会议摘要

SYMPOSIUM ABSTRACTS

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中国科学院古脊椎动物与古人类研究所

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Vice Chairman of the Symposium: Song XING and Xiaoling ZHANG

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大会特邀报告

Plenary Session

The genetic history of the Paleolithic populations in East Asia based on molecular evidence

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Abstract: The extraction, sequencing, and analysis of ancient molecules -specifically ancient genomes and proteomes - from archaeological remains have evolved into a powerful method for investigating human origins and evolution. Despite the scarcity of Paleolithic molecular evidence in East Asia, we have retrieved and analyzed over a dozen ancient molecules dating back to 146,000-11,000 years ago out of sediments and ancient human remains from China, including the first DNA of Denisovans outside the Denisova Cave, nuclear genomes of the early modern humans in northern and southern China, etc. Our analysis of these ancient molecules has not only extended the spatial-temporal distribution of the Denisovans and provided a more detailed investigation of this group in East Asia, but also uncovered the genetic characteristics of the diverse early modern human lineages in East Asia, their ancestral contributions to the later and present-day East Asians, their genetic relationships with other Eurasian populations, and some specific adaptive traits, highlighting a unique evolutionary trajectory of East Asian populations during the middle and late Paleolithic period.

Human evolution in Eurasia: A comparative overview of the Pleistocene *Homo* fossil record from Europe and China

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Abstract: A major prevailing assumption is that Africa was the birthplace of most hominin species, while Eurasia was home of only a few, most of the time isolated from the main course of human evolution. However, in recent years, new discoveries have prompted the necessity to reconsider the weight that Asia may have played in the origin and evolution of the populations that settled Eurasia, including Europe (Dennell and Roebroeks 2005; Martinón-Torres et al. 2007, 2011).

Here we present a general overview of the comparative anatomy of the European and Chinese Early and Middle Pleistocene populations, with special focus on the dental evidence, in order to better understand their variability and their possible phylogenetic relationship.

Morphological similarities found between the European and the Asian hominins suggest that they may have shared a more recent common ancestor than they did with Africans. Chinese *Homo erectus* and *H. antecessor* recovered at the Sierra de Atapuerca sites (Burgos, Spain) share an Eurasian dental pattern (Martinón-Torres et al., 2007) and some aspects related to their mid-facial topography (Wu et al., 2021, 2023), that suggest some phylogenetic proximity between them. These morphometric similarities include some traits that were generally classified as typical of Neanderthals and modern humans, but that are indeed present in Eurasian hominins close to million years ago (Martinón-Torres et al., 2019). Although they share an Eurasian dental pattern, our comparative analysis also reveals that European and Chinese hominins display remarkable differences in their dentitions, suggesting that their divergence occurred at some point in the Early Pleistocene after which they followed different evolutionary trajectories (Bermúdez de Castro et al., 2021).

Overall, the evidence is increasingly pointing to Asia not as an evolutionary end but as an evolutionary cradle. Future studies should aim to characterize and interpret the variability of the increasing fossil record.

Bermúdez de Castro, J.M., Xing, S., Liu, W., García-Campos, C., Martín-Francés, L., Martínez de Pinillos, M., Modesto-Mata, M., Martinón-Torres, M. 2021. Comparative dental study

between *Homo antecessor* and Chinese *Homo erectus*: Nonmetric features and geometric morphometrics. Journal of Human Evolution, 161, 103087.

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Martinón-Torres, M., Dennell, R., Bermúdez de Castro, J.M. The Denisova hominin need not be an out of Africa story. Journal of Human Evolution 60, 251-255.

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Wu, X., Pei, S., Cai, Y., Tong, H., Xing, S., Jashashvili, T., Carlson, T.J., Liu, W., 2021. Morphological description and evolutionary significance of 300 ka hominin facial bones from Hualongdong, China. Journal of Human Evolution, 161, 103052.

Wu, X., Pei, X., Cai, Y., Tong, H., Zhang, Z., Yan, Y., Xing, S., Martinón-Torres, M. 2023. Morphological and morphometric analyses of a late Middle Pleistocene hominin mandible from Hualongdong, China. Journal of Human Evolution, 182, 103411.

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大会主题报告

Key-note Session

主题：人类演化与环境适应
Human Evolution and Environmental Adaptation

The *Homo erectus* legacy of Zhoukoudian, China

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Abstract: The early Middle Pleistocene hominin assemblage from Zhoukoudian includes nearly 200 skeletal and dental remains (with four crania, 11 mandibles, 147 teeth and 11 postcranial elements) representing juvenile, subadult and adult specimens. The vast majority of this exceptional assemblage was found between 1921 and 1937, during the excavation of the sediments of Locality 1, dated to 780–680 ka. Attributed to *Sinanthropus pekinensis* by Black and Zdansky in 1927 and later finely described and moulded by Weidenreich, these fossils were later lumped within the *Homo erectus* hypodigm. In 1941, during World War II, the collection was lost during transport from the Peking Union Medical College (Beijing) to the American Museum of Natural History (New York). Today, the only evidence of the lost assemblage includes the detailed description of the fossils with pictures and radiographs published by Black and Weidenreich, and a series of 130 first-generation, high-resolution plaster casts of crania, teeth and post-crania curated at the AMNH. Only 15 original fossil human remains from Zhoukoudian are available for study to this

day, including a piece of frontal bone, an occipital bone fragment, a mandible, 10 isolated teeth, a humerus, and a tibia.We present here the preliminary results of our work aiming to revise all the human remains from Zhoukoudian. We obtained high-resolution surfaces of the casts of postcranial and large cranial elements using Einscan Pro scanners and we scanned dental casts with both laser-based and microCT scanners. We also microCT scanned the 10 fossil isolated teeth. Altogether, these data provide new ways to investigate the Zhoukoudian *H. erectus* assemblage and should help reveal more biological information on this extinct human group. To this aim, the virtual archive of the casts will be published online and accessible to the scientific community, accompanied by key archival records, and measurements from original casts and surface models.

Funding source: Funding provided by Région Nouvelle Aquitaine (project Zhoukoudian revival), the AMNH's Yaghian Fund for Anthropology.

Denisovans from Baishiya Karst Cave on the Tibetan Plateau

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Abstract: In East Asia, mysterious Denisovans so far are only found in Baishiya Karst Cave (BKC) on the Tibetan Plateau. A human mandible found in the 1980's in BKC is confirmed to be from a Denisovan at least 160-thousand-years-old based on paleoproteomic analysis and U-series dating of carbonate crust outside of the fossil, providing the first Denisovan fossil evidence outside of Denisova Cave and the earliest human occupation evidence on the Tibetan Plateau (Chen et al., 2019). Subsequent archaeological excavation in BKC reveals that prehistoric human occupied the cave for a long time from the late Middle Pleistocene to the Late Pleistocene. Comprehensive studies of stratigraphy, chronology, archaeology and mitochondrial DNA extracted from the sediments in BKC suggest that Denisovans occupied the cave ~100 thousand and ~60 thousand years ago (ka) and possibly as recently as ~45 ka (Zhang et al., 2020). The long-term and intensive occupation of BKC by Denisovans suggests that they may have adapted to life at high altitudes and may have contributed such adaptations to modern humans on the Tibetan Plateau.

Using zooarchaeology by mass spectrometry and Shotgun proteomic analysis, a new human specimen that dates to approximately 48–32 thousand years ago (layer 3) has been screened out from more than 2000 bone fragments and identified to be a new Denisovan bone (Xia et al., 2024). It extends Denisovan's presence at Baishiya Karst Cave well into the late Late Pleistocene. This combined zooarchaeological study also reveals that, throughout the stratigraphic sequence, the faunal assemblage is dominated by Caprinae, together with megaherbivores, carnivores, small mammals and birds. The high proportion

of anthropogenic modifications on the bone surfaces suggests that Denisovans were the primary agent of faunal accumulation. The chaîne opératoire of carcass processing indicates that animal taxa were exploited for their meat, marrow and hides, while bone was also used as raw material for the production of tools. This new study sheds light on the behaviour of Denisovans and their adaptations to the diverse and fluctuating environments of the late Middle and Late Pleistocene of eastern Eurasia.

青藏高原白石崖溶洞遗址的丹尼索瓦人

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摘要：在东亚，神秘的丹尼索瓦人目前仅在青藏高原的白石崖溶洞遗址发现。20世纪80年代在白石崖溶洞发现的一件人类下颌骨化石，通过古蛋白质组学分析和化石外包裹的碳酸盐结核的铀系测年结果显示，其为距今至少16万年前的丹尼索瓦人化石。这是丹尼索瓦洞以外发现的第一件丹尼索瓦人化石证据，也是青藏高原上最早的人类活动证据（Chen et al.，2019）。白石崖溶洞遗址随后的考古发掘和多学科研究揭示，从中更新世晚期到晚更新世，史前人类曾长期在该洞穴活动。综合地层学、年代学、考古学以及沉积物DNA分析结果表明，丹尼索瓦人在大约距今10万年、6万年，甚至晚至距今4.5万年，都生活在该洞穴 (Zhang et al., 2020)。系列研究显示，丹尼索瓦人曾长期生活在白石崖溶洞，表明他们可能已经适应了高海拔环境，并可能为青藏高原上的现代人群适应高海拔环境提供了基础。

利用质谱动物考古学和鸟枪蛋白质组学分析，从白石崖溶洞遗址发掘获得的2000多件骨头碎片中筛选出了一件可追溯到大约距今4.8-3.2万年前(第 3 层)的新的人类骨骼化石标本，并被鉴定为新的丹尼索瓦人骨骼 (Xia et al., 2024)。它将丹尼索瓦人在白石崖溶洞遗址的活动时间进一步延伸到了晚更新世晚期。这项综合动物考古学研究还表明，在整个地层序列中，动物群落以羊亚科动物为主，还有大型食草动物、食肉动物、小型哺乳动物和鸟类。骨骼表面的人为改造比例很高，这表明丹尼索瓦人是动物群骨骼的主要聚集着。动物尸体加工的操作链分析表明，动物资源被古人类进行了充分利用，包括肉类资源、骨髓和皮毛等，而骨头也被用作生产工具的原材料。这项新研究不仅揭示了丹尼索瓦人的动物资源利用行为，而且对于我们理解他们对适应欧亚大陆东部多样的、波动的中更新世晚期和晚更新世的自然环境有重要启发。

Early *Homo erectus* in eastern Africa

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Abstract: The discovery of hominin fossils at Trinil (Java, Indonesia) in 1891 and 1892 and their attribution by Eugène Dubois to the new species *Anthropopithecus* (now *Homo*) *erectus* is a milestone in the study of human evolution (Pop et al., 2024). It represents the first active search for early fossil evidence, followed by systematic excavation and publication of the findings. From the 1920s onwards more fossils that are now part of the core hypodigm of *H. erectus* were found in China and Indonesia. The species thus became well-documented in a relative short period of time, even though it was not until decades later that all specimens were interpreted as representing a single species of the genus *Homo* (Weidenreich, 1940). Since the 1930s hominin fossils from northwest and southern Africa have been likened to *H. erectus,* but the presence of this species in Africa only became accepted after the large calvaria OH 9 was discovered at Olduvai Gorge in 1960 (Leakey, 1961). Subsequent finds in the Turkana Basin of northern Kenya (e.g. Leakey, 1976; Brown et al., 1985) strengthened this interpretation, but also resulted in proposals that these specimens represent a separate species, *Homo ergaster* (Wood, 1992). To this day the fossil record of *H. erectus* is dominated by a large number of neurocranial specimens, and it is this anatomical region that provides the most consistent diagnostic features. As a consequence, attribution of craniofacial and mandibular fossils is generally less certain, especially in eastern Africa where two other early species of the genus *Homo* are known from the same time period. In our presentation we will consider the early fossil record of *H. erectus* from Kenya and Tanzania, with special reference to ongoing research assessing specimens with uncertain affinities.

