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Explore the ancient roots of the Huaxia people and Chinese civilization

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Abstract
Chinese civilization, which stands as a shining star in human civilizations, is distinct in its nature and development path. Although it suffered numerous turns of devastation in its 5,000 years of history, it has resiliently remained uninterrupted in its growth and radiance. Characterized by continuity, innovation, unity, inclusiveness, and longstanding commitment to peace, it also exhibits strong cohesion, vitality, flexibility, and adaptability. These characteristics emerged in the Paleolithic Period, indicating that the Chinese civilization did not emerge overnight. Its roots run deep with a long history, sprouting in the Paleolithic Period, breaking ground in the late Neolithic period, and gradually growing into the towering trees it is today. How did the ancient people in China evolve into today's Chinese nation? How did the ancient culture of prehistoric times develop into the current Chinese civilization? What are the connections between the history buried underground and the society we see today? Obviously, there is no clear answer to these questions. There are still many gaps in prehistoric China that need to be filled, and the process of and reasons for the evolution of ethnic groups and cultures still need to be further interpreted. The author tries to trace the roots of the Chinese nation and its civilization back to the Paleolithic Period, using archaeological materials to connect the survival and reproduction process of ancestors and delve into studying the ancient roots of the Huaxia people and Chinese civilization.

Keywords Huaxia people · Chinese civilization · The Paleolithic Period · Continuous evolution · Exchange and integration

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1 Introduction: tracing human origins in China

In the mythical narratives of ancient China, the legendary figures Pangu and Nüwa play pivotal roles—Pangu in the separation of heaven and earth, and Nüwa in the creation of humans. But in a scientific sense, a question remains to be answered: where and how did humans, especially those in China, originate?

It has gradually become an academic consensus that humans originated in Africa and evolved from an ancient ape species since Darwin published *The Descent of Man, and Selection in Relation to Sex* in 1871 (Darwin 1871). The contemporary scientific definition of humans categorizes them as a primate group that can routinely walk on bipedal upright. Therefore, tracing the origin of humans is to find the earliest evidence of upright walking or what can prove the starting point where humans became different from their closest relative, the chimpanzee. In the past two decades, discoveries in Africa have revealed evidence of the early emergence of upright walking, such as the *Sahelanthropus* dating back to seven million years ago and the *Orrorin tugenensis* to around six million years ago, followed by the *Ardipithecus* and the *Australopithecus*. These early humans retained many physical and behavioral traits of ancient apes, presenting a transitional state between apes and humans. Although capable of upright walking, their early walking posture was unsteady, which gradually evolved into a more stable and agile gait. Evidence related to upright walking is extracted from the positions of the foramen magnum, morphology of leg bones, and footprint characteristics found at a few sites, providing compelling proof (Wu and Xu 2015). Later, *Homo habilis*, the earliest members of the genus *Homo*, as well as the subsequent *Homo ergaster* and early *Homo erectus*, all found in Africa, constructed the fossil evidence chain for the origin and early evolution of the human subgroup. The earliest cultural evidence also comes from Africa, including the 3.3-million-year-old stone artifacts unearthed at the Lomekwi 3 in Kenya and the 2.5-million-year-old stone artifacts unearthed at the Gona in Ethiopia. Geological studies indicate drastic climate changes in the African continent, with tropical jungles receding, leading to the transformation of many areas into savannas or steppes and even deserts. This shift forced some arboreal apes to adapt to ground living, which is considered to be the environmental cause of the transition from apes to humans, the emergence of upright walking, and the origin of human beings in Africa.

Is China the birthplace of humankind? Where did early humans in China and even Asia come from? This has been a longstanding focus of academic inquiry. In the early twentieth century, some Western scholars began to believe that human beings originated from the inland areas of Asia, including China's Qinghai-Tibet Plateau, Xinjiang, Inner Mongolia, and Central Asia. This perspective was influenced by the flourishing population of early primates in Asia and the ecological and climatic changes in Central Asia brought about by the uplift of the Himalaya Mountains, which were thought to have prompted the early great apes to change their life habits and eventually evolve into humans. Many scholars then embarked on scientific expeditions to the East in search of fossil evidence for the origins of humanity, leading to significant discoveries such as the Java Man

and the Peking Man. The remains of *Homo erectus* found in Java and Zhoukoudian provided further evidence for the perception that Southeast Asia and China were among the possible cradles or origins of human beings. However, in the late 1950s, following the discovery of a series of older human fossils in East Africa, scholars turned their attention to evidence for human origins in Africa, and the idea that China and Asia were the birthplaces of humanity gradually faded. In the 1970s and 1980s, the discovery of the *Lufengpithecus lufengensis* in Yunnan in China, dating back to the Miocene period about 6–8 million years ago, led certain individuals in academic and media spheres to interpret this discovery as supporting the notion that China and Southeast Asia could be the possible birthplaces of humanity, temporarily shifting the humankind's origin stories eastward. However, subsequent research findings indicated that the *Lufengpithecus lufengensis* were eventually extinct and had no direct relationship with human evolution. Since then, the possibility of China as a human birthplace has rarely been mentioned in the international academic community, with only a few Chinese scholars holding this view.

