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RESEARCH ARTICLE

A STUDY ON THE CULTURAL MEMES IDENTIFICATION IN THE HUMAN-FACED IMAGES OF ANCIENT ROCK ART FROM THE BAICHA RIVER BASIN, CHINA

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ABSTRACT

Baicha River Basin is the earliest area in which ancient rock art were discovered in Western Liaohe region of China. Rock art were discovered one after another from 1984 to 2022. However, the basic historical materials of human-shaped rock art have not been systematically sorted out. Based on the historical data of human-faced rock art in two papers and five monographs, 18 rock art and 26 human-faced images from the Baicha River Basin were selected and utilized to decode explicit cultural memes according to Cultural Textual Theory, encompassing 5 environmental attributes and 6 morphological features. The 26 images alongside the Baicha River are mainly distributed in 5 places such as Shanqian Village and Dahelong Village of Wanheyong Town in Keshiketeng Banner, Inner Mongolia Autonomous Region, China. 65.4% of human-face images are distributed in the left bank of Baicha River. 69.2% of human-face images are less than 10 meters from the ground. And 65.4% of human-face images are less than 350 meters from Baicha River. 92.3% of the images with eyes are the key expression content. 80.7% of them have no beard, 76.9% have cheeks, 61.5% have headdress, 61.5% have mouth and 57.6% have nose.

KEYWORDS

The Human-Faced Images of Ancient Rock Art, Cultural Textual Theory, The Cultural Memes Identification, TXT Analysis, The Baicha River Basin

1. INTRODUCTION

The Baicha River, is a first-order tributary located on the south side of the upper reaches of the Xar Moron River in Hexigten Banner, Chifeng City, Inner Mongolia Autonomous Region, China. It originates from the Daguangmingding Mountain, the main peak of the Qilaotu Mountain, the northern branch of the Yanshan Mountain. The Baicha River has a total length of 136 kilometers, a drainage area of 1,786 square kilometers and the average annual runoff of 67.8 million cubic meters (Compilation Committee of Local Chronicles of Hexigten Banner & Liu, 2020).

The Baicha River Basin is the earliest region where rock art was discovered on the northern foothills of the Yan Mountains. As early as 1929, the rock art sites at Guangyi and Yushunguang in the Baicha River Basin were documented as Historical Sites in the county gazetteer 'Local Chronicles of Rehe Jingpeng County' (Han Lixin, 2013). In 1981, 48 groups of rock art across 9 sites in the Baicha River Basin were discovered by the archaeological investigation, which conducted by the Zhaowuda League Cultural Relics Workstation (now the Chifeng Museum) and the Hexigten Banner Cultural Center (now the Hexigten Banner Museum) of the Inner Mongolia Autonomous Region,China(Zhang, Liu, 1984).

Since the 1990s, multiple field investigation in the Baicha River Basin were conducted by archaeologists and rock art researchers, and firsthand foundational historical materials have been provided for in-depth studies on the rock art. From September to October 1991, Tian Guanglin, Xiao Aimin, and Ren Aijun from the Institute of Northern Ethnic Cultures, revisited the rock art sites and other ancient cultural remains in the Baicha River Basin (Tian, 2022). In June 1992, a re-investigation on the rock art of the Baicha River was conducted by Mr. Gai Shanlin from the Institute of Cultural Relics and Archaeology of Inner Mongolia Autonomous Region, accompanied by Sun Jimin from the Cultural Relics Management Office of Hexigten Banner and Huang Fusheng, the editor-in-charge from Liaoning Fine Arts Publishing House (Gai, 2002). In 1993, 55 groups and over 250 individual rock art in 11 sites of Hexigten Banner were published by Liu Zhiyi and Compilation Committee of Local Cultural Relics Chronicles of Hexigten Banner in the Local Cultural Relics Chronicles of Hexigten Banner (Liu, 1993). And in 2004, 90 groups and more than 400 individual images across 23 sites in Hexigten Banner were publicized by Han Lixin, the former curator of Hexigten Banner Museum (Han, 2013), including the rock art of the Baicha River Basin, Zhenzi Mountain, the Xar Moron River Basin, and Tuchengzi. Until 2022, two specialized publications were published. One was the Rock Art of

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Chifeng by Zhou Yushu and Wu Jiacai, Hongde School. The other was Investigation and Research on Ancient Rock Art Remains in the Eastern Section of the Landlocked Eurasian Steppes, founded by the National Publication Fund,China.