Brown, F., Harris, J., Leakey, R., & Walker, A. (1985) Early *Homo erectus* skeleton from

west lake Turkana, Kenya. Nature, 316, 788-792. Leakey, L.S.B. (1961) New Finds at Olduvai Gorge, Nature 189, 649-650. Leakey, R.E. (1976) New hominid fossils from the Koobi Fora formation in Northern Kenya. Nature, 261, 574-576.Pop, E., Noerwidi, S., & Spoor, F. (2024) Naming *Homo erectus*: A review. J. Hum. Evol. 190, 103516. Weidenreich,, F. (1940) Some problems dealing with ancient man. Am. Anthropol. 42, 375–383. Wood, B. (1992) Origin and evolution of the genus *Homo*. Nature 355, 783-790.

Hominin brain variation: the case of *Homo erectus*

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Abstract: The study of the human brain and its evolution is a complex subject. Indeed, the brain does not fossilize and we only have access to the internal surface of the skull which partially reflects the shape and characteristics of the brain. Here we present a quick summary of the work carried out on this subject.

Then we present the main results obtained within the framework of a recent project, the paleobrain project. Its goal has been to improve our ability to determine brain-related traits observed on the endocast. Concerning *Homo erectus*, the shape and structure of the endocranium illustrates primitive characteristics relative to the other well-documented human species, *Homo sapiens* and *Homo neanderthalensis*. A better appreciation of the characteristics of these different groups is fundamental to better understand the anatomical specificities of particular specimens, which are more difficult to classify. Thus, our prospects are to improve our ability to "read" the endocast and to better document the diversity of the endocast, particularly within *Homo erectus*.

Origins of agriculture in Central Asia - 9000-year-old barley remains in Toda Cave

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Abstract: Scholars are increasingly favoring models for the origins of agriculture that involve a protracted process of increasing interdependence within a series of mutualistic relationships between humans and plants, as opposed to a rapid single event or innovation1-3. Nonetheless, these scholars continue to debate over when people first started foraging for grass seeds, when they began to readily utilize sickles, how prominent the early selection pressures were, and when the first traits of domestication fully introgressed into the cultivated grass population4,5. Here we present complementary archaeobotanical and archaeological (stone tool) evidence for cereal foragers from Toda-1 Cave in the Surkhan Darya, dating to 9200 cal BP. We conclude that early Holocene foragers were processing grains along with nuts and fruits as far north as the rich river valleys of southern Uzbekistan. These data expand the known range that pre-agricultural cereal foragers covered in the early Holocene, adding to our understanding of the cultural processes that led to farming. Additionally, we present the earliest evidence for people interacting with the progenitors for pistachios and apples (or a close apple relative). The complex foraging behaviors that led to cultivation were being undertaken by people during the early Holocene across a wider area of Eurasia than previously thought.

中亚农业起源——Toda洞穴9000年的大麦遗存

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摘要：学者们越来越倾向于认为农业的起源是人类和植物之间一系列互惠关系中不断增长的相互依赖的长期过程，而不是一个快速的单一事件。尽管如此，这些学者仍在继续争论人类何时开始觅食草种子，何时开始使用镰刀，早期的选择压力的形态特征表现，以及驯化的第一个特征何时完全渗入到栽培的作物中。在这里，我们提供了来自苏尔汗河Toda-1洞穴的9200 cal BP的早期谷物的考古植物学和考古（石器）证据。结论认为，全新世早期在中亚乌兹别克斯坦南部山麓地区的前陶新石器人群加工谷物、坚果和水果，这种经济模式与西南亚及伊朗地区的人群扩张相关。这些数据扩大了全新世早期农业前谷物采集者的已知范围，增加了我们对导致农业的文化过程的理解。此外，我们提出了最早的证据，证明人们与开心果和苹果的祖先（或苹果的近亲）互动。我们的数据证明，在全新世早期人群在欧亚大陆的更广阔地区进行了复杂的觅食行为，而这些行为促进了中亚山麓农耕活动的起源。

OSL dating reveals interactive migrations of Western and indigenous populations in north China during the last glacial

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Abstract: The timing and mechanism of modern human's dispersal and occupation into North China, especially cultural interactions between exogenous Paleolithic populations and those indigenous to East Asia during the Late Pleistocene are of great interest.

Homo sapiens dispersed eastward into Siberia and Northeast Asia after ~45 ka. When anatomically modern humans crossed the Mongolian steppe/desert and dispersed further across East Asia, encounters between allochthonous modern humans and indigenous hunter-gatherers inevitably occurred, possibly leading to population replacement and geographical shifts. How they colonized and interacted with autochthonous Paleolithic populations in East Asia remains ambiguous.

In this study, two Paleolithic sites (YZXS and TZL) located in the southern piedmont highland of the Yanshan Mountains, with artifacts typified by simple core and flake technology associated with foraging populations, have been dated to ~39-29 ka and ~53-47 ka respectively, using Optically Stimulated Luminescence (OSL). Our results suggest that North China south to the Yanshan Mountains was occupied mainly by autochthonous East Asian Paleolithic populations using a core-flake technology, although during this period Initial Upper Paleolithic (IUP) modern human populations have been present in Western Europe and dispersed into Asia. By synthesizing and integrating the ages of Northeast Asian Paleolithic sequences during the last glacial period (ca.70-10 ka), we analyzed spatio-temporal variations in Late Pleistocene human populations during relatively cold stadial events (MISs 4 & 2) and warmer interstadials (e.g., MIS 3), revealing an "ebb and flow" pattern for migrations of the Western IUP "blade" populations and indigenous "core-flake" populations in East Asia

corresponding to the advance and retreatment of the East Asian monsoon belt around the Greater Khingan and Yanshan mountain ranges. During relatively cold MIS 4, only a few small indigenous human populations remained in the Qinling Mountains and along the North Chinese coastline. During subsequent MIS 3, a warm climate both facilitated expansion of the autochthonous "core-flake" population size and the dispersal of populations whose lithic technology focused on the production of blades. However, the subsequent extremely cold climate phase engendered a major population shift during the Last Glacial Maximum (LGM; ca. 26.5-19 ka), which drove the recession of both these Paleolithic populations, but afterward facilitated the emergence and rapid dispersal of microblade populations in Northeast Asia, including North China. These populations associated with microblade technologies achieved their maximum extent during the warm Bølling-Allerød interstadial event (ca. 14.7-12.9 ka) and then gradually decreased, perhaps due to the development of agriculture after ~13 ka.

Keyword: Late Pleistocene hunter-gathers, IUP population changes, Core and flake technology, Microlithic technology, East Asian monsoon

Upper Paleolithic burials from the territory of Russia: reconstruction of burial traditions according to anthropological data

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Abstract: Most paleoanthropologists are aware of the Upper Paleolithic graves of Sunghir (Russia), because of the highly elaborate treatment with an abundance of decoration and grave goods never seen previously for this period. Two adolescent boys from Grave 2-one (Sunghir 3) approximately 10 years of age and the other (Sunghir 2) closer to 12 years old-were buried head to head, while a 35-45-year-old adult male (Sunghir 1) was buried adjacent to them (Grave 1). Next to the left humerus of Sunghir 2, archaeologists recovered the broken shaft of an adult femur (Sunghir 4) stuffed with ochre. The site, discovered in 1956, has been the subject of many archaeological and anthropological investigations.

The mortuary behaviours at Sunghir are presented within Mid Upper Palaeolithic (Gravettian sensu lato) mortuary contexts with descriptions of the application of ochre at the bottom of the grave, and to the bodies and clothing, the location of different adornments, including abundant mammoth ivory beads (c. 3,000 for Grave 1 and c. 13,000 for Grave 2), and grave goods (knifes, darts and the mammoth ivory spears placed alongside the bodies of the boys in Grave 2).

Despite the apparent exceptionally elaborate treatments of the Sunghir individuals, parallels to most of what was found at Sunghir' graves have been discovered at other synchronous European sites. It is also discussed the selection of buried people based on biological criteria (age-at-death and sex) and paleopathological one (traumas and abnormalities) while genetic background of the Gravettian people.

The paleoanthropological study using paleopathology and paleogenetics techniques allows us to discuss the causes of death and the life style of an adult man and two adolescent boys. These data provide an opportunity to interpret the burial rites as well as the social status in Upper Paleolithic hunter-gatherer society.

主题：旧石器时代文化与行为模式

Paleolithic Culture and Behavioral Patterns

The Obirakhmatien bladey Middle Paleolithic in Central Asia: in search of ancestry

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Abstract: Early systematic production of large blades at the beginning of Middle Paleolithic (EMP) in the Levant, associated with the anatomically modern humans (AMH) at Misliya cave, existed there from 220 to 140 ka, and then disappeared. However, recent archaeological evidence from Central Asia prompts a reconsideration of this thesis. Here we describe archaeological assemblages from Obi-Rakhmat and Kulbulak sites, located in the Western Central Asia, dating from 180 to 65-40 ka BP. Their distinctive assemblage closely resembles the Levantine EMP at a distance of more than 3000 km west of Central Asia sites. Levantine population brought with them a material culture which, even after extensive geographical relocation, remained in its original state for millennia. New population continuously inhabited western Central Asia up to 40 ka BP, in contrast to the Levant. The diagnostic anthropological remains known from Obi-Rakhmat are dated to 70 ka and possess mosaic characteristics of modern and archaic populations, likely AMH and Neanderthals. This fact in the face of the unchanging state of the lithic industry highlights the limits in our understanding of early population processes in Central Asia. This is the first instance of long-distance dispersal involving early AMHs and it is linked to a distinctive Paleolithic industry.

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Hominin evolution path and behavior model in Pleistocene China

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Abstract: The past two decades have witnessed rapid accumulation of Paleolithic archaeological data in China. Due to additional archaeological discoveries and in-depth research, the history of human biological evolution and cultural development in Pleistocene China has be reconstructed completer and more accurate than ever before, and understanding of the dynamics of the unique characteristics of Paleolithic industries and human evolution and adaptation in the region has been deepened and become more comprehensive .

While it is clear that Pleistocene China was never an absolutely isolated area for the survival of certain hominin groups, and Paleolithic remains in the region were not necessarily the remnants of a "cultural backwater," and although Paleolithic industries in China and East Asia share some features in common with those of western Eurasia and Africa, it is also undeniable that the Chinese Paleolithic industries do exhibit unique developmental trends. Most Paleolithic industries in the region are characterized by the strong persistence of core-flake tools dominated by scrapers in North China and pebble tools typified by choppers and picks in South China. On their development trajectory, "lithic industries in China hardly follow the traditional definitions of the Lower, Middle, and Upper Paleolithic commonly employed in western Eurasia. …the long-term continuity of artifacts known as core choppers, core and flakes…do not fit within the Eurocentric subdivision of the prehistoric periods mentioned above." (Ofer Bar-Yosef, 2012).