Does China and even Asia, which were no longer considered the birthplace of humanity, lose significance in human evolution? Of course not. China has consistently been one of the early human evolution centers that aroused the attention of the academic community, standing out as the oldest and most abundant region where human fossils and cultural remains were found outside of Africa. Currently, evidence of early humans has been discovered in a few sites or regions, such as the Renzidong site in Fanchang, Anhui, the Longgupo site in Wushan, Chongqing Municipality, the Longgudong site in Jianshi, Hubei, and the Shangchen site in Lantian, Shaanxi, dating back to around 2 to 2.4 million years ago. Despite primitive and crude stone tools, scarce and controversial human fossils, and uncertain dating of some sites, the fact that ancient humans existed in China and even Asia around two million years ago has been increasingly acknowledged by the academic community. These human remains are considered the results of the earliest outward dispersal of African humans. In other words, they all originated from Africa. It is generally believed that they belonged to the *Homo erectus*, and some scholars suggested that their journey out of Africa might have started in the *Homo habilis* stage. After reaching the East, these early humans began a long process of adaptation and survival. The *Homo erectus* developed and thrived in China and Southeast Asia, which marks an important evolutionary stage with regional physical characteristics, cultural features, and behavioral patterns.

2 Materials and methods

This study involves research fields of paleoanthropology, archaeology of the Paleolithic Period, archaeogenetics, and paleoenvironmental studies, as well as related methods (Gao 2017).

Paleoanthropology studies human fossils, and its results heavily depend on the abundance of human fossils and the completeness of the information they show. Human fossils have been unearthed in nearly 100 Paleolithic sites in China, covering

a time span from 1.7 million years ago to 10,000 years ago. Although the unearthed human fossils are often fragmented, and it is challenging to construct a complete chain of evidence in terms of time and space, they are the remains of ancient human skeletons and teeth, preserving certain physical characteristics at the time of their death. They objectively record the individual's physiological information at death, such as age, gender, height, brain volume, nutrition and health, growth and development, and paleopathological conditions (of course, the completeness and authenticity of the information depend on how well the fossils are preserved). They provide direct and irreplaceable morphological evidence for the evolutionary stages, importance and changes of ancient individuals and the populations they represent, morphological differences of populations from different regions, and physiological adaptations and adjustments of ancient humans to environmental changes, etc. They also offer important clues and insights into the temporal and spatial information on the survival and distribution of ancient humans, the migration and dispersal routes of a specific group, and gene exchange between different groups. These materials, evidence, and information are indispensable for studying and reconstructing the process, trends, and patterns of human evolution, as well as for building theories of human origins and evolution.

Paleolithic archaeology is the study of technologies, behaviors, and cultural evolution of ancient humans, as well as their adaptive survival strategies in response to environmental changes through examining the material cultural remains during the Paleolithic Period. This discipline focuses on the material cultural products, including tools made and used by ancient humans, remains of hunted, gathered, and utilized plants and animals, works of art, tombs, architectural remains, and evidence of fire usage. Unlike human fossils, which are rare due to the difficulties in their formation and preservation, material cultural remains are much more abundant and provide a more coherent picture of how these remains are related over time and space. Since the cultural remains are often unearthed in archaeological strata in groups, they provide a solid foundation for dating and taphonomic assessment, offering clear symbiotic relationships or correlations between cultural remains and sites. They were created and preserved to meet the needs of survival, thus reflecting the technological development, intellectual evolution process, and social relations of humans, as well as their ability and methods of adapting to specific environments. They serve as markers for the temporal and spatial scope of specific human activities, migration and dispersion routes, exchanges and interactions among different groups, as well as the cultural differences among different regions, providing key information on the origins and spread of specific technologies and the origins of agriculture, civilization, cities, and countries. Especially for a certain region or time period, they can provide important information on whether human evolution was continuous or underwent interruptions and substitutions.

Archaeogenetics is a cutting-edge field of research on human origins and evolution. At present, this academic discipline mainly focuses on the following two aspects: 1) Extraction and comparative analysis of the genomes of modern human populations to trace the origin and dispersal of modern populations and infer the possible living places of ancestral populations by examining the genetic diversity among populations in different regions, tracing the surviving ancient genes, and

estimating the starting point of modern human genes based on the molecular biological clock. 2) Extraction of DNA from ancient human fossils and sequencing analysis to decipher the genetic code of the individual and the group it represents, looking for genetic relationships with other populations and connections with modern humans. The discipline is based on the rapidly advancing modern molecular biology technology and information technology. Compared with traditional paleoanthropology and archaeology, it has a stronger foundation of modern scientific methods, characterized by robust capabilities in big data analysis and reproducibility testing. For example, scholars in archaeogenetics can extract DNA from very small bone fragments, even from humans or other animals in the sediments. The strength of this field is to use microscopic analysis to reveal the internal causes or mechanisms of human evolution. The introduction of genetics to the study of human origins and evolution has greatly influenced and revitalized traditional research models based on the morphological observations of human fossils and cultural remains. It has provided new scientific and technological means to solve major problems and offered an opportunity to supplement and verify the existing research conclusions.

Paleoenvironmental studies involve the extraction and analysis of geochemical indicators from the stratigraphic deposits containing human fossils and cultural remains. This process aims to restore the ancient landforms and geological environment where ancient humans lived. Paleoenvironmental studies also cover the analysis of conditions of local vegetation, climate characteristics, and resources available for human collection during specific periods of ancient human populations through extracting the plant remains (macro-botanical fossils such as charcoals, seeds, or micro-botanical fossils such as pollen, phytoliths, and starch grains) from sediments. They also study animal species in the living area of ancient humans through animal fossils unearthed with human remains, allowing for the analysis of local paleoclimatic, paleoenvironmental, and resource conditions for ancient humans to hunt during the relevant periods. Meanwhile, the observation and analysis of materials like ice cores, stalagmites, and the cyclic sedimentation of the loess stratum, or the drilling of lacustrine deposits can enlighten researchers about large-scale environment-changing events in specific regions and local climate characteristics in a given time and region. This, in turn, facilitates the study of environmental and resource conditions for ancient human habitation.