Since 2012, research on the human-faced rock art of the Baicha River has gradually entered the scope of master's and doctoral dissertation topics in higher education institutions. For instance, Ruan Jinyi (2013) from Minzu University of China focused his master's these on human-faced rock art in the Chifeng region. Concurrently, scholars such as Zhang Wenjing (2012), Sun Xiaoyong (2013, 2014, 2015), Zhu Lifeng (2014), and Xiao Bo (2016, 2022) have conducted multi-dimensional discussions and analyses on the human-faced rock including the Baicha River area. Human-faced rock art, a "text" of image narrative and material narrative, has been selected to explore the cultural genes and encoding mechanisms recorded in prehistoric rock art "texts", thereby deciphering these cultural genes. Based on the corrected human-faced images of rock art, this study adopts a cultural meme perspective, aims to identify environmental genes and morphological genes of rock art taking the ancient human-faced rock art in the Baicha River Basin as the research subject.

2. RESEARCH DESIGN

2.1 Theoretical Foundation

Over the past century, a renewed understanding of prehistoric and ancient cultural frameworks in China has been developed through Chinese archaeology (Wang, 2021). And a new interdisciplinary research trend has gradually emerged through the synthesis of archaeology, anthropology, and literary studies (Liu,2024). According to the nascent theory, termed "Cultural Textual Theory" posits that different civilizations possess scultural text encoding rules with their own unique systems (Ye, 2023). Methodologically, culture is structured through a four-tiered encoding system (Ye, 2010), also referred to as the 'Quadruple Evidences of Chinese Civilization Exploration' (Ye, 2019; Yang, 2022; Hu, 2022). These are as follow as the ' text ' composed of image narratives and material narratives in the pre-text era (i.e.,the "Great Tradition" of culture), the text of encoding inherent in pictographic writing itself, the early written texts, and the later written texts (Ye, 2019). Among these texts, identifying the cultural genes embedded in the "texts" formed by image and material narratives constitutes the first step in Cultural Text Theory.

2.2 Variable Design

The term "Memes', also known as cultural Genes, refers to the fundamental units that determine the inheritance and variation of a cultural system (Liu, 1988; Wang, 2003). And they serve functions such as cultural transmission, maintaining ethnic identity, regulating human behavior, and guiding societal trajectories and so on (Zhao, 2008). Influenced by the biological concept of genes and genomics, more and more academic attention have gradually played on the research related to cultural genes. In recent years, applied studies on Chinese cultural genes have predominantly focused on identifying concrete meme elements in various contexts (Bai, 2021), such as those in Mongolian yurts (Buhe Chaolu, 2013), Jiangnan classical gardens (Liu,Li, 2016), Piying (shadow puppetry, Chen,Liu, 2019), Mongolian costumes (Song,Zhan, 2020), and Nuo masks (Zhao,Hui, 2021; Liao,Yin, 2024). Their focuses primarily lay in the identification of cultural genes, including morphological, chromatic, pattern, and semantic memes (Liu, Lei, 2022).

As an image narrative "text", rock art possesses unique characteristics that necessitate the identification of its cultural genes based on its textual features. Existing research on rock art indicates that these images are predominantly located on sunlit mountain slopes and near water bodies, often coexisting with ancient ruins and relics. Studies on human-faced rock art further revealed that facial features such as eyes and head ornaments serve as cultural markers for dating these artworks.

Therefore, on the basis of the existing research on rock art, this study attempts to use the text analysis method of 'Cultural Textual Theory' to select the ' environmental genes' of the carrier of human face rock art and the ' morphological genes ' of the facial features of human-faced rock art. These two types of variables are used to identify the cultural genes of human-faced rock art, which lays a research foundation for the source of cultural symbol coding of the images recorded in the subsequent rock art.