Changes do occur within these industries, but they take the form of gradual renovation and refinement in which the core of lithic technology and tool-kit composition remains stable. Rapid replacement by new techno-complexes seldom occurred. The so-called "western cultural elements", such as the Acheulean-like industries, the Mousterian industries and blade-based industries, emerged only temporarily in limited regions and their influence on mainstream autochthonous

industries was not very profound or long-lasting.

What we need to do is try to understand the Chinese Paleolithic on its own terms instead of trying to shoehorn it into preconceived paradigms from the West. To interpret the unique path of hominin evolution and cultural features in Pleistocene China, an Adaptive Behavioral Model is proposed. It is suggested that the so-called simple core-flake and pebble tools in Paleolithic China were sufficient and suitable for hominin survival and adaptation to a relatively stable paleoenvironment. During the coupled evolution of humans and their environments, a comparatively stable cultural tradition emerged. This cultural tradition was maintained and reinforced by a set of flexible human behavioral patterns, including high mobility, a pragmatic attitude toward the fabrication of expedient stone tools and the exploitation of available resources, simple and flexible lifestyles, etc. As such a cultural tradition took shape, it possessed its own life, members of the community shared a common cultural pathway, and exogenous influences were largely rejected unless severe environmental changes or major migrations occurred.

更新世中国人类演化路径与行为模式

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摘要：最近二十年间，中国地区的旧石器考古材料显著增加。新材料的发现和研究的深化，使该地区人类演化的历史重建比以前更加全面和精细，对该地区旧石器文化独特性的成因和人类演化适应机制的探讨也更加深入和全面。

研究表明，更新世的中国并非与外界完全隔离的封闭之地，这里的古文化也绝非一潭死水，东西方旧石器时代文化具有某些方面的共性。但中国、东亚旧石器时代文化具有明显的区域特点也是毋庸置疑的，而且这些石器技术和人类适应方式特色一直居于该地区文化的主流。

这些文化现象的背后原因是什么？除了该地区相对独立和稳定的自然环境的影响和主流人群连续演化的群际效应，古人群特定的行为方式所形成的具有强大惯性发展和裹挟力的文化传统也应该是重要原因。本报告对“旧石器时代东方行为模式”加以阐述，以期抛砖引玉，深化对相关问题的讨论。

Revisiting models in Paleolithic archaeology

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Abstract: For the past century, Paleolithic archaeology in eastern Asia (East and Southeast Asia) has long had its roots in western Eurasian and to some extent, American, schools of thought. This included westerners coming to eastern Asia and influencing the development of the field and occasionally, an Asian scholar receiving training in the West and returning to the East with a more western view of the eastern Asian record. Some of these interactions have been quite influential in developing Paleolithic research in eastern Asia. For instance, the interdisciplinary approaches that are common in eastern Asia today finds its roots in western schools working in places like Europe and Africa. However, what this has also meant is the near-universal application of models developed for western Eurasia and Africa to the eastern Asian record, often, unfortunately, regardless of fit. Good examples of this are the long-standing influence in eastern Asia of the Movius Line and the simple application of the three stage Paleolithic model that was initially based on the European record. Although some may ask why this is a problem, a bigger question that should be posed, particularly of Asianists, is why must we be "required" to find typical western Eurasian and African handaxes and/or Levallois technology in the areas in which we work to supposedly justify our work and findings? After all, is eastern Asia the same as Europe and/or Africa? In this presentation I will delve more deeply into such provocative questions and challenge eastern Asian scholars to develop models that more correctly represent the Asian record as we currently understand it. In this age of decolonizing our field, we can and should be doing more to stand on our own.

Archaeological evidence suggests two hominin populations shared Middle Pleistocene Europe and likely beyond

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Abstract: Based on archaeological evidence from Middle Pleistocene sites in Europe, in 2010 we offered a hipothesis that two different hominin populations shared European environments during most of the Middle Pleistocene, from about 800 ka to about 300 ka ago. One of these populations was related to the Acheulean bifacial stone working tradition and another related to a post-Oldowan non-bifacial stone working tradition that we called Premousterian, following the definition offered by Hugo Obermaier in the 1920s.

Makers of the European Oldowan represent the European branch of *Homo erectus*, which earlier form is defined *Homo erectus* georgicus (in Dmanisi) and the later form is defined *Homo antecessor* (in Atapuerca). This Oldowan making initial hominin population in Europe well adapted to mild climates in Mediterranean European ecosystems and since about 1.0 Ma started expansion into northern European ecosystems with cold, snowy winters. The Premousterian tradition, the makers of which are not yet represented by definable anthropological remains and can be provisionally called "population X", shows derived Oldowan characteristics, such as core-choppers, small flakes and flake-tools, and lacks characteristic Acheulian features, such as production of large cutting tools, and large flake, Levallois, and laminar technologies. The Premousterian tradition was represented during the Middle Pleistocene in Europe and south-western Asia, beyond the areas of Acheulian expansion in Europe and south-western Asia.

The Acheulian-making hominins invaded to Europe and south-western Asia from Africa in the onset of Middle Pleistocene. Makers of Acheulian industries in Africa and Europe are defined as *Homo heidelbergensis* sensu lato. The Acheulian expansion in Europe and was a stepwise process. Also, during the

Final Acheulian stage we see the evolutionary transition from *Homo heidelbergensis* to *Homo neanderthalensis.*

A comparison of the Acheulian and Premousterian assemblages shows major differences between these two hominin populations in Europe:

Acheulian population	Premousterian population
Gradual technological development	Technological stability, lack of technological development
Gradual territorial expansion, likely indicating population growth	Territorial stability, likely indicating lack of population growth
Gradual adaptation to moderate continental environments, likely indicating adaptational sensibility to continental climate	Pre-adaptation to moderate continental environments, indicating developed adaptability to continental climate
Progressive evolutionary development towards neanderthalization	Anthropological stability, lack of evolutionary development towards neanderthalization
Evolutionary ancestral population to Middle Palaeolithic Neanderthals	Probable population extinction due to Neanderthal expansion to moderate continental environments

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After the Acheulean: The lithic-fauna nexus in the Levant and beyond

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Abstract: Significant cultural and biological transformations took shape in the course of the process of changes from Acheulean to post-Acheulean human adaptations in the Levant and beyond. In this talk I will put an emphasis on the lithic-fauna nexus, in an attempt to correlate between faunal turnovers/transformations and possible related technological preferences. I will focus on the dependency of Paleolithic human groups on large game and the significant relations between hunters and their prey. I will suggest that human interactions with animals were not only practical and economic, but based on ontological and cosmological conceptions. Thus, changes in the availability of major game animals might have necessitate a significant modification in human mode of adaptation, which is not only practically oriented. Furthermore, several behavioural transformations characterizing the Acheulean and post Acheulean continuum will be viewed in light of the evidence for the decline in game size during the Pleistocene. This talk will attempt at presenting a new model for reconstructing changes in human adaptation during Middle Pleistocene times in the Levant and beyond.

Keywords: Acheulean, lithic-fauna nexus, human adaptation, behavioral transformations, ontology and cosmology

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Preliminary analysis on the lithic assemblage from the Ishinomoto Site Loc.8 in Kumamoto Prefecture, Japan (日本熊本县石之本遗址 8 区石制品的初步分析)

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Abstract: The assemblage from layer VIb of the Ishinomoto (石の本) site loc.8 in Kumamoto Prefecture, one of the oldest Upper Paleolithic assemblages (UP) in Japan (ca.33,400-32,800 14CBP: 38,300-36,300 calBP, Morisaki et al. 2020), exhibits several similarities with the denticulate tool industry (Industry D) in North China (Huabei), especially in the Shandong District (SD). These similarities include the following characteristics:

(1) The main lithic raw materials are collected from the vicinity of the site.

(2) The main flaking technology produced irregular flakes without prepared core technology, and blade technology cannot be found.

(3) Denticulate flaking is often used for secondary retouching of lithic tools.

(4) The main tools included the denticulate tool group (denticulate tools, notches, and becks), thick side scrapers (limaces), and pointed tools with marginal retouch.

Of course, there are also differences between the denticulate tool industry of SD and the Ishinomoto assemblage. For example, in SD, polyhedral and cubic cores are used, whereas the Ishinomoto assemblage used cores on platy flakes. However, as pointed out by Morisaki et al. (2020), this may be related to the quality of porous andesite, which is the main lithic raw material in Ishinomoto. Both Industry D in SD and the Isinomoto assemblage used flaking technology to produce irregular flakes without using the prepared core technology.

In addition, the Ishinomoto assemblage has trapezoid tools and edge-ground axes, which have not been detected in SD. The main reason for the lack of

trapezoid tools or their progenitors, such as partly retouched and hafted tools, is that the materials have not been sufficiently observed, and the existence of these tools is certain owing to their typological similarity with the paleolithic assemblage in other districts of N. China.

The similarities between the Ishinomoto assemblage and Industry D in N. China mentioned here can also be pointed out in the other oldest UP in Kyusyu, such as the assemblage from layer VI (lower level) of the Uwaba (上場) site in Kagoshima Prefecture. Thus, we can see a strong similarity between the oldest UP in Kyushu and Industry D in SD of N. China.

Nagai (2018) pointed out the similarity between the oldest UP in Kyushu and denticulate tool assemblages in the Korean Peninsula. Although we did not observe them, Nagai (2018) and others indicate that they are similar to Industry D in SD. Therefore, we can recognize the technological connections between UP in SD, Kyusyu, and South Korea. It is presumed that the oldest UP in Kyusyu or the Paleo-Honsyu Island (古本州島) developed from Industry D diffused directly from SD or via the Korean Peninsula.

分组报告 1：古人类化石新发现和新成果

Session 1 New Discoveries and Advances in Fossil Hominins

主题：古人类演化路径（Evolutionary Route of Hominins）

Face to face: a mathematical algorithm applied to reconstruct the fossil hominin's appearance

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2.

Abstract: The reconstruction of faces for humans of the past has always been an intriguing question in paleoanthropology. Most often, these are digital or manual productions guided by soft-tissue databases. In this work, we applied a mathematical algorithm developed as part of two doctoral theses (Nardoni 2017, Uro 2019).

This algorithm, called FaciLe, applies mesh deformation techniques known as morphing and warping. It proposes a deterministic facial reconstruction method working from a database composed of *Homo sapiens* skulls and their faces (N=40) to calculate an elastic deformation between one of its reference skulls (from the database) with a known face, and the skull for which the face is to be reconstructed.

We tested the applicability of this method on non-*Homo sapiens* individuals using the skull of a *Homo heidelbergensis* (Arago 21, Tautavel, France, 500 ka) and that of a toothless Neanderthal (La Chapelle-aux-Saints, Corrèze, France, 50 ka). The results have the advantage of generating neutral faces, with no secondary characters (eye color, skin color, facial hair), which breaks with the

stereotypes conveyed by artists' works. On the other hand, because they are based solely on a set of *Homo sapiens* used as references and applied to skulls that are mostly incomplete or damaged, the facial reconstructions for these fossils are biased. Ongoing development of these methods will enable us to overcome these limitations in the future.