3 Results and discussion

3.1 The continuous evolution of ancient humans in the East

The understanding of the continuous evolution of humans in China and East Asia over millions of years has undergone a long and intricate process of finding evidence for discussion and analysis.

The discovery of the Peking Man Site at Zhoukoudian marked the beginning of research into the million-year continuous evolution of humans in East Asia. At the end of 1929, Pei Wenzhong[1] dug out the first skullcap of the Peking Man at Locality 1. Subsequently, human fossils and cultural remains from different periods of time were found at other localities. Following that, in the 1930s and 1940s, anatomist Franz Weidenreich conducted observational studies on the human fossils unearthed at the Zhoukoudian Site. He published numerous monographs that detailed the anatomical characteristics of the Peking Man and attempted to find out the relationship between the Peking Man and the Mongoloid. Weidenreich found a series of similarities between the Peking Man and modern people from North China, including a prominent sagittal keel running across the midline of the skull with depressions on both sides, Inca bones, and frontal process of zygomatic bones. Features such as a rounded infraorbital margin, mandible torus, and shovel-shaped incisors were also noted. He argued for a morphological continuity between the two groups, proposing for the first time that the Peking Man could be considered an ancestor of modern Chinese and even the Mongoloid. Afterward, Weidenreich suggested the existence of four human evolutionary lineages in East Asia, Europe, Africa, and Southeast Asia-Australia, among which, in the East Asian lineage, he delineated the inheritance relationship of Peking Man-Upper Cave Man-Mongoloid (Weidenreich 1946).

In the 1950s, human fossils dating between the time of Peking Man and modern humans were successively discovered in sites or regions such as Ziyang in Sichuan, Dingcun in Shanxi, Changyang in Hubei, Liujiang in Guangxi, and Maba in Guangdong. These findings filled the lacuna in evidence between *Homo erectus* and modern Chinese people. Building on this, Wu Rukang and other researchers further argued for the continuous evolution of ancient humans in the Chinese region (Wu and Jia 1955). In the 1960s and 1970s, more early human fossils were unearthed in locations such as Yuanmou in Yunnan, Tongzi in Guizhou, Jianshi in Hubei, and Lantian in Shaanxi. Through a comprehensive analysis of Chinese human fossils, scholars, including Wu Xinzhi, pointed out significant similarities in most ancient Chinese skulls, including a sagittal keel, protruding facial features with high zygomatic bones, broad noses, shovel-shaped upper incisors, and mandible torus. Based on this analysis, they suggested that ancient humans of different periods in China underwent continuous evolution with clear ancestor–descendant relationships and proposed for the first time the possibility of genetic exchange among ancient human groups in different Chinese regions (Wu and Zhang 1978).

In the late 1980s, Western geneticists proposed the hypothesis that all modern humans can trace their ancestry back to a common maternal ancestor in Africa (Cann et al. 1987). This idea quickly gained popularity in Western anthropology and archaeology and influenced the Chinese academic community. According to this hypothesis, all evolutionary chains outside Africa underwent interruptions, with a period of discontinuity in human existence in China and even East Asia between 100,000 and 50,000 years ago, and for the same reason, there was

[1] The names of Chinese scholars in the text of this paper follow the rules of Chinese, with surnames first.

no genetic connection between modern humans in Eurasia and indigenous ancient human groups of that region (Gao et al. 2010). However, in 1998, building upon "the Multiregional Hypothesis" of modern human evolution, Wu Xinzhi proposed the notion of "Continuity with Hybridization." He contends that humans in East Asia have experienced continuous evolution since the time of *Homo erectus* without interruptions. According to Wu, there was no wholesale replacement of indigenous populations by immigrant groups. He also highlighted that gene flow occurred intermittently between indigenous populations of East Asia and external groups, and this interaction increased over time. Therefore, while East Asians maintained some distinct regional characteristics due to their isolation, the population still remained the same species as their Western counterparts. Yet compared with the generational continuity among local populations, as Wu argued, the admixture with different groups was secondary, as the relationship between the indigenous population and a small number of immigrants tended to be one of integration rather than replacement (Wu 1998).