2.3 Indicator Selection

The environmental genes of the rock with human-faced rock art were identified through textual analysis with the following five indicators selected. They are the location sites of human-faced rock art, the positional relationship between the rock art and rivers bank, the positional relationship between the rocks bearing the human-faced rock art and the cliffs, the height of the rocks above the ground, and the distance between the rock and the riverbanks.

The morphological genes of the facial features on human-faced rock art were identified through content analysis, with the following six indicators selected. They are whether the human-faced images depict headdresses, whether cheeks are engraved, whether eyes, noses, or mouths are represented, and whether beards are portrayed.

3. DATA RESOURCES

3.1 Data Sources

The historical materials on ancient 26 human-faced images of rock art in the Baicha River Basin are primarily compiled from the following 7 sources.

Five images from the report on the rock art in the Baicha River Basin, published by Zhang Songbai and Liu Zhiyi in 1984. And the same five ones from the Local Cultural Relics Chronicles, published by Liu Zhiyi and Compilation Committee of Local Cultural Relics Chronicles of Hexigten Banner. 11 images from the paper of Sun Jimin, published in the Issue 1 of the journal Inner Mongolia cultural relics archaeology in 1994. 8 images from the specialized publication of Gai Shanlin and Gai Zhihao, published by Beijing Library Publishing House in 2002 according to their re-investigation on the rock art of the Baicha River in 1992. 14 images form Han Lixin's book, published by Inner Mongolia Culture Publishing House in 2013. Nine images from the book edited by Zhou Yushu and Wu Jiacai, published by Science Press in 2022. And the Rock Art of Inner Mongolia, edited by Tian Guanglin and published by Liaoning Normal University Press in 2022. The sources of the human-faced images from the Baicha River Basin are listed in Table 1.

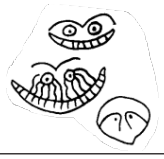
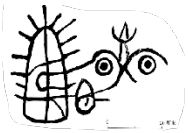
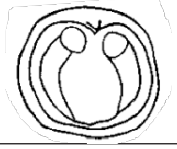
The 18 human-faced pictures are crosswise distributed in the 7 literature as follows. Three pictures, specifically RM04, RM10, and RM18, have been documented in all seven referenced academic publications. Five pictures are documented in four sources, namely RM01, RM09, RM14, RM16, and RM17. Three pictures are recorded in three sources each, specifically RM03, RM06, and RM13. Five pictures appear in two sources each, which are RM02, RM07, RM11, RM12, and RM15. And two ones are each documented in only one source, namely RM05 and RM08.

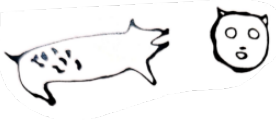
3.2 Data Processing

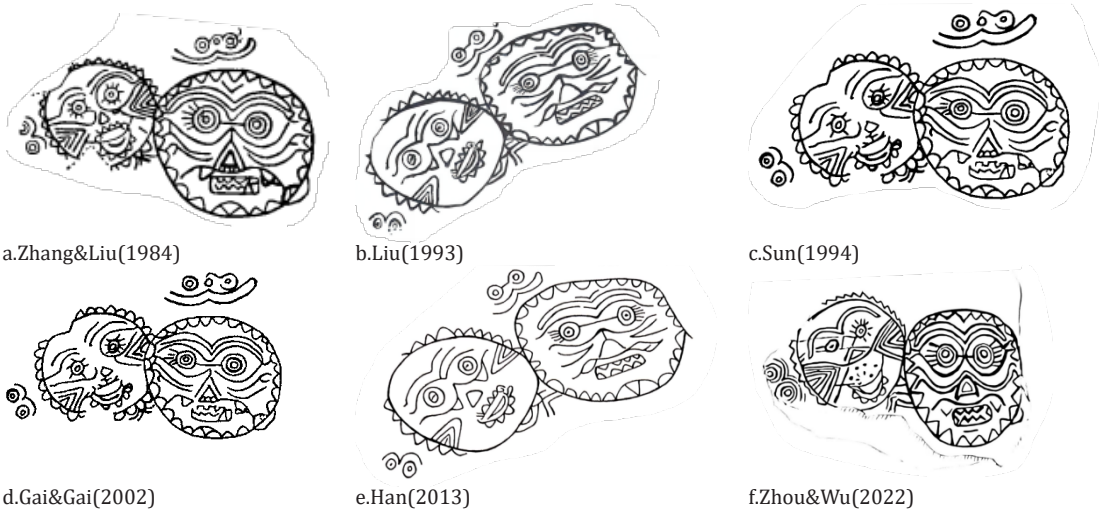
The environmental genetic data of the human-faced images in each ancient rock art from the Baicha River Basin were primarily extracted through textual analysis from the literature listed in Table 1. Due to the wide temporal span of the literature and variations in research perspectives and methodologies, some data are missing and treated as null values. They are the location information of RM15, the riverbank details of Baicha River and the distance from the river for RM03, RM04, and RM15, as well as the distance from Baicha River for RM14.