The unique semicircular canal morphology of Indonesian *Homo erectus* from Sangiran

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Abstract: *Homo erectus* plays a central role in deciphering the evolutionary history of the genus *Homo*. The species populated mainland Asia at least 1.7 Ma ago and reached the Indonesian archipelago as early as 1.5-1.4 Ma, as testified by the hominin remains recovered at the Sangiran dome in Java. Among the several craniodental specimens, the partial calvaria Sangiran 2 and 4 (S2 and S4) represent two of the most iconic remains. Originally regarded as pertaining to two different species due to clear differences in robustness (S4 being much more heavily built than S2), they are now included in *H. erectus*. However, the relationship among *H. erectus* populations, as well as between *H. erectus* as a whole and African early *Homo* species (e.g., *Homo ergaster*) is still a matter of contention.

Previous analyses have shown that the semicircular canal and vestibule morphology embeds a strong phylogenetic signal and is a useful proxy to infer the phylogenetic affinities of extinct hominin taxa. Here we thus inspect the vestibular system morphology of S2 and S4 to assess their phylogenetic affinities with early hominins and within *Homo erectus*. First, we provide a detailed

description of the semicircular canal and vestibule shape. Second, we analyze it using diffeomorphic surface matching, which allows direct comparisons among continuous surfaces and that has been proven very useful to assess phylogenetic affinities among extinct hominin species. The vestibular apparatus of S2 and S4 was compared to a broad sample of Plio-Pleistocene hominins comprising australopiths (*Australopithecus africanus* [n=15] and *Paranthropus robustus* [n= 7]), East (n=5) and South African (n=2) early *Homo*, and Chinese *Homo erectus* (n=3). The raw shape data was inspected by means of principal component analysis (PCA) to assess the main patterns of shape variation, as well as between-group PCA (bgPCA) and canonical variate analysis (CVA), aimed to inspect the grouping structure in the morphological data. CVA and bgPCA used genus (*Paranthropus*, *Australopithecus*, and *Homo*) as grouping factor.

Our results show that Sangiran 2 and 4 possess clear affinities with other members customarily included in the genus *Homo* and both bgPCA and CVA classify them within *Homo*. Typical *Homo* features include the presence of large, rounded anterior and posterior canals, as well as a small lateral canal that separates the posterior canal plane in two roughly equally sized portions. This is opposed to the australopith condition, which is characterized by a much more inferiorly positioned lateral canal, as well as the opposite state for the size of the lateral canal relative to the vertical ones. However, both S2 and S4 show an extreme reduction in lateral canal size, to a degree that is unparalleled in other *Homo* individuals. Similarly, the anterior canal forms an acute angle with the lateral canal, which is instead close to the right angle in *Homo*. These feature cause S2 and S4 to fall at the edge of the distribution for the genus *Homo* in the PCA. Interestingly, our analyses do not recover clear affinities with mainland *H. erectus* individuals (Hexian and Lantian), as the latter display a larger and more inferiorly positioned lateral canal. The Chinese specimens are also distant from one another in the morphospace.

The analyses here presented are in line with the existence of multiple variants of *H. erectus* in mainland and insular Asia, which could be the result of divergent chronogeographical evolutionary trends and genetic isolation. Particularly, the unique lateral canal arrangement found in S2 and S4 is likely the effect of local evolutionary processes, favored by the island context of Java.

Paleo-Syndemics and human resilience: The changing demography and epidemiology of North China's Neolithic to Iron Ages

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Abstract: To explore the origins of modern human populations and health in China and globally, it is important to look back into the ancient remains of the past. Using a proposed framework of "Paleo-Syndemics" to describe Holocene populations from North China, we are able to demonstrate that the ancient peoples from this geographically and environmentally diverse area were resilient through their biological and cultural adaptations. Proposed to describe ways that modern epidemics interact and mutually enhance one another within specific temporal, geographic, and social structures, the concept of "Syndemics" has been extended to explore historic population health, but not yet the pre-historic. Osteoarcheological studies are poised to take advantage of this framework of overlapping health conditions and biocultural structures to investigate prehistoric population health through concepts of frailty and resilience and within the context of high-resolution archaeological data. Utilizing a meta-analysis of the published paleo-demographic data from 92 Neolithic to Iron Age (10,000 BCE -0) sites from North China that contained the skeletal remains of 22,726 individuals, along with paleoclimatic reconstructions, we use demographic measures as a proxy for underlying health along with data from macroscopic observations of non-specific stress indicators from 1,000 individuals to describe the cultural and biological adaptations of North Chinese prehistoric populations that made them resilient despite global climate change and evidence for increased, zoonotic disease transmission. The demographic and environmental conditions of Northern China were defined by consistent population growth during climatic cooling and aridification at the end of the Holocene Climate Optimum and the 4.2k Rapid Climate Change event, and this bioarchaeologically contextualized synthesis illuminated that Neolithic to Bronze Age populations demonstrated

flexible behavioral adaptations by intensifying millet agriculture, livestock rearing, and habitat exploration throughout time and ecosystem change while undergoing an epidemiological shift. This project is supported by NSF grant #BCS#2040388 to Q. Wang.

古综合病理学与人类适应力：中国北方新石器至铁器时代人口与流行病学的变迁

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摘要：要探究中国乃至全球现代人类人口和健康的起源，回顾过去的古代遗迹非常重要。使用“Paleo-Syndemics”这一拟议框架来描述华北全新世人口，我们可以证明，来自这一地理和环境多样化地区的古代祖先通过其生物和文化适应而具有韧性。“Syndemics” 这一概念旨在描述现代流行病在特定的时间、地理和社会结构中相互作用和相互促进的方式，现已扩展到探索历史人口健康状况，但并未涵盖史前人口健康状况。骨考古学研究准备利用这种健康状况和生物文化结构重叠的框架，通过脆弱性和韧性概念以及高分辨率考古数据的背景下研究史前人口健康状况。利用对华北地区 92 个新石器时代至铁器时代（公元前 10,000 年 - 公元 0 年）遗址已发表的古人口统计数据的荟萃分析，这些数据包含了 22,726 具尸体，结合古气候重建，我们使用人口统计学指标作为基本健康状况的指标，结合对 1,000 名个体的非特异性压力指标的宏观观察数据来描述华北史前人群的文化和生物适应性，正是这种适应性使他们在全球气候变化和人畜共患疾病传播增加的证据下仍能保持韧性。中国北方的人口和环境条件是由全新世气候适宜期末期和 4.2k 气候变化事件期间气候变冷和干旱期间的持续人口增长决定的，这种生物考古学背景的综合表明，新石器时代到青铜时代的人口通过加强粟农业、畜牧业和栖息地探索表现出灵活的行为适应能力，并随着时间和生态系统的变化而经历流行病学的转变。该项目得到 NSF-BCS#2040388 对王谦(Q. Wang)的资助。

Middle Pleistocene enamel proteome from Zhoukoudian site resolves *Pachycrocuta* phylogeny

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Abstract: The evolutionary and dispersal history of hyenas (Hyaenidae) is not only representative of the evolution and turnover of Quaternary mammalian fauna, but also closely related to global environmental events. This provides valuable insights for studying the evolution and adaptation of hominids. However, due to the influence of convergence and incomplete fossils, morphological studies of the Hyaenidae family during the Quaternary period in East Asia still contain numerous controversies. Since the establishment of the giant hyena clade (*Pachycrocuta* sp.) in 1938, there has been ongoing debate about its phylogenetic relationships with the three extant hyaena species, i.e. spotted hyena (Crocuta sp.), striped hyena (*Hyaena* sp.), and brown hyena (*Parahyaena* sp.). We still do not know which extant clade is most closely related to giant hyena, which necessitated molecular data. However, the degradation susceptibility of ancient DNA has resulted in a severe lack of genomic data for Hyaenidae fossils, especially for those fossils older than 50 ka. Recent advances in mass spectrometry have enable the retrieve of ancient proteins from middle Miocene materials, which makes ancient protein analysis a promising approach in Paleontology area. In this study, we take advantages of the good preservation of ancient proteins and have retrieved endogenous enamel proteome from four giant hyena teeth from Zhoukoudian Locality 1 (0.6 - 0.2 Ma) in Beijing. This is the first molecular data for this species. Based on the protein sequences, a phylogenetic tree was constructed to explore the evolutionary relationships between giant hyena and extant hyaenas.

Keywords: Ancient protein analysis; Phylogeny; Giant hyena; Zhoukoudian Locality 1

Combined palaeoproteomic and geometric morphometric analyses of Early-Middle Pleistocene hominid teeth from the Sangiran Dome, Indonesia

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The Sangiran Dome in Java holds the most extensive hominid fossil records of Southeast Asia, providing evidence of an early dispersal of *Homo erectus* onto the Sunda Shelf during the Early Pleistocene. The high morphological diversity observed in these fossils has been associated with a high diversity of hominid species on Java during the Pleistocene. Based on the analysis of phylogenetically-informative internal dental structures, such as the enamel-dentine junction (EDJ), three genera have been confirmed: *Homo erectus*, *Pongo* sp., and the enigmatic species *Meganthropus palaeojavanicus*. The high diversity in hominid species on Java raises intriguing questions about their interspecies interactions and the occupation of different ecological niches. Determining their respective position within the Hominidae family is vital for comprehending the processes of speciation, adaptation, and extinction of these hominid taxa in Southeast Asia. We used combined high-resolution tandem mass spectrometry to sequence enamel peptides and geometric morphometric analyses of the EDJ to recover biological and phylogenetic information. We conducted palaeoproteomic and geometric morphometric analyses on the teeth of *Homo erectus* and *Meganthropus* from Sangiran. Palaeoproteomics confirm that *Homo erectus* and *Meganthropus* are grouped within the Homininae subfamily. Subsequently, we ran geometric morphometric analyses on the EDJ of *Homo*

erectus and *Meganthropus* molars and we compared them with those of *Australopithecus*, *Paranthropus* and Early to Middle Pleistocene *Homo* samples. The results indicate that while H. erectus falls well within the variation of the *Homo* sample, *Meganthropus* teeth classify with *Australopithecus*. These results offer new insights into the phylogenetic relationships of *Meganthropus* and raise questions about its relationship with *Australopithecus*. Despite the challenges of protein preservation in dental remains from open-air tropical sites like Sangiran, the successful retrieval of ancient peptides underscores the potential of palaeoproteomics for studying hominids from the Early to Middle Pleistocene. As more specimens are analyzed, the expanded protein databases will enhance our ability to reevaluate phylogenetic relationships. Combining EDJ morphology with palaeoproteomics provides a strong foundation for further exploring the evolutionary relationships and palaeodiversity of Pleistocene hominids in Southeast Asia.

主题：现代人起源和演化模式

Pattern of Modern Human Origin and Evolution

Testing the molecular models of modern human origins

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Abstract: Molecular studies have yielded two primary models for understanding the uniparental DNA phylogenetic trees of modern humans: the Recent Out of Africa (ROA) and the Recent Out of East Asia (ROE) models. These models differ in their underlying assumptions and the topology of early stem haplotypes, even though they share many haplotype relationships. Three types of new DNA data have emerged that could be used to independently test these models, including complete sequencing of Y chromosomes, ancient DNA, and mtDNA variants collected from 56434 human individuals. We summarize the results of these tests, which have all turned out to support the ROE model. Using new genetic variants within the male-specific region of human Y chromosomes, we were able to corroborate the existence of stem haplotypes specific to the ROE model, but not those exclusive to the ROA model. We found that A0b and A1a shared the most variants with each other, aligning with the A00A1a clade of the ROE model. Also, stem haplotypes specific to the ROE model showed the expected relationships, with A00A1a closest to B, AB closest to E, E closest to B, A, and C, ABDE closest to C. Our findings on ancient and present Y chromosomes also revealed extensive variant sharing independent of common ancestry, consistent with the maximum genetic diversity theory underlying the ROE model but challenging the neutral theory behind the ROA model. These genetic tests lend robust support to the ROE model as the more accurate representation of modern human origins.