Over the past 20 years, China has made major progress in these research areas. More human fossils were excavated in China at a number of archaeological sites, including those located in Hubei (Huanglong Cave, Yunxi), Guangxi (Zhiren Cave, Chongzuo), Guizhou (Dadong, Pan County), Henan (Lingjing, Xuchang), and Anhui (Hualong Cave, Dongzhi). With new technologies, research into formerly unearthed archaeological sites and human fossils was launched again, revealing the consistent and complicated human evolution process in China from 300,000 to 100,000 years ago. In Hualong Cave of Dongzhi, Anhui, over 30 human fossils and more than 100 stone tools dating back to 330,000 to 270,000 years ago were unearthed. The fossils demonstrated mosaic evolution from *Homo erectus* to *Homo sapiens* and offered new evidence of the consistency in the East Asian human evolution, such as an absence of the third molar and other typical early East Asian human characteristics, along with a series of characteristics of skull, mandible, and teeth similar to modern humans (Wu et al. 2019). Another latest research into the skull of Dali Man living in Shaanxi 300,000 to 250,000 years ago suggested that the Dali Man had a combination of characteristics common to humans in the late Middle Pleistocene and some early modern humans, as well as the *Homo erectus* in East Asia and the Middle Pleistocene human groups in the western Old World. Many progressive characteristics and the genealogy represented by the Dali Man might have made a bigger genetic contribution to the evolution of modern humans in China than other hominins (Wu 2020). Fossils of the Lingjing Man, who lived in today's Henan 120,000 to 100,000 years ago, also showed mosaic characteristics typical of both ancient and modern humans and shared many characteristics of early modern humans and Neanderthals. The general features of their skulls, especially those represented by the broad cranial base and the low braincase, were obviously inherited from East Asian human groups in the Middle Pleistocene era, demonstrating primarily the regional evolutionary consistency while showing a certain degree of genetic exchanges between the East and the West. Additionally, human teeth unearthed in Dadong, Guizhou, which dates back to 130,000 to 300,000 years ago, already had early modern human characteristics; the human mandible excavated in Zhiren Cave, Guangxi, which dates back to 100,000 years ago, also took on some

derived features of modern humans, such as the protuberant tuber symphyses, a prominent chin cleft, the tubercular lateralia in medium development, the nearly vertical mandibular symphysis and pronounced curvature of the mandibular symphysis section, and maintained some primitive characteristics like the strong lingual surface of mandibular symphysis and body of the mandible. The mosaic features of all the fossils mentioned above show that there were human groups evolving from *Homo sapiens* to modern humans on the archaic Chinese land, belonging to the developing early modern humans. More importantly, human teeth, with an age of 50,000 to 120,000 years excavated in Fuyan Cave of Dao County, Hunan, and Huanglong Cave of Yunxi, Hubei, show complete characteristics typical of modern humans. Two other examples that more typically show modern human features are the Tianyuan Cave Man and the Upper Cave Man unearthed in Zhoukoudian, Beijing. All the physical evidence proved that the evolution from archaic hominins to modern humans in China was a consistent process (Liu et al. 2019), while there is little fossil evidence supporting the hypothesis that the archaic Chinese hominins were totally replaced by the early modern humans from Africa.

3.2 The Paleolithic culture in China carried on

The first period of human history defined from a cultural perspective is the Paleolithic Period, which accounted for 99% of human history in length, spanning from the time when cultural remains (mostly stone tools) appeared to about 10,000 years ago. The cultural remains left by ancient human groups in different regions and ages have their own geographical and temporal characteristics and give clues to the archaic humans' survival time, ways of living, migration routes, and characteristics of their techniques and cultures in specific regions as well as the interaction between different groups.

The Paleolithic culture in Africa can be traced back to a time of simple stone tools with primitive human-made signs (unearthed at the Lomekwi 3 excavation site in Kenya) 3.3 million years ago (Harmand et al. 2015). Some 2.5 million years ago, the Oldowan Industrial Mode came into being when the ancestors used pebbles to produce simple ancient tools for pounding, cutting, and digging. The subsequent Acheulean Industry Mode, from about 1.7 million years ago, displayed another style of making stone tools—using big stone flakes or pebbles to produce big cutting, chopping and digging tools, such as handaxes, cleavers and pickaxes with symmetric double sides. The Acheulean technique was later spread to West Asia, Europe, and East Asia along with the dispersal of *Homo erectus*.

From 300,000 to 200,000 years ago, the Mousterian Industry Mode appeared in the west of the Old World, using the Levallois technique to produce standardized stone flakes, which were processed into small, regular-shaped scrapers, pointed tools, etc. This industry tradition prevailed for a very long time. From 45,000 to 40,000 years ago, the west of the Old World first saw exquisite blade technology and later the combinations of small, delicate microblade tool kits. However, these words just roughly outlined the development of the West's Paleolithic culture, which was represented by typical stone-tool technology. Other aspects, including the

spatial–temporal variation in both stone-tool technology and stone-tool combinations, along with aesthetic pursuits, social identities, and religious origins reflected in artistic creation and tombs, also merit discussion.

China's Paleolithic culture dates back to about two million years ago. Although some archaeological sites or remains have offered data of earlier ages thanks to chronological dating, there are still controversies and uncertainties over the data. China's Paleolithic culture differed from the West's in many aspects, indicating that the ancient human groups in the East were different from those in the West. Yet there are certain cultural similarities between the East and the West, from which the evidence for related human migrations and cultural exchanges can be extracted. Current research findings show that the Paleolithic cultures of China and East Asia shared the same origins, which were different from the Western traditions for a long period of time (Gao 2014). The common points are shown as follows:

1) Utilizing local stone materials in a flexible method

For the most part of the Paleolithic Period, the ancient humans in the East made stone tools mainly with raw materials such as vein quartz, quartzite, dolomite, flint with impurities, sandstone, and volcanic breccia. These materials, compared with large-high-quality flint pieces commonly used by the ancient humans in the west of the Old World then, were mostly of inferior quality and had inherent deficiencies. Limited by such resource conditions, the early humans then applied easy, practical, and flexible methods to a variety of local stone materials for further application. For example, the ancient humans who inhabited the Zhoukoudian site, the *Homo erectus pekinensis*, dealt with abundant low-quality vein quartz with the inefficient and wasteful bipolar knapping technique, while those in today's Three Gorges region treated near-globular river pebbles with the throwing-against-anvil technique. These raw materials' properties and utilization methods have exerted a significant impact on stone tool technology and culture.