The morphological genetic data of each human-faced image in the ancient rock art of the Baicha River Basin are primarily identified based on the line drawings of the respective rock art as documented in Table 1. In cases where discrepancies exist among line drawings from multiple sources (as illustrated in Figure 1), the version represented by two or more similar line drawings shall prevail. If only two line drawings are available for a given rock art and discrepancies exist between them, the most recently published line drawing shall be adopted as authoritative.

Table 1: Sources Summary and Human-faced Images in the Baicha River Basin

No.	Site	Literature	Image
RM01	YushunGuang	Sun (1994) Han (2013) Zhou&Wu (2022) Tian (2022)	
RM02	Shanqian	Sun (1994) Gai&Gai (2002)	
RM03	Shanqian	Sun (1994) Gai&Gai(2002) Tian (2022)	
RM04	Shanqian	Zhang&Liu (1984) Liu (1993) Sun (1994) Gai&Gai (2002) Han (2013) Zhou&Wu (2022) Tian (2022)	
RM05	Shanqian	Zhou&Wu (2022)	
RM06	Shanqian	Sun (1994) Gai&Gai (2002) Tian (2022)	
RM07	Shanqian	Sun (1994) Gai&Gai (2002)	
RM08	Shanqian	Tian (2022)	
RM09	Shanqian	Sun (1994) Gai&Gai (2002) Han (2013) Zhou&Wu (2022)	
RM10	Dahelong	Zhang&Liu (1984) Liu (1993) Sun (1994) Gai&Gai (2002) Han (2013) Zhou&Wu (2022) Tian (2022)	
RM11	Dahelong	Sun (1994) Gai&Gai (2002)	
RM12	Dahelong	Gai&Gai(2002) Tian (2022)	

RM13	Dahelong	Han (2013) Zhou&Wu (2022) Tian (2022)	
RM14	Dahelong	Zhang&Liu (1984) Liu (1993) Gai&Gai (2002) Han (2013)	
RM15	Goumen	Sun (1994) Gai&Gai (2002)	
RM16	Goumen	Zhang&Liu (1984) Liu (1993) Gai&Gai (2002) Zhou&Wu (2022)	
RM17	Gelaoyingzi	Gai&Gai (2002) Han (2013) Zhou&Wu (2022) Tian (2022)	



a.Zhang&Liu(1984) b.Liu(1993) c.Sun(1994)

d.Gai&Gai(2002) e.Han(2013) f.Zhou&Wu(2022)

Figure 1: The No.RM04 Line Drawings at Shanqian, Wanheyong Town in the Baicha River Basin

4. STATISTLCAL RESULT

There are 26 human-faced images among the historical materials of the ancient rock art in the Baicha River Basin. They are primarily concentrated at five locations along the flow direction, such as Yushunguang Village, Shanqian Village, Dahelong, Goumen Village, and Gelaoyingzi Village. The schematic diagram of the human-faced images from the Baicha River Basin are listed in Figure 2.

4.1 Identification Results of Environmental Genes

The environmental genes of the 26 human-faced images in the Baicha River Basin are primarily identified through five indicators: the location of the rock art, the spatial relationship between the rock art and the Baicha River, the position of the host rock, the height of the rock art above ground level, and the distance from the rock art to the riverbank. The genetic identification results are presented in Table 2.