Cranial affinities of Late Pleistocene and Early Holocene hominins in East Asia based on 3D homologous analysis, implication of origin of the first layer in the concept of 'Two Layer' model of AMH dispersal

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Abstract: Our craniometric data analysis assigned the Late Pleistocene and early Holocene foragers in East Asia, as well as Hoabinhian in Southeast Asia, are all belonging to the "first layer" of dispersal in Eastern Eurasia, who pre-dated the expansion of Neolithic agricultural populations of East/Northeast Asian origin that is, the "second layer" of human dispersal proposed by our 'Two Layer' model (Sci Rep 9 1451 doi.org/10.1038/s41598-018-35426-z ; Sci Rep 11.20830 doi.org/10.1038/s41598-021-00295-6). We have conducted more extensive craniometrics analysis using novel 3D morphometric technique to test adaptive of this model in the vast Eurasian and African scale. The comparisons with the early and modern Eurasian, Oceanian and African samples revealed that the people of the "first layer" including pre-Neolithic East/Southeast Asians (including the Upper Cave, Liujiang Yahuai, Liyupo, and Huiyaotian) have closer affinity to modern Australo-Papuans, who extensively shared African features to some extent, than to the present-day Eurasian samples compared. This finding enables us more comprehensive interpretation that the Late Pleistocene through Early Holocene hunter-gatherers of pre-Neolithic stage were direct descendants of the atomically modern humans (AMH) who first migrated out of Africa to the East/Southeast Asia with their cranial shape being not substantially altered due to extreme climate condition, whereas present-day Eurasian people possess a different cranial shape generally attributed to a dry and/or cold climatic adaptation.

Late Pleistocene evidence of “fuso” from the Shiraho-Saonetabaru Cave site

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Abstract: Excavations at the Shiraho-Saonetabaru Cave site on Ishigaki Island have revealed archaeological evidence of continual and intermittent human use of this cave from late Late Pleistocene to Holocene. From the 1000+ largely fragmented human bone remains found in Pleistocene layers, nineteen individuals were identified, including one near-complete and two partial skeletons. Detailed documentation of the excavated remains allows us to infer that the Pleistocene people may have treated the corpses in a manner similar to the traditional funeral process called “fuso”. The word “fuso” literally means “burial in the wind” in Japanese. The “fuso” mortuary process was practiced in the Ryukyu Islands until quite recently. In this process, the corpse was placed on the floor until the flesh had disappeared. Caves and rock shelters were preferred locations for “fuso” treatment, and such places were often used as cemeteries. Our findings at the Shiraho-Saonetabaru Cave site indicate that the cave was used as a cemetery in the Pleistocene, and such funerary treatments like “fuso” could be traced back to the Late Pleistocene.

Structural properties of the Late Pleistocene Liujiang femoral diaphyses from southern China

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Abstract: The characterization of the femoral diaphysis in Pleistocene hominins with chronoecogeographical diversity plays a crucial role in evaluating evolutionary shifts in locomotor behavior and body shape. However, Pleistocene hominin fossil remains in East Asia are scarce and are widely dispersed temporally and spatially, impeding our comprehension of the nature and polarity of morphological trends. Here, we present qualitative and quantitative analyses of the cross-sectional properties and structural organization of diaphyses in two Late Pleistocene hominin femora (Liujiang PA91 and PA92) from southern China, comparing them to other Eurasian and African Pleistocene hominins. By integrating surface features and internal structure, our findings reveal that the Liujiang femora exhibit modern human-like characteristics, including a developed pilaster, a gluteal buttress, and minimum mediolateral breadth located at the midshaft. The presence of a femoral pilaster may relate to posterior cortical reinforcement and an increased anteroposterior bending rigidity along the mid-proximal to mid-distal portion of the diaphysis. Compared to archaic *Homo*, Liujiang and other Late Pleistocene modern human femora show a thinner mediolateral cortex and lower bending rigidity than the anteroposterior axis, and a lack of medial buttress, potentially indicating functionally related alterations in a range of pelvic and proximal femoral features throughout the Pleistocene. The femoral robusticity of the Liujiang individual resembles that of other Pleistocene hunteregatherers from East Asia, implying comparable overall mobility or activity levels. The investigation of Liujiang femoral diaphyseal morphology contributes to a more comprehensive understanding of early modern human postcranial structural morphology in East Asia.

The terminal Pleistocene human skull from Yahuai cave: morphological variation and complex population history in southern China

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Abstract: The terminal Pleistocene was a key stage in the formation and differentiation of modern populations. Recent studies have shown that the humans in East Asia during this period exhibited a high degree of morphological variation and demonstrated regional differentiation. This study examined the human remains (YH1) discovered at the Yahuai Cave site in Guangxi, southern China, dating back to 16.0 kyrs ago. The analysis encompasses metric and non-metric characteristics of the cranium and mandible. The findings indicate that the YH1 exhibits a mosaic of morphological attributes, featuring a modern mandible and a blend of modern, plesiomorphic, and some distinctive traits within the vault and facial skeleton. This serves to illustrate the morphological diversity of late Pleistocene-early Holocene humans in southwestern China and the north-south differentiation in craniofacial morphology among China was not fully established at the terminal Pleistocene. Moreover, multivariate analyses of craniofacial metric traits challenge the traditional "two-layer" theory and reveal that human evolution and dynamics in South China during the late Pleistocene were far more complex than previously recognized.

Keywords: East Asia; Late Pleistocene-early Holocene transition; differentiation of modern human; morphological diversity

A biomechanical approach to understand the evolution of the dentition in European Pleistocene hominins

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Abstract: Through the course of human evolution, we have witnessed the progressive simplification of the cranio-dental system from our ancestors to the ultimate adaption of our species. However, how different morphometric dental traits evolved to better adapt to dietary changes and withstand biomechanical strains remains unknown. Neanderthal's unique cranio-dental morphology evolved to resist high-magnitude forces. To unveil the factors that acted in the evolution of the hominin dentition this study focuses in the analysis of three related and chronologically consecutive European Pleistocene hominin species (*H. antecessor*, Sima de los Huesos population and Neanderthals) as well as modern humans. We present an innovative way to answer these key questions by using a multidisciplinary approach that considers different components of the masticatory system, and integrates data on fauna consumption, ecology and isotopes to provide an overview of the dental changes throughout human evolution. First, we will examine dental wear employing Occlusal Fingerprint Analysis (OFA) to define wear facets and their structure and simulates the chewing cycle to determine if the facets result from dietary (masticatory activity) or behavioural (cultural) activities. Second, we will explore if certain crown morphological traits developed to improve mechanical efficiency. By applying Finite Element Analysis (FEA) to the enamel crown, we will identify which dental traits provide robustness to the crown. Finally, we will investigate the functional significance of enamel thickness. By combining FEA results on the crown areas with higher stress and the distribution of thicker enamel on the crowns using the chromatic maps, BITE will identify correspondences between enamel thickness and resistance.

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Evolution of oasis agriculture and civilization exchange since the 4000 yr BP Amu Darya region, Central Asia

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Abstract: Transoxiana in central Asia played a significant role in the early exchange of civilizations across Eurasia. The arid climate, which makes the local ecology sensitive to climate change and the well-preserved archaeological remains, make Central Asia an ideal location for studying the mechanisms of interactions between civilization evolution and environmental change. This research presents archaeobotanical, palynological and stable isotope records from the Djarkutan site in southeastern Uzbekistan, which was occupied between 4100 and 3700 cal. yr BP. Our research shows that in the Late Bronze Age, after 4000 yr BP, the oasis agricultural activity in local civilization was highly complex. Pollen and stable isotope result indicate a sudden drought event occurred in the local area around 3900 yr BP, which had an impact on the local oasis agricultural system. Subsequently, this event promoted the migration of northern steppe populations into Central Asia, leading to the development of an agro-pastoral economy in the research area.

中亚阿姆河流域 4000 年以来绿洲农业的演化与早期文明的交流

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摘要：中亚河中地区是欧亚大陆早期东西方文明交流的重要通道。该地气候干旱，对全球环境变化响应敏感的同时利于考古遗迹保存，是研究文明进化与环境变化相互作用机制的理想地点。本研究通过炭化植物遗存、孢粉和稳定同位素等记录，对位于乌兹别克斯坦东南部的 Djarkutan 遗址开展了系统的植物考古学研究。研究结果显示，该遗址年代为 4100 - 3700 cal. yr BP，为青铜时代晚期，在约 4000 yr BP 时，当地已经发展出了一套结构高度复杂的农业系统。孢粉和稳定同位素结果表明，该地区在 3900 yr BP 左右发生过一次突发性干旱事件，对当地绿洲农业系统产生了影响。随后，这一事件促进了北部草原人口向中亚的迁移，促进了研究区农牧经济的发展。

Unlocking the hidden past: Palaeoproteomics and the new frontier of modern archaeological research

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Abstract: Recent advances in the extraction and analysis of ancient biomolecules such as DNA and lipids have led to extraordinary insights about the human past, and shotgun proteomics has emerged as a promising means of identifying proteins derived from ancient plant, animal, and human sources. Here we unveil new findings from a paleoproteomic investigation of ostrich eggshell beads from Africa that includes 11 ethnographic and 84 archaeological specimens. We identified tissue-specific proteins from humans, plant and fauna, including evidence of megafauna (elephants, hippos), marine resources (cetacean, fish, mollusk), breast milk, semen, and even milk peptides from beads which appear to predate the spread of herding. We are still probing the temporal limits for this data but the techniques here are applicable worldwide—from sites in Africa to the Americas, Europe, and China—where similar cultural artifacts may reveal critical aspects of ancient lifeways and interspecies interactions. This research highlights how biomolecular techniques, when applied to even the smallest artifacts, can drive new insights into our shared past, expanding the scope of paleoanthropological inquiry across diverse regions and time periods.

分组报告 2：旧石器时代文化多样性及古人类行为模式

Session 2 Cultural Diversity of the Paleolithic Period and Behavioral Patterns of Fossil Hominins

主题：欧亚大陆旧石器早、中期文化

Eurasian Early and Middle Paleolithic Cultures

First evidence of the use of red minerals in the Lower Palaeolithic Levant: the case of Qesem Cave, Israel

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Abstract: The use of iron-based red pigments is well documented in the archaeological record of the Old World, including the Levantine region, from the Middle Stone Age and the Middle Palaeolithic period onwards, while information regarding their use in the Lower Palaeolithic is lacking. Here we present one of the earliest cases of human use of red coloured minerals in the Levant region: 400-300,000-year-old pigments discovered at the archaeological site of Qesem Cave (Israel). The archaeological layers of the site were associated with the Acheulo-Yabrudian Cultural Complex, which was characterized by major transformations: evolutionary, cultural and technological innovations, such as the habitual use of fire, the knapping of stone tools with innovative technologies, and the development of advanced methods for processing and preserving animal bone marrow. In this setting, the very ancient presence of red minerals in the cave is intriguing.