2) Applying simple techniques and flexible process

Stone-tool technology can be divided into two parts: flaking and refining. In the Paleolithic Period, the flaking techniques by the ancient humans in East Asia were random and made by chance. Specifically, they applied a variety of simple techniques, including the bipolar technique, hammer percussion, throwing-against anvil and block-on-block technique, without prefabricating or refining lithic cores. The retouch techniques were characterized by simplicity and also randomness. To be specific, the raw materials were far from completely processed, systematic, and standardized. In addition, the bifacial technology in most Eastern regions was underdeveloped throughout most of the Paleolithic Period. This was in sharp contrast to the west of the Old World, where the bifacial technology and Levallois technique were widely applied in the deep and standardized processing of stone tools.

3) Stone tools of limited types with varied shapes in the same type

Western scholars often describe China's or East Asia's Paleolithic cultures with labels such as "Chopper-Chopping Tool Tradition," "Pebble Tool Tradition," and "Simple Core-Flake Tool Industry." Although these labels may not be appropriate, it is true that East Asia's Paleolithic culture differed from the West's in terms of type, shape, and combination of stone tools. To be specific, East Asia's Paleolithic stone tools mainly included scrapers, chopping tools, pointed tools, and picks made of pebbles or flakes. These stone tools, compared with those of the West's Paleolithic culture, had limited types and were not standardized enough, with no obvious distinctions between different types, but the same type featured varied shapes.

4) Stone tools in northern and southern China different in diversity

Throughout the Paleolithic Period, China's northern and southern parts had their own regional cultural traditions. In most areas of southern China, the large rough stone tools made of pebbles using a basic and crude method prevailed but had few types. In contrast, northern China was dominated by small stone tools made of lithic flakes in a more exquisite manner and had more types. There is no doubt that it is, to some extent, too arbitrary to divide China into only two parts, given that both parts also had their own cultural variations reflecting certain diversity. For example, the Yunnan-Guizhou Plateau in southern China was dominated by stone tools made of flakes, while in a few areas of northern China, large and rough stone tools made of pebbles prevailed. In a word, it has long been the case that northern and southern China differed in stone tool styles with local diversity.

5) Developing in a slow but stable way

In contrast to the clearly delineated developmental stages observed in the west of the Old World, Chinese Paleolithic cultures evolved at a measured pace, demonstrating notable stability across various aspects. The predominated large pebble-tool kits in southern China and the simple flake-tool kits in the Yunnan-Guizhou Plateau underwent fewer changes from the Lower Paleolithic Period to the Upper Paleolithic Period. Although lithic tools made on flakes and well-curated samples grew in numbers in these regions, no distinct staged developments are apparent in their overall progression. In northern China, changes were more pronounced than in the south. While simple flake-tool traditions persisted in most periods, the northern border witnessed the introduction of new technologies between 50,000 and 40,000 years ago, such as the Levallois technique, blade technology, and later the microblade technology. These innovations hastened the pace of cultural development.

6) "Western elements" seldom observed

The Movius Line once demarcated the Old World into East and West (Movius 1948). Yet, the subsequent evidence has demonstrated that the presence or

absence of handaxes cannot be considered a conclusive factor for differentiating the two culture circles. Nevertheless, notable cultural distinctions did exist between the western and eastern regions of the Old World (Bar-Yosef and Wang 2012), and certain crucial elements within the Western lithic technology system, especially the Levallois technique, handaxes, and blade technology, were either rarely found or entirely absent in Chinese Paleolithic culture. For instance, although the Levallois technique was prevalent in Africa, West Asia, and Europe from 300,000 to 45,000 years ago, it only appeared briefly in today's Xinjiang, Inner Mongolia, and Ningxia from 50,000 to 40,000 years ago. Regarding blade technology, it was widespread in the western Old World during the Upper Paleolithic Period but was limited to the northern borderlands of China and some areas in the Tibetan Plateau for a brief period from 40,000 to 30,000 years ago. The distribution of handaxes was slightly broader, encompassing areas such as the Baise Basin, Luonan Basin, Hanzhong Basin, Danjiangkou Reservoir Region, and Chuanxi Plateau. However, these handaxes exhibited lower frequency and technological standardization and appeared later compared to their Western counterparts (Gao 2012). Such lithic technologies with traces of "Western elements," which were rarely observed in East Asia during the Paleolithic Period, were overshadowed by the prevailing mainstream practices at that time and gradually dissipated.