In terms of the distribution of rock sites with human-faced images, 61.5% of them are located near Shanqian Village, while 19.2% are found in Dahelong. In Goumen Village, 7.7% of the anthropomorphic images are distributed on the Beigoumen Mountain, while an equal proportion is found in Gelaoyingzi Village. There are just 3.8% found in Yushunguang Village.

From the perspective of the spatial relationship between the rock art and the Baicha River, 65.4% of these images are situated on the left and north bank of the Baicha River, while 3.8% are found on each of the southern and western banks. 26.9% of the human-shaped rock art were not mentioned the positional relationship with the Baicha River in the literature.

From the perspective of the host rock's position where the rock art are situated, 34.6% of the facial images are positioned at the cliff tops, 26.9% at the foot of cliffs, 19.2% on ground-level rocks of slopes or flat terrains, and approximately 15.4% on the cliff, while 3.8% of these images lack specific positional documentation in the literature.

Based on the height of the rock art above ground level, 69.2% of the human-faced images are located within 10 meters of the ground, 26.9% are situated between 31 and 50 meters, and 3.8% are found at heights ranging from 10 to 30 meters.

Based on the distance from the rock art to the riverbank, 26.9% of the these images are located within 150 meters of the river, 30.8% are

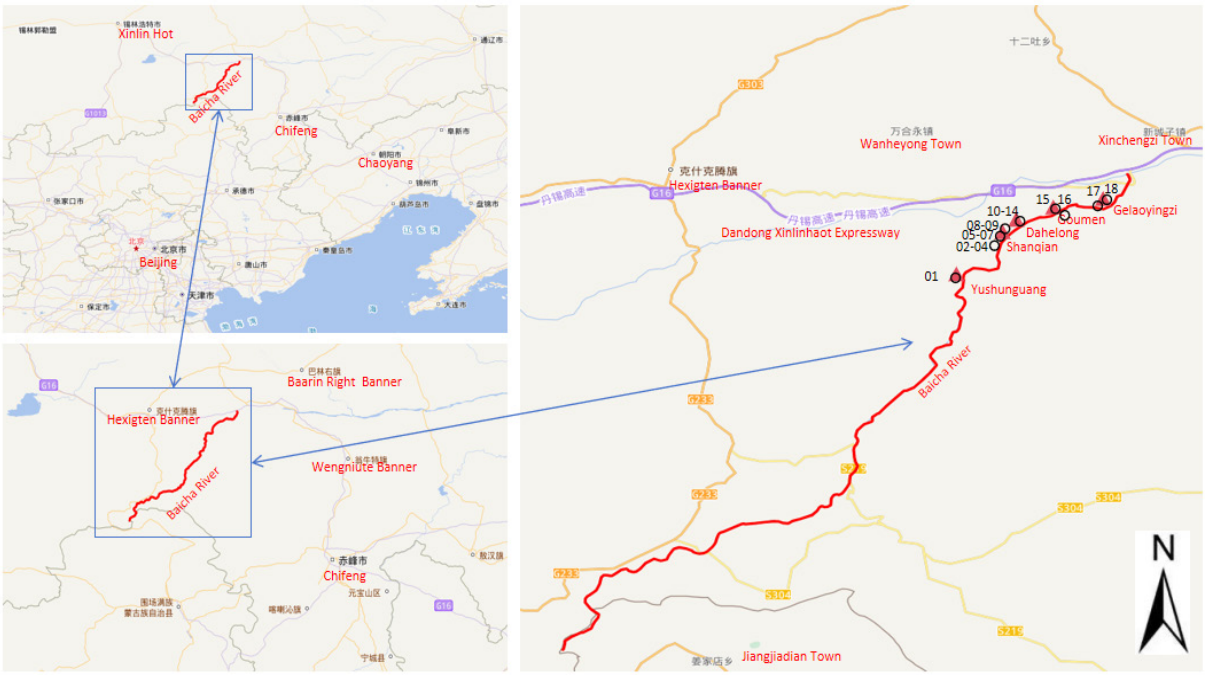


Figure 2: Schematic Diagram of the Human-faced Images of Rock Art at Baicha River Basin

Table 2: Summary of Environmental Gene Identification Results for 26 human-faced images in the Baicha River Basin