Results of X-ray Photoelectron Spectroscopy (XPS) analysis defined the mineralogical and chemical composition of five pigments and showed that four contain different ratios of Fe (58-90%) and Mg (10-42%), in addition to the commonly found atoms such as Ca, Si and O. The different composition can affect the intensity and hue of the pigments, but almost all showed the same bonding for all metals. These minerals could have been procured locally, in the vicinity of the cave. Interestingly, one sample showed a peak shapes for both the Fe2p and Ca2p that match andradite– a non- local mineral which was possibly brought by the inhabitants of the cave from afar.

Through this analysis, we will raise some preliminary thoughts regarding the possible role of minerals in the lives of Lower Palaeolithic populations, the connection between the use of pigments and the use of caves, and between the systematic use of fire and the use of pigments during this time period.

The Lower Paleolithic archaeological sequence at Sierra de Atapuerca, Spain

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Abstract: The sites of the Sierra de Atapuerca (Burgos, Spain) offer a chronological sequence that allows the reconstruction of the evolution of technology on a local scale during the Early and Middle Pleistocene. This presentation summarises what has been found in the different levels of the cave sites of Sima del Elefante, Gran Dolina, Galería, Sima de los Huesos, Galería de las Estatuas, and Cueva Fantasma. Emphasis is placed on the technological features that are of great evolutionary significance. Other archaeological, palaeoanthropological, and paleoenvironmental data will be cross-referenced with the technical features documented in these archaeological complexes in order to better understand the hominin occupation of Atapuerca during the Pleistocene.

The first occupation of Atapuerca occurred before 1.2 Ma and is represented in levels TE7 and TE9 in Sima del Elefante, by *Homo* sp. and a Mode 1 technology, very poor in terms of diversity and energy invested in tool production. This technology is associated with opportunistic subsistence strategies that focused on exploiting carcasses that had fallen into the cavities. In the Gran Dolina level TD6, dated to 850 ka, a second cultural phase has been revealed: a phase characterised by new subsistence and technological strategies, although still belonging to Mode 1 and carried out by *Homo antecessor*. In TD6, the lithic assemblage is rich and diversified. Intensive occupation with well-organised subsistence strategies has been documented, including hunting activities and the earliest trace of cannibalism in prehistory. After a hiatus of more than 300 ky with very sparce hominin presence, the occupations of Galería and Gran Dolina-TD10 correspond to a third cultural phase between 500 ka and

300 ka. They are represented by an Acheulean technology associated with systematic carcass processing, including hunting events in TD10. Pre-neanderthals appear instead of *H. antecessor* and are exceptionally represented at the Sima de los Huesos site in the form of a deliberate accumulation of numerous individuals. The Late Acheulean assemblages recorded at the top unit TD10 of the Gran Dolina show transitional technological features that point to an Early Middle Paleolithic. This entity has recently documented in the cave sites of Galería de las Estatuas and Cueva Fantasma, as well as in various open-air sites in the Sierra.

The technological features that have been found to have evolutionary significance along the long studied sequence are related to: a) raw material selection (use of local rock types, with a progressive increase in the selection of the most workable materials throughout the Middle Pleistocene); b) production sequences (coexistence of several knapping methods, with a clear increase in centripetal strategies and flake predetermination techniques, eventually leading to Levallois-like methods); c) representation of large shaped tools (with scarce choppers, and handaxes and cleavers appearing around 450 ka and progressively decreasing in number, standardisation and intensity of shaping throughout Gran Dolina TD10); and d) tools on flakes (recorded only from the end of the Early Pleistocene, increasing in number, complexity and standardisation throughout the Middle Pleistocene).

Evidence of inter-cultural contacts among Neanderthals in the Caucasus

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Abstract: Current archaeological data support the hypothesis (Doronicheva et al., 2023) that in the Middle Paleolithic in the North Caucasus two culture different populations of Neanderthals settled the region from two various source regions: from eastern Europe along the Sea of Azov coast and from the Lesser Caucasus and Armenian Highlands along the Caspian Sea western coast and that irregular contacts existed between these two culture diverse Neanderthal populations in the North Caucasus.

From late MIS 5 to mid MIS 3, a Neanderthal population bearing the Eastern Micoquian cultural tradition inhabited the North-Western Caucasus (the Kuban River basin), whereas a Neanderthal population bearing the Zagros Mousterian cultural tradition inhabited the eastern North Caucasus (Terek River basin and the Caspian Sea northwestern coast).

Our studies of the Neanderthal sites in the North-Western Caucasus, first of all -Mezmaiskaya cave, showed that local Neanderthals exploited a variety of raw materials, including high-quality flint from distant sources and obsidian from sources in Zayukovo (Baksan), located in the North-Central Caucasus (>200-250 km straight). These artifacts possibly suggest that the Eastern Micoquian Neanderthals could sporadically reach the Elbrus region in the north-central Caucasus, and, consequently, have contacts with a local Neanderthal population that produced the Zagros Mousterian assemblages in the Saradj-Chuko grotto, located in the North-Central Caucasus.

The first studies of flint sources in the North-Eastern Black Sea region conducted in 2024 allowed us to collect new data confirming the hypothesis of contacts of the Neanderthals of the North-West Caucasus (Matuzka Cave) and the

North-Eastern Black Sea region during the Middle Paleolithic. Further studies of contacts between the populations of the two regions will be continued in the near future.

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A comparative study on three-dimensional geometric morphology of Acheulean large cutting tools in China: A case study of Baise Basin and Danjiangkou Reservoir Region

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2.

Abastract: The Acheulean industrial complex, represented by handaxe, picks, and cleavers, was known as the earlist lithic industry equipped with standard shapes in human lithic ethnological history. It provides crucial materials for understanding the development of lithic technology and human cognitive abilities. Research on morphology of Large Cutting Tools（LCTs）has been a prominent topic in domestic and international academic world for long. Continuous advancements and breakthroughs have been made in research methods and interpretations of related issues. The Baise basin and Danjiangkou Reservoir Region (DRR) are highly concentrated sites in southern China where Acheulean artifacts have been discovered, providing significance insights into the characteristics of Acheulean not only within China but also across East Asia. We applied 3D geometric morphometric methods to quantitatively investigate the morphological features of these two regions, followed by a comparative study on the geometrical morphology of the handaxe across different regions based on these features. Our results indicate that although there is some morphological overlap among LCTs between Baise basin and DRR, more noticeable differences exist regarding pointedness of tip shape, elongation, and thinning index. Moreover, internal morphological variation among handaxe at Baise Basin is greater than those from DRR. In summary, this research will provide clues on diversities and variabilities within Chinese Acheulean

industries.

Keywords： Acheulean Large Cutting Tools; 3D Geometric Morphological Analysis; Handaxe; Picks; Lithic Variability

中国阿舍利大型工具三维几何形态比较研究：以百色盆地和丹江口库区为例

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摘要：以手斧、手镐和薄刃斧等为代表的阿舍利大型工具组合被认为是人类石器技术史上最早出现的具有相对稳定形制的工具类型，为认识早期人类技术与认知能力发展提供了重要材料。针对阿舍利大型工具形态的研究，长期以来是国内外学术界关注的热点问题，无论在研究方法和手段的提高和创新上，还是在相关问题的阐释上，都不断有新的进展和突破。百色盆地和丹江口库区是我国南方地区发现的阿舍利遗址最为集中的区域，对于认识中国乃至东亚地区阿舍利工业面貌意义重大。本文以上述两个区域发现的手斧工具为研究对象，采用基于三维扫描模型的几何形态分析方法，定量研究和揭示两个区域手斧工具的形态特征，在此基础上，开展跨区域手斧几何形态的对比分析。结果显示，百色盆地和丹江口库区手斧在几何形态上虽然存在一定程度的相似性，但差异性更加明显，并主要体现在尖部形态、拉长度和减薄度等方面，同时百色盆地手斧具有比丹江口库区手斧更大的内部形态变异性。本研究对于揭示中国境内阿舍利工业面貌的区域变异性和多样性提供了证据支持。

关键词：阿舍利大型工具；三维几何形态分析；手斧；手镐；技术变异性

Structure of type and technique of Salawusu (Sjara-osso-gol) assemblage

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Abstract: The Sjara-osso-gol River in the southeastern Muus Desert, which stretches across the southeastern Ordos Plateau in Inner Mongolia, China, has created a unique perforated meandering landscape. The erosion caused by the river has exposed Late Pleistocene human activity and faunal fossils across an area of approximately 8 km. This region, which includes the Salawusu site, is recognized as the first Paleolithic site investigated in China and has been the focus of extensive paleontological and geological research.

The author reviewed artifacts from Locality-Shaojiagouwan at the Institut de Paléontologie Humaine (IPH), Paris. This locality was excavated in 1923 by French Jesuit missionaries Licent and Chardin. In a 1928 report, Breuil, responsible for analyzing the lithic artifacts, classified the Salawusu and Shuidonggou assemblages as Late Middle Paleolithic to Late Paleolithic based on typological comparisons with European lithic assemblages. He also noted that the Salawusu assemblage represented a somewhat new phase of material.

Subsequent research, particularly by Chinese archaeologists, has reinforced the classification of the Shuidonggou assemblage as belonging to the Early Upper Paleolithic (IUP). In contrast, further investigations around Salawusu Site have yielded fewer findings. The lithic artifacts at Locality-Shaojiagouwan are primarily composed of hornfels and chert, with a smaller amount of quartzite tools. The area surrounding the site contains thick fine-grained sediment deposits, as noted by Chardin.

In the 1980s, a sand and gravel layer containing rocks similar to those used in the Salawusu assemblages was discovered 43 km west of the site. This suggests that the raw materials used for tool production were sourced locally. The assemblage consists mainly of small-sized tools, less than 2 cm in length, with a smaller number of middle-sized tools, including Quinson points. The lithic

materials exhibit a series of reduction sequences, with larger flakes initially processed into middle-sized tools and smaller chips and flakes later refined into small-sized tools. The retouch on these tools is shallow and narrow, with minimal modification of the primary flakes. Notably, there is a scarcity of Late Paleolithic forms in the assemblage, except for the presence of a crested blade.

Understanding modern human behavior in north China: blending, innovation and adaptation

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Abstract： The evolution and widespread of *Homo sapiens* is a key event in the human evolution history. By the end of the Late Pleistocene, our species was distributed across every continent except Antarctica and adopted to varied ecological niches. North China, across the northwest desert Gobi to the Pacific Rim, is an important corridor of population and cultural exchange on the eastern Eurasia. With the arrival of the IUP in Eastern Asia in MIS3, it remains unclear whether local populations adopted this technology or if it represents a replacement of indigenous cultures and populations of North China. Recent findings provided new data to discuss the human history and behavioral adaptations in North China during MIS3. These new analyses indicate that we should expect to find a mosaic of innovation patterns, with the spread of earlier innovations, the persistence of local traditions and the local invention of new practices all taking place.