7) Uninterrupted evolution

A preposition for the hypothesis of modern humans "Out of Africa" is that the severe conditions during the Last Glacial Period wiped out the local population in East Asia, causing interruptions in evolution from 100,000 to 50,000 years ago until the arrival of "modern humans" from Africa. However, this hypothesis is untenable. Cultural horizons and human remains were found in some archaeological sites dated to the 100,000–50,000 BP (before present) duration, including the Beiyao site in Luoyang, Yangshang site in Gansu, Dadiwan site, Baishiya Karst Cave, Zhiji Cave in Henan, Jiege Cave in Shaanxi, Huanglong Cave in Hubei, Jingshuiwan site, Zaoziping site and Chibaling site in Chongqing. Palaeoenvironmental data indicate that the extreme climatic conditions that led to mass extinctions of living creatures did not exist in most regions of China during the Last Glacial Period. Throughout the Pleistocene period, southern China was home to *Giant Pandas-Stegodon Sinensis* faunal assemblages, which enjoyed warmer climates, while in northern China, mammals like woolly rhinoceros, mammoths, wild horses, bison, wild asses, wild boars, bears, hyenas, and wolves all successfully survived the last ice age. Thus, it seems illogical that humans, capable of using fire and crafting tools and clothing, could not survive this period. Besides, during the Pleistocene, Earth experienced numerous cycles of ice ages and interglacial periods, with the Last Glacial Period not being the coldest. It goes against logical reasoning to suggest that the human species in East Asia did not become extinct during previous, harsher ice ages but could not adapt to the Last Glacial Period despite being more technologically advanced with stronger surviving

capability. It also defies logic to suggest that indigenous species could not cope with a gradually cooling environment while immigrants from Africa could adapt to a new, colder environment.

These aspects clearly show that the Paleolithic cultures of China and even East Asia differ greatly from those of the West. The slow but continuous evolution of the dominant culture shows that ancient human groups have formed stable cultural traditions and passed them down from generation to generation. During that time, outside populations and cultures occasionally brought in new elements but quickly absorbed and assimilated them into the dominant culture. There was no replacement or substitution of populations and cultures.

3.3 Exchange and integration shaping modern peoples

The proposition that indigenous peoples in China have evolved continuously does not negate the possibility of foreign populations immigrating, admixture, and assimilation with indigenous people. Instead, there is growing evidence that no region is the exclusive territory of a particular people and that no people are genetically "pure." Exchange and integration have shaped modern peoples, including the Huaxia people. During the Neolithic Period, distinctive population patterns took shape in the north and south of China, along with the integration of populations in these areas. This continuous intermingling of southern and northern populations formed the genetic basis for the Huaxia people in China (Yang et al. 2020). Such process can be traced back to the Paleolithic Period.

DNA analyses of the 40,000-year-old human skeletons in Tianyuan Cave near Beijing suggest that the Tianyuan Man represents an archaic East Asian population whose genes are still carried and passed on among East Asian Mongoloid and Amerindian populations. However, the modern East Asian population does not descend directly from the Tianyuan Man. Instead, there were complex genetic admixture and introgression during their evolution (Yang et al. 2017). The analysis also shows that modern East Asian humans carry a small number of genes from Neanderthals and Denisovans. The genetic information of Neanderthals, a population believed to be extinct, was discovered in modern East Asians. The bony labyrinth of Neanderthals was detected after CT-scanning the fossils of ancient humans in China, such as the Xujiayao Man, the Lingjing Man, and the Maba Man, suggesting that Neanderthals dispersed into China and East Asia and underwent genetic exchange with indigenous peoples there. Previous studies found that Denisovans only lived in Siberia, but the analyses of ancient proteins and DNA show that they lived even earlier in Baishiya Karst Cave in the Gannan on the edge of the Tibetan Plateau (Zhang et al. 2020), suggesting that Denisovans are a subgroup of ancient humans in China.

Cultural evidence also shows that exchanges and interactions between different human groups once happened, at least in some regions. One proof is the Levallois products, scrapers and points with Mousterian style excavated in the lower layers of the Tongtian Cave, Xinjiang, and the Jinsitai site, Inner Mongolia. Their tool kits and technologies differ greatly from those in China and East Asia but are similar to the Mousterian techno-complex used in Europe, West Asia, Central Asia, and Siberia in

the Middle Paleolithic Period, which is closely connected with Neanderthals. More evidence was discovered at the Shuidonggou Site complex, Ningxia. Archaeological studies and dating of several sites at the complex indicate that ancient humans immigrated to this region around 40,000 years ago. These settlers crafted blade tools reminiscent of the Levalloisian tradition, which closely resembled the stone tool remnants found in the Initial Upper Paleolithic Period in western and northern Eurasia. Since there were no earlier technologies similar to the blade technique in China, it is reasonable to assume that this technology was introduced to northern China by Western human groups in the Last Glacial Period. However, this "alien" technology did not exist long at the Shuidonggou site. It was replaced by the core-and-flake technology between 33,000 and 27,000 years ago. In addition, cultural remains with the characteristics of modern human behaviors were discovered in this region, such as non-local high-quality stone materials, ornaments, ground bone tools, and complex use of fire. All these show that immigrated populations did not supplant indigenous peoples. Instead, they probably exchanged and integrated. Indigenous peoples developed in the system of simple core-and-flake technology many revolutionary technologies and ideas, thus evolving into modern humans (Li and Gao 2018).

These cultural remains, which are characteristics of the Western Middle and Late Paleolithic Period, have a limited spatial and temporal distribution in China, being found at a few sites near the borderlands of Central and Northeast Asia. It failed to become a dominant culture, let alone to be the renewal or a replacement for the native cultures. Why did such a cultural system fail to continue to expand eastward and southward into the Chinese hinterland but quickly disappear? Through a comparative study of the distribution areas and numbers of the remains of the Mousterian-blade technology and the native small flake-tool remains in northern China, we believe that an important reason is that the newly arrived populations were hindered by the native peoples in northern China who were more numerous, stronger, and better adapted to the local ecological environment. The latter took up the well-resourced ecological niche so that the former could only stop, retreat, or be assimilated (Li et al. 2016). Migration, exchange, competition, and mutual learning among different human groups should be regarded as the main themes of population reproduction, survival, integration, and development in China during the Paleolithic Period. It is in this way that the ancient roots of the Chinese nation and its civilization featuring unity in diversity were nurtured and expanded for steady thriving in later generations.

