not the end. After our work is published, anyone can propose a better interpretation of a given image, as long as it meets the four norms. The “character formation based on imagery” theory we put forward is just an initial attempt. We hope to attract more scholarly attention and participation to develop and refine our theory.

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