解读中国北方现代人行为：融合、创新与适应

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摘要：“现代人”从与其姐妹种群共存到脱颖而出，成功扩散到了沙漠、热带雨林、高海拔山区等全球多样的生态环境之中，其 “前所未有”的行为复杂化和适应能力被认为在全球扩散中起到了关键性作用。中国北方地区横跨亚洲内陆干旱-半干旱区到邻近西北太平洋的东北地区，这一广袤区域是欧亚大陆东侧人口、文化交流的重要走廊。解读和评估该区域内现代人的行为发展对于理解全球背景下现代人的起源与演化。近来随着，考古学与人类学（含体质与遗传学）数据的积累和不断更新，我们有机会重新思考现代人在华北地区的行为展现出来的特征并探讨其与气候环境背景、人群迁徙交流之间的关系。从颜料的使用、工具类型的发展、打制技术的杂糅，再到装饰品形制变化以及远距离黑曜岩资源的利用，都体现了在距今 5 万年以来中国北方地区出现的现代人行为。而其内涵与欧洲和非洲材料相比较展现出了更多的多样性和差异性，体现了融合、创新与适应。

Use-wear in quartzose materials. Methods and experimental programs for obtaining qualitative data in rock crystal, quartz and quartzite tools

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Abstract: The materials of the quartz group, including rock crystal, phyllonian quartz and quartzite, make up the majority of the lithic assemblages in some areas. Obtaining functional data from these assemblages is as necessary as it is complex, since they are the only materials from which functional information can be obtained, and the nature of the traces produced cannot be compared with those found in more commonly functionally analyzed materials such as flint.

Despite recent research into these raw materials, there is still some confusion between natural features and actual use-wear. This is partly due to the characteristically reflective and smooth surfaces of quartz, which cause confusion when compared to flint, and to the lack of sequential and multi-scale experiments aimed at monitoring the wear formation processes.

This work presents some of the results obtained through sequential and projectile experiments carried out at TraceoIPHES on quartz, rock crystal and quartzite. Among the most outstanding data obtained from these experiments is the identification of the wear-forming processes in these "brittle" rock types. In all these quartz-materials, the formation of traces is caused by the incipient fracturing of the surface and the appearance of striations on the quartz, which indicate the kinematics of the use of the pieces. Once created, these striations begin to be obliterated by new striations until the surface is polished and the fracturing cycle begins again. Although this cycle is continuous and quite similar

in the three types of rock in which we carried out the experiments, it is not possible to identify it in the same way. The type of granulometry in some cases prevents an immediate identification of the traces, so in addition to understanding the process of formation of these functional traces, it is necessary to use the appropriate combination of microscopes for each type of material. In addition, the fragile and semi-translucent nature of these materials allows the reliable identification of retouching actions, as well as projectile impacts. In these cases, the appearance of iridescence provides relevant information on the type of impact suffered by the lithic tool, which, together with the orientation of the lithic tool, can be used to identify the type of impact suffered by the lithic tool, which, together with the orientation of the striations, makes it possible to identify the use of some pieces as projectiles.

Keywords: quartz; rock crystal; quartzite; use-wear; sequential experiments

Late Neanderthal behavior in the Altai Mountains, Southern Siberia

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Abstract: The latest research justified, two waves of Neanderthal migration to the Altai region on the basis of genetic and archaeological evidence. A second Neanderthal migration took place around 60 000 years. B.P., and brought a specific lithic assemblage similar to the European Micoquian/Keilmessergruppen to the Altai region (Kolobova et al. 2020). Until recently, only two sites yielding Micoquian/KMG lithic assemblages were known in the Russian Altai Region. Currently, four main sites are known, including base camps and temporary hunting camps.

Chagyrskaya Cave has been classified as a consumption camp, primarily geared toward hunting and processing bison and horses. A complete behavioral sequence of stone and bone tool manufacturing has been identified at the site (Kolobova et al. 2019), which seems to have been regarded by Neanderthals as a safe haven where they brought their children (Kolobova et al. 2020). Published data on Okladnikov Cave also support the interpretation that it was used as a permanent shelter and consumption site of horses and bison (Krause et al. 2007). Recent investigations of the Verkhnyaya Sibiryachikha Cave have shown that it may have been used as a game observation point for hunters pursuing prey in the river valley below (Kolobova et al, 2023).

According to our technological and experimental analysis, in the Chagyrskaya cave we have two models of raw materials used associated with core and bifacial reduction. The initial stages of core reduction were carried out outside the cave. While bifacial shaping was executed on the site. The techno-typological characteristics of the Chagyrskaya Cave assemblage are completely consistent with the characteristics of the Crimean Micoquian techno-complex, which is an integral part of the European Micoquian. With regard to the settlement pattern, Chagyrskaya Cave is typical for a recurrently

visited base camp with the exploitation and consumption of animal carcasses and an intensive lithic reduction as well as bone tool production.

At Verkhnyaya Sibiryachikha Cave, we found only two artifacts in a layer synchronic with the habitation of late Neanderthals there, but their cultural and chronological contexts greatly increase their scientific significance. Late Neanderthals in the Russian Altai Region apparently practiced the same behaviors as their European relatives. Several examples of such similarities in subsistence strategies have already been reported (Salazar-García et al. 2021), which may indicate there were no significant changes in the behavior of the Neanderthal population that migrated eastward into Siberia.

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主题：欧亚大陆旧石器时代晚期文化

Eurasian Upper Paleolithic Cultures

The Upper Paleolithic at Tolbor-4, Northern Mongolia: new data on the chronology of human occupation and on the archaeological sequence

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Abstract: To date, the largest known concentration of Paleolithic sites in the eastern part of Central Asia has been identified along the main source of the Lake Baikal, the Selenga River drainage system. Along with its tributaries, it has yielded more than a hundred Paleolithic localities distributed along a stretch of ca. 150 km between the Khanui-Gol River to the east, and the Egiin-Gol River to the west. The most significant cluster of sites is located along the banks of two small rivers, the Kharganyn-Gol (19 localities) and the Tolbor (45 localities), 8-12 km away from their confluence with the Selenga (Gillam et al., 2019). One of the first discovered and excavated site is Tolbor-4.

Excavations at Tolbor-4 were the first to reveal the importance of the region for Paleolithic research in and beyond Mongolia, and it remains one of the most informative Paleolithic sequence in Central and Northeast Asia. Pioneer explorations of the Tolbor River valley, between 2002 and 2007, documented an extensive archeological sequence spanning from the onset to the end of the Upper Paleolithic (Derevianko et al., 2006, 2007, Rybin et al., 2007, Kolomiets et al., 2009, Gladyshev et al., 2010). The first geological descriptions and radiocarbon age estimates, although consistent with such chrono-cultural attribution, also raised issues such as the occurrence of stratigraphic inversions but also yielded

infinite age estimates near the limit of the radiocarbon method. In turn, it raised questions regarding the exact age of the earliest archaeological occupations known today as the Initial Upper Paleolithic.

In 2017, an international team led new excavations to clarify the site formation processes and the chronology of human occupations at Tolbor-4. In this context, series of sediment (Optically Stimulated Luminescence) and bone (radiocarbon) samples associated with archeological occupations were collected in clear stratigraphic positions. Here, we present the radiocarbon and OSL age estimates obtained and discuss their implications for the cultural evolution of Northern Mongolia between Marine Isotope Stage (MIS)-3 and MIS-2, such as the issues of continuities and/or breaks in the local cultural sequence.

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Geoarchaeological Investigations at Tarvagatain Am (T-Am), an Early Upper Paleolithic site in northern Mongolia

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Abstract: Around ~45,000 to 40,000 years ago, a cultural phenomenon often referred to as the Initial Upper Paleolithic (IUP) is documented across Eurasia. Concomitantly, early modern humans dispersed in the same regions. Although what processes led to their definite settlement in Northern Eurasia remains unclear, the following period, between 40,000 to 33,000 years ago, is characterized by the development of several early Upper Paleolithic (EUP) variants. It suggests that significant shifts in population dynamics, cultural diversity, and settlement patterns occurred. The nature and causes of these changes are still poorly understood, partly due to the lack of high-resolution chronological and environmental data currently available. The latter are, however, essential to document the environmental challenges faced by human groups, but also the subsistence strategies they developed to cope with the continental climates of Siberia and Mongolia. In an attempt to address these issues, we are undertaking geoarchaeological investigations in northern Mongolia since 2015, more specifically at the early Upper Paleolithic site of Tarvagatain Am (T-Am).

The T-Am site (N49. 48' 44", E107. 26' 19", 714 m.a.s.l.) is located on a stable riverine terrace situated along the southern side of Tarvagatai Creek. As a tributary of the Khuder River, it merges with the Tsukh (in Russian, Chikoi) and then the Selenge River, flowing north until the Lake Baikal. A series of test pits have revealed a stratigraphic profile best represented along the west wall of the block excavation (BE1a), reaching a depth of 1.8 meters. It is divided into four lithostratigraphic units from top to bottom: Unit 1: Holocene soil A horizon (mostly plowed, 30cm in thickness), Unit 2: eolian loess (40cm in thickness), Unit 3: colluvial laminations (30cm in thickness), Unit 4: bedded fine sand and sandy silt (>80cm).

During the test phase of excavation, a single artifact scatter, consisting of in situ bone fragments and chipped stone tools, was uncovered in a sandy silt bed (3cm in thickness) at a depth of 145cm from the ground surface. During our recent investigations, artifacts were discovered within all four geological units (1-4). The assemblages include a blade-based convergent scrapers, side scrapers on blade, so-called débordant blades, regular blades, and flakes. Some of these objects display several diagnostic characters of the IUP-EUP stone tool technology known in Mongolia and Siberia. Notable is the good preservation of bones, which is rare in such chrono-cultural context. With results of direct dating still pending, we posit that artifacts from units 1-3 may have originally belonged to Unit 4 before being redistributed throughout the sequence (e.g. Goebel et al., 2001; Jaubert et al., 2004). However, further investigations are necessary to test this hypothesis, or to determine if the artifacts found in various units reflect multiple occupations from different time periods.

Here we present the results of a taphonomic investigation documenting variations in bone surface preservation with respect to their stratigraphic attributions. Comparing various degree of bone surface weathering between geological units provide archaeologists with valuable insights into the nature of sediment and bone accumulations. It informs on changes in the depositional and mechanical processes affecting bone artifacts, thereby providing us with a more precise reconstruction of site formation processes and past landscapes. We note that the sediment matrix points toward a low energy deposition consistent with an alluvial context. The latter has a high potential for precise geochronological control, but also for the preservation of archaeological features in their primary context.

New evidence of Initial Upper Paleolithic art in North Asia

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Abstract: The genesis and spread of Paleolithic portable art as part of a modern human behavioral complex in North Asia is one of the actively debated discussions. Today more than 20 IUP assemblages with personal adornments, jewelry or elements of clothing and sculptures are known in the Siberia and northern China (Lbova, 2021). Fieldworks of last decade in Baikal Siberia added new evidence of Initial Upper Paleolithic art to these data.