3.4 The formation mechanism of the Chinese nation and its civilization

Why can the ancestors of the Huaxia people live and grow on this land for so long, and why can they become a Chinese nation with a strong power of survival and centripetal force, different from other ethnic groups? Why has the culture inherited from the Paleolithic Period been able to survive and form a system of its own in China, evolving into the Chinese civilization, which is the only uninterrupted one among the world's ancient civilizations? What are the external conditions and internal motivations?

Each place has its own way of supporting its inhabitants. China is located in the center of East Asia, with a vast area and diverse ecology. The ancestors living in such a vast geographical space could make full use of the environment to obtain kinds of plant-source and animal-source foods and living resources and could make north–south or altitudinal migration when the climate fluctuates, so as to maintain their survival in such a way of seeking advantages and avoiding hazards. Geological and paleoenvironmental studies have shown that the climate fluctuations in East Asia during the Pleistocene were far inferior to those in Europe and the Americas, and even during the Ice Age, the level of coldness was milder than that in Europe and the Americas and even the existence of a true Ice Age similar to that of Europe and the Americas in China has always been a topic of debate in the academic community (Liu 2009). This suggests that most areas of China were suitable for human survival and reproduction during the Paleolithic Period, and it was under this environmental condition that ancient humans in the East were able to hold on to their homeland for a long period of time.

China's geographical position is relatively independent, and its landform and landscape have had a significant impact on the formation of the Chinese nation and its culture. In the west of China, there are the Altai Mountains, the Tian Shan Mountains, the Kunlun Mountains, and other high mountains; to the southwest lies the Himalayas, often referred to as "the roof of the world;" and in the west and north, there are the Tibetan Plateau, the deserts of Central Asia and the Gobi Desert of Mongolia. While not constituting a complete barrier to human migration, these mountains and deserts can pose a challenge to large-scale population movements in times of environmental degradation, with the main difficulty being the scarcity of food and water (Dennell 2009). As the continent was seaward in the east, humans could not continue to migrate eastward. This geographical feature creates a blocking effect. In such a relatively closed environment, early *Homo erectus* migrated here in climatic optimum and later survived and evolved, forming a population and culture with regional characteristics. Although a small number of people may have moved in and out of the land during that period, large-scale migration rarely occurred, and the newcomers could only be integrated into the main local peoples, with some of their physical characteristics and cultural traits being kept but unable to become mainstream. Because of the vastness of geographical space and the abundance of resources, local peoples have been able to remain viable and diverse without becoming specialized or extinction. Such an evolutionary process has continued into the history period.

Beyond all those things, there is also an intrinsic factor in the continuous evolution and cultural development of ancient human groups in China and East Asia: a special way of survival, or "comprehensive behavioral pattern," a term I used in my research preceding this one to describe the survival mode of ancient humans in China and East Asia adopted to adapt to changing environments (Gao and Pei 2006). After careful rethinking, I would rather use, in this paper, "Paleolithic Behavioral Pattern in the East" to describe this survival mode, which covers the following aspects:

1) Working with what the environment offers and keeping it bare-bones

Ancient human groups in the East made full use of the advantageous conditions, which meant opting for sunny waterside environments with easy access to raw materials for stone tools and food sources; when making stone tools, they usually drew upon local materials and adopted simple processing, without much-preparing effort before flake-detaching; no goal of standardization or refinement was involved in the simple tool-making process. Stone tools were mainly composed of simply retouched flakes or even unmodified flakes, and could serve various purposes. Their tool-making process showed very different ways of thinking and pursuits of techniques from the ones adopted by ancient humans in the west of the Old World, whose practices include making symmetrical handaxes systematically using bifacial techniques, making standardized stone flakes from a prepared core with Levallois technique, and detaching long, thin and parallel blades from pre-made cores with a fixed direction.

2) Low-impact exploitation of resources to maintain harmony between humans and nature

The ancient humans living in China rarely searched out high-quality raw materials for stone tools, nor did they exploit the environment heavily for an extended period of time; the lithic tools they used were mainly for processing, logging, digging, and cutting up animal carcasses; they did not have many lethally sharp tools, and there is little evidence for excessive animal hunting. All these points to low-level exploitation of the available resources and a harmonious and friendly relationship between humans and the ecological environment.

3) Constantly migrating in pursuit of better living conditions

Most of the archaeological sites were occupied for only a short period of time, and the number of relics excavated from the ruins was relatively small. This indicates that the ancient human groups in the East were constantly on the move. When their habitat was running short of resources (particularly food sources), they migrated elsewhere for new resources. With this mode of living, early humans enhanced their ability to adapt to changing climates, regional resources were not exhausted to the point of ecological catastrophe, and there was no need for significant improvement or change in technology or culture to exploit hard-to-obtain resources. As a result, the ancient human groups in the East could sustain life with simple tools, and there was little incentive for technological innovation.