Location	Yushunguang	Shanqian	Goumen	Gelaoyignzi	Dahelong	Total
Pencent 1	3.8	61.5	7.7	7.7	19.2	100.0
Bank	North	South	West	Missing		—
Pencent 2	65.4	3.8	3.8	26.9		100.0
Position	Ground	Cliff foot	Cliff	Cliff Top	Missing	—
Pencent 3	19.2	26.9	15.4	34.6	3.8	100.0
Height(meter)	Within 10	11-30	31-50	50 above		—
Pencent 4	69.2	3.8	26.9	0		100.0
Distance(meter)	Within 150	151-250	251-350	350 away	Missing	—
Pencent 5	26.9	30.8	7.7	3.8	30.8	100.0

Note: N = 26; the percentage used is ' percentage of the total '.

situated between 151 and 250 meters from the river, 7.7% are found between 251 and 350 meters, 3.8% are positioned more than 350 meters away, and 3.8% are located more than 350 meters away from the Baicha River, while 30.8% of these rock art lack documented distance references to the river in the literature.

4.2 Identification Results of Morphological Genes

The morphological genes of the 26 human-faced images in the Baicha River Basin are primarily identified based on six indicators: whether the facial images depict headdresses, whether cheek lines are engraved, and whether eyes, noses, mouths, or beards are represented.The morphological genes identification results of the human-faced images in the Baicha River Basin are presented in Table 3.

Regarding whether the human-faced images depict headdresses. Those with headdresses account for 61.5%. Specifically, at Shanqian Village, these images with head ornaments constitute 26.9% of the human-faced images, while those at Dahelong account for 19.2%. In Goumen Village, the northern Goumen Mountain accounts for 7.7%, while Yusunguang Village and Gelaoyingzi each account for 3.8%.

Judging from whether the human-faced images are depicted with cheeks. Those featuring cheeks account for 76.9%. Among them, the number of human-faced images with cheeks at Shanqian Village constitutes 42.3% of the total human-faced rock art. Dahelong accounts for 15.4%, while Goumen Village North Goumen Mountain and Gelaoyingzi each constitute 7.7%, with Yusunguang Village representing 3.8%.

Regarding the presence of eyes in human-faced images, 92.3% of them depict eyes. Among these, images with eyes account for 53.8% of the total human-faced images at Shanqian Village, 19.2% at Dahelong, 7.7% each at Goumen Village (North Goumen Mountain) and Gelaoyingzi, and 3.8% at Yushunguang Village.

Regarding the depiction of noses in human-faced images, those with noses account for 57.7%. Specifically, at Shanqian Village, these images featuring noses constitute 42.3% of the total human-faced images. The proportion for Dahelong accounts for 7.7%, while Goumen and Gelaoyingzi each constitute 3.8%, and Yusunguang Village represents 0.0%.

Regarding whether the human-faced images depict mouths, 61.5% of them include mouths. Among these, the ones with mouths at Shanqian Village account for 34.6% of the total human-faced rock art. DaheLong accounts for 11.5%, Gelaoyingzi for 7.7%, while Yusunguang Village and the Beigoumen Mountain in Goumen Village each constitute 3.8%.

In terms of whether the human-faced images depict beards, those without beards account for 80.8%. Among them, the number of beardless

Table 3: Summary of Morphological Gene Identification Resultsfor 26 human-faced images in the Baicha River Basin

Location	Yushunguang	Shanqian	Goumen	Gelaoyignzi	Dahelong	Total
Proportion with Headdresses (%)	3.8	26.9	7.7	3.8	19.2	61.5
Proportion with Cheeks (%)	3.8	42.3	7.7	7.7	15.4	76.9
Proportion with Eyes (%)	3.8	53.8	7.7	7.7	19.2	92.3
Proportion with Nose (%)	0.0	42.3	3.8	3.8	7.7	57.7
Proportion with Mouth (%)	3.8	34.6	3.8	7.7	11.5	61.5
Proportion without Beard (%)	3.8	50.0	3.8	7.7	15.4	80.8

Note: N =26; the percentage used is 'percentage of the total '.

human-faced images at Shanqian Village constitutes 50.0% of the total human-faced rock art. The proportion from Dahelong accounts for 15.4%, while those from Yushunguang Village and the Goumen Village each constitute 3.8%, and Gelaoyingzi represents 7.7%.