4) Flexible and pragmatic approaches, with simplicity at their core

The ancient human groups in the East chose readily available resources and dealt with materials in ways that best fit their features. For instance, the Peking Man used the inefficient and wasteful bipolar technique to remove flakes from low-quality vein quartz, a material abundant in the Zhoukoudian area; and in the Three Gorges region, the throwing-against-anvil technique was employed to work with large amounts of round or flat river pebbles hard to detach flakes—with this technique, either flakes with sharp edges were produced, or a pebble was broken into two, clearing the way for further flaking and processing. These are simple and practical techniques with little technology involved, yet a testament to the flexibility and ingenuity of ancient humans.

5) Open to influences from other cultures

The ancient humans in China and East Asia lived and evolved in a space that was relatively independent but not completely isolated from the outside world, and migration and exchanges took place from time to time. In the Paleolithic Period, the northern and southern populations in China exerted mutual influences on each other. Moreover, a number of lithic product sets of Acheulean characteristics, which were supposedly works of people in the West, can be found in the Chinese southern population's pebble tool system. Likewise, shreds of evidence show that small flake tools of the Chinese northern population coexisted with Mousterian (from the West) and blade technology (from the North) during that time. Ornaments, an element that has its origin in the West, can also be seen. All these cultural phenomena speak to how open and inclusive the ancient human groups in the East were—rather than rejecting all outside peoples or cultures; they embraced external influences to suit their needs, which added weight to the groups' survival and evolution while pushing for new developments in their own culture.

6) Pursuing innovation and development

Behind the apparently slow Paleolithic cultural development, we can see in ancient humans in China and East Asia a temperament of industriousness and incessant pursuit of innovation development. This is evident in their ability to overcome difficulties brought about by low-quality raw stone materials, the continuous improvement of the flake-detaching techniques, the constant refinement of stone tool processing, and the exploration and utilization of various material resources. For example, at Zhoukoudian Locality 1, around 500,000 to 600,000 years ago, the Peking Man counted on the bipolar technique to detach stone flakes from vein quartz for stone tool processing. Later, at Zhoukoudian Locality 15, the method shifted to direct hammer percussion technique when chipping the same material, resulting in more standardized and refined stone flakes and tools. Sites such as Zhoukoudian Locality 15, Xujiayao, Dingcun, and Lingjing witnessed the emergence of a technique involving reciprocal striking on discoid cores to detach relatively regular stone flakes, which is definitely an improvement and innovation compared to the previous random flaking patterns. Moreover, Locality 2 of the Shuidonggou in Ningxia exhibited a systematic and refined approach to tool processing within the traditional system of the small flake techno-complexes. At the Ma'anshan site in Tongzi, Guizhou, finely crafted ground bone tools were unearthed from the 34,000-year-old stratum there. All the above demonstrates the continuous innovation and progress of ancient East Asian humans.

The essence of archaeological research lies in the understanding of peoples through artifacts. The "Paleolithic Behavioral Patterns in the East" may not be applicable to all periods or all populations in East Asia. Still, it reveals to some extent the cognitive patterns, technological characteristics, behavioral modes, and survival strategies that distinguish the East Asian ancients from their Western counterparts. These cultural traits and behavioral patterns are the result of the comprehensive interaction of environmental factors, resource conditions, social structures, interpersonal relationships, thinking habits, and cultural traditions. Once the traits

and patterns are established, they are vibrant and influential, passing down through generations to exert profound and lasting influences on the formation of the Chinese nation and its civilization. Until the present time, one Chinese kitchen knife is enough to cut various ingredients into different sizes and shapes, whereas Western knives need to be categorized and specialized to process different food materials. East Asians enjoy a variety of cuisines using a pair of chopsticks, while Westerners use a combination of knives, forks, and spoons. Neither of the two approaches is any superior to the other, but their difference shows the variance in thinking and habits, and this reflects longstanding cultural and technological differences between the East and the West during prehistoric and historical periods.

4 Conclusions

The Chinese civilization has a long and profound history, with deep and complex historical roots and powerful cultural genes. The Chinese nation, standing in the east of the world, has witnessed continuous development of its civilization for 5,000 years without interruption (Liu 2020), with roots dating back to the Paleolithic Period. Human evolution in the land of China has a history of more than two million years, from *Homo erectus* onwards, continuously enduring and thriving. The Paleolithic culture in the East, marked by its distinctiveness, diversity, and inclusiveness, has been passed down through generations, while the Chinese nation and its civilization have been deeply rooted in the land of East Asia, where the viable environment has enabled the inception and development of Chinese culture. The axis of history is stretched and extended here, connecting the ancient and modern humans in the East.

There should be a consensus in the archaeological and historical communities that the Huaxia People and the roots of Chinese civilization have undergone millions of years of uninterrupted development and refinement. The "Xia-Shang-Zhou Chronology Project" and the "Project to Trace the Origins of Chinese Civilization" have achieved remarkable results. Given that the emergence of Chinese civilization was not a swift process, research should progress towards the more distant Paleolithic Age. A significant research initiative should be established under the theme "Homeland of Eastern Humans." This endeavor aims to integrate research efforts and technological capabilities from various academic disciplines, including archaeology, genetics, anthropology, paleoenvironmental studies, and chronology, to trace where and when the Chinese nation originates and how it evolves, and to clarify the history and drives of cultural development. The systematic study of "Homeland of Eastern Humans" can help fill in the gaps, shed light on the ambiguity, and solve controversies about the East Humans' history. It will enhance our understanding of the extensive and profound Chinese civilization, reveal its roots and process of development, and highlight its significant contributions to the world.

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Comments