5. CONCLUSIONS AND DISCUSSION

The identification of cultural genes in the human-faced rock art of the Baicha River Basin, from the perspective of Cultural Textual Theory, lays a foundation for subsequent interdisciplinary dating of these rock art. Based on systematically compiled historical materials of ancient human-faced rock art in the Baicha River Basin, this study examines 26 human-faced images from 18 ancient rock art in the Baicha River Basin as its research subjects. Using textual analysis, five environmental genes were identified: the location of the rock art, the spatial relationship between the rock art and the Baicha River, the position of the host rock, the height of the rock art above ground level, and the distance from the rock art to the riverbank. Using content analysis, this study identified six morphological genes of ancient human-faced rock art:whether the facial images depict headdresses, whether cheek lines are engraved, and whether eyes, noses, mouths, or beards are represented.

The 26 ancient human-faced rock art in the Baicha River Basin are predominantly concentrated across five distinct sites within the Wanheyong Township of Hexigten Banner.

65.4% of the human-faced images are distributed on the north bank of the Baicha River, occurring on ground-level rocks, cliff bases, cliff, and cliff tops. 69.2% of these images were captured within 10 meters above ground level, while 65.4% of the ones were located within 350 meters from the Baicha River. Among the 26 images, 61.5% feature headdresses, 76.9% display cheeks, 92.3% exhibit eyes, 57.6% include noses, 61.5% present mouths, and 80.7% are devoid of beards.

The rock art in the Baicha River Valley has long "lacked systematic collation" (Sun, 2019). Regarding the quantity of human-faced rock art in the Baicha River Valley, Ruan Jinyi, a member of the Chinese Rock Art Research Center, conducted a statistical analysis in his 2013 master's thesis, documenting 125 rock art images across various regions of Chifeng. He identified 12 human-faced images, accounting for 10% of the total. These statistical analysis results were followed Sun Xiaoyong in his 2019's monograph. Based on the screening of rock art literature from the Baicha River Basin between 2012 and 2022, it has been identified that 26 human-faced images are present across 18 discovered rock art.

In the analysis of the specific facial features of human-faced rock art, some scholars focus on the eyes, even referring to these rock art directly as "eye images" (Gai, 1986).As Sun Xiaoyong (2015) categorized these eye images in the Western Liao River region into two types based on their eye depiction techniques and proportions, and conducted sustained research on them: The type featuring human faces with concentric circle patterns forming the eyes (2015) and the type with human faces composed of whorl circle patterns for the eyes. For instance, Xiao Bo (2016) conducted a comparative analysis of the "teardrop-shaped" eye motifs in human-faced rock art from northern China, the Russian Far East, and the central-southern regions of Siberia.

The preliminary classification of ancient human-faced rock art has laid a solid foundation for the study of human-faced rock art, particularly in terms of the presence or absence of cheeks and their specific categorization. However, these rock art, or possibly the human-faced images derived from animals, require further in-depth study regarding their stylistic elements—such as beards, cheeks, mouths, noses, and headdresses—beyond the depiction of eyes. With the advancement of digital historiography, the three-dimensional digital collection of ancient rock art, the new historical materials, should also be prioritized to further uncover and identify the cultural meme of rock art and facilitate the digital preservation of cultural heritage.

The cultural sites in the Baicha River Basin are distributed with remarkable density. Archaeological evidence indicates a continuous cultural sequence spanning from the Xinglongwa Culture, Zhaojiagou Culture, Hongshan Culture, Xiaoheyan Culture, Lower Xiajiadian Culture, and Upper Xiajiadian Culture to the Liao, Jin, Yuan, and Qing dynasties. On the hilltop behind the Shanqian natural village, artifacts characteristic of the Xinglongwa Culture type have been discovered. The summit of Dahelong yielded several distinctive stone tools and numerous "Zhi"-patterned pottery shards attributable to the Hongshan Culture. While sites of the Lower and Upper Xiajiadian Cultures are even more abundant. The subsequent research on gene extraction and knowledge map construction of rock art will be continuously carried out in the study of human-faced rock art in Baicha River Basin.

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