Shchapovo site (52°18'3.22"E, 104°19'2.50"N) is located in Irkutsk city, on the southwestern slope of Mount Nesterovskaya, on the left side of the Pchshenichnaya valley. The height relative to the Angara River is about 45–46 m. Discovered and excavated in 2001, Shchapovo was briefly reported by Artem Kozyrev and Elena Slagoda (2008). The only cultural layer is composed of cryoturbated sandy-clay matrix with lenses of yellow sand and dark bands, which overlapped by grey carbonate loess-like loams. The attribution of this unit to MIS-3 and overlaying stratum to MIS-2 is broadly consistent with the available radiocarbon date – ≥ 39900±1285 (SOAN-5569) (Kogai, Rogovskoi, 2013). The Upper Paleolithic material consists of 411 findings, including flakes, chopper, triangular and oval scrappers (n=5), point, flat-faced core, single bones of Equus sp. and Rangifer tarandus. Non-utilitarian object presents by the fragment of oval flat pebble with biconical perforation.

In 2022, new fieldwork resulted in the yielding 587 artifacts, providing updated information on the cultural and chronological attribution of Shchapovo site. Primary knapping is presented by flat-faced cores for blades and flakes, discoidal cores, edge-faceted core, flakes and rare blades. There is no evidence of Levallois methods. Tool collection consists of canted, transverse, denticulated and single side-scrapers; oblique and single end-scrapers; burin on flake; retouched flakes; backed knives; hammerstones. Petrographic analysis of the lithic collection shows the dominance of quartz and quartzite, and less mudstone, flint, siltstone, basalt porphyrite. Faunal remains includes identified bones of

Equus sp., *Mammuthus* sp., *Bovinae* gen. indet., *Bison priscus*, *Rangifer tarandus*. Some of bison bones and deer antlers has butchery traces (striations and percussion impact). One of the most remarkable cultural artifacts is a tear-shaped object with a large perforation. The pebble blank is the same as analogue from previous excavation in 2001. The raw material also is identified as serpentinite – dark, dull green, white-mottled metamorphic rock. The artifact (pendant?) has a maximum length of 86.13 mm, a width of 66.75 mm and a thickness of 29.69 mm. The perforation is located at the narrow edge of the pebble and has a biconical profile with maximum diameter of 30.7 mm and minimum diameter of 4.7 mm. The one bone of Bovinae sp. and three tooth of Bison priscus and Equus sp. were AMS dated in 2024. But only 3.09mg (0.6wt%) collagen was extracted from bone sample, other samples failed. Nevertheless ages on samples with very low collagen yields (<5mg or 1wt%) are more likely to have some potential problem, available radiocarbon date is 35400±1100 (OxA-X-3288-8). Shchapovo lithic assemblage can be interpreted as Initial Upper Paleolithic complex with the mix of MP and UP features. The presence of personal adornments links Baikal Siberia with other territories of North Asia and can suggest regional social contacts in IUP.

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New evidence for the Early Upper Paleolithic of Central Siberia from the Sabanikha 3 site

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Abstract: South Siberia and the Northern Central Asia is one of the centers of Upper Paleolithic appearance and expansion. One of the northern areas of UP expansion is Central Siberia and the Yenisei River valley. The appearance of modern anatomical type humans in this area is presumed in the final MIS3 and is associated with the Early Upper Paleolithic (EUP). Currently, the key problem of EUP studies in Central Siberia is that archaeological artifacts come from redeposited or unstratified complexes. We discusses the preliminary results of the Sabanikha 3 study, a new stratified EUP site in the Yenisei River valley (Kharevich et al. 2023).

On the whole, primary reduction oriented toward sub-prismatic unidirectional laminar production is characteristic of the Yenisei EUP along with the predominance of end scrapers and points on retouched blades, intensive retouched blades, and sparse (Malaya Syya, Sabanikha) or nearly complete absence (Ust-Maltat II, Derbina IV and V) of burins in the tool-kit. One characteristic feature of several EUP complexes (e.g., Ust-Maltat II, Derbina IV and V) is a developed tradition of oval and pointed biface production (Akimova et al. 2018). However, this characteristic is not recorded everywhere; no bifaces were found at the Sabanikha and Sabanikha 3 sites. Moreover, not all EUP archaeological complexes in the region include a developed bone industry and a tradition of personal ormament manufacture, which are well represented at Sabanikha, Sabanikha 3, and Malaya Syya (Lisitsyn 2000; Lbova et al. 2018). Perhaps these characteristic features reflect the functional variability of EUP complexes in the region, but also the absence of one or another component may be due to the exposed nature of most of these sites, resulting in the poor preservation or absence of some objects.

New archaeological, paleontological, and spatial data from the Sabanikha 3 stratified complex allow to fill the existing lacuna in the reconstruction of Central Siberia occupation by anatomically modern humans at the MIS3/MIS2 boundary.

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Early Upper Palaeolithic tubular beads from Denisova cave and their closest analogies across Northern Eurasia

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Abstract: Bone elongated beads are a specific category of personal ornaments, sporadically represented in Eurasia since the Early Upper Palaeolithic (EUP). Here we present the results of the technological and functional analysis of elongated beads from the Upper Paleolithic layer 11 in the Main Chamber of Denisova Cave, (40.0–38.0 ka cal BP), Northwest of the Russian Altai. The technological sequence of operations has been reconstructed. It included several stages: selection of blank, planing, manufacture of preform by truncating the epiphyses, ornamenting the preform, marking preforms for fracturing into short tubes, sawing or cutting, fragmentation by cuts, removal of cancellous bone, and smoothing the fracture surfaces. The analysis uncovered evidence of wear marks indicative of contact with clothing or human skin, as well as indications of threading on a string or thin strap. The tubular beads were employed by Upper Paleolithic inhabitants of the cave as components of clothing, necklaces, and likely bracelets. Outside Altai, the oldest decorated beads come from the Initial and EUP complex of the Kamenka site in Transbaikalia (44.9–41.4 ka cal BP), Zhoukoudian cave in China (35.1–33.5 ka cal BP) and Yana site in the Siberian Arctic (33.2–31.0 ka cal BP). Analysis of elongated beads in Eurasia reveals a complex pattern: similar beads found in different regions have different cultural attributions. Their spread in the EUP may have been due to technology transfer during migrations or intercultural contacts, or the convergent emergence and reappearance of technology in different parts of Eurasia. These processes were probably facilitated by demand, availability of raw materials and ease of production.

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Comprehensive Evidence of the Complexification of Human Behavior in the Early to Middle Late Pleistocene: The Discovery and Research of Mengxihe Site in Ziyang, Sichuan

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Abstract： Mengxihe Site is a water-logged open-air site in central Sichuan Basin dated to 80-60 ka. It is found that the raw materials of stone products are basically silica wood, with the size of small and medium-sized ones, and the types of tools are mainly scraping tools,which is a rare combination of small stone tools in South China. Many wooden and bone artifacts were also discovered at the site, indicating that the ancient humans of Mengxi River had a complex and diverse technological system.The site has uncovered tens of thousands of plant and animal remains, including dozens of animal species living in different environments and at least 30 kinds of fruits and seeds that are rarely preserved in Paleolithic sites. Additionally, evidence of fire use, cutting、engraving、perforating on various materials has been found, providing rich data for understanding the subsistence strategy and behavioral complexity of Late Pleistocene hunter-gatherers.

Keywords: Mengxihe site; Core-Flake Technology; behavioural complexity; Late Pleistocene; South China

晚更新世早中期人类行为复杂化的综合实证——四川资阳濛溪河遗址的发现与研究

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摘要：濛溪河遗址是四川盆地中部资阳市的一处饱水遗址，年代在距今 8-6 万年。遗址石制品原料以硅化木为主，尺寸多为中小型，工具主要类型为刮削器，是华南地区少有的小型石器组合。遗址还发现了较多的木器和骨器，显示濛溪河古人类具有复杂多样的技术体系。遗址发现的动植物遗存数以万计，包括了数十种生活在不同环境中的动物和至少 30 余种在旧石器遗址中很少能够保留下来的植物果实和种子，同时，还发现用火、切割、刻划、钻孔等行为迹象，为了解晚更新世狩猎采集者的生计策略和复杂行为模式提供了丰富的资料。

关键词：濛溪河遗址、石核－石片技术、行为复杂化、晚更新世、中国华南

Raw material strategies, Palaeotechnologies and Mobility: New evidence for cultural dynamics in the Upper Palaeolithic of Altai

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Abstract: This research was focused on addressing the challenges associated with emergence and advancement of the Upper Palaeolithic in Northern and Central Asia. It involved reevaluating the existing archaeological data on the Upper Palaeolithic of the Altai, as well as developing new methodologies for the examination of archaeological sites in the region. Here we present the latest results of comprehensive geochronological, geological-mineralogical, spatial, technological and experimental studies of the classical open-air sites of the region – Anui-2, Ust-Karakol-1, Anui-3, Kara-Bom, Kara-Tenesh, etc., on which field work was carried out in the 1990s. Our reconstructions were based on addressing the challenges of preserving and understanding the structure of cultural layers at multi-layered sites, clarifying the material composition of multi-temporal assemblages, determining their cultural and chronological position in the new regional model of the development of Upper Palaeolithic traditions. As a result of our research, the models and chronology of the occupation of the investigated sites during the Initial and Early Upper Palaeolithic have been significantly updated. We have reconstructed the peculiarities of the raw materials used and the mobility strategies of the inhabitants, traced the routes for the transport of high quality lithic raw materials by comparing data on the chemical composition of artefacts with their sources. We have also identified and attributed new evidence for the processing of bone, soft stone, mollusc shell and ochre. The results of this research could significantly change our understanding of "transitional" assemblages with characteristics of both Middle and Upper Palaeolithic technologies in the regions of North and Central Asia.

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Comprehensive analysis of obsidian artifacts and behavioral insights from the microblade assemblages at the Samgeori Site, Central Korean Peninsula

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Abstract: The emergence of microblade technology has long fascinated archaeologists in Asia and is believed to have originated somewhere along coastal Asia at mid-to-high latitude during the Last Glacial Maximum (LGM). However, little is known about the behavioral context of the hunter-gatherers who adopted this technology as an adaptation to arid and cold environments. Studies of lithic assemblages, combined with raw material compositional analyses, provide valuable insights into the behavioral patterns and strategies of these foragers within their local ecological context.

Fine-grained, glassy rocks were commonly used to produce chipped-stone tools within Upper Paleolithic microblade assemblages in Korea, with high-quality obsidian being the primary lithic raw material in Gangwon and Gyongi provinces in the central Korean Peninsula. However, no geological obsidian deposits have been discovered in this region. While knappable-quality obsidian may exist in volcanic formations in southern North Korea, the nearest known high-quality sources are located at Paektu-san Volcano (or Changbai-shan in China) in northern North Korea and several obsidian deposits in northern Kyushu, Japan– both at considerable distances of approximately 400 km and 600 km away in a straight line, respectively.

Over the past few decades, Korean scientists have conducted archaeological obsidian provenance analyses at several sites in the central Korean Peninsula using chemical compositional technique. These studies indicate that all obsidian artifacts in this region originate from Paektu-san, which is divided into three or four sub-sources. Most of the obsidian used in microblade assemblages is from Paektu-san North Korea 1(PNK1), typically semi-gloss black with high translucency. Small amount of PNK2 and PNK3, which are greenish-gray or brownish and lack of translucency, have also been reported. These finding suggest that hunter-gatherers

equipped with microblade technology were engaged in hyper long-distance seasonal movement, incorporating obsidian procurement as a strategic part of their behavioral adaptation. However, due to the limited number of chemically analyzed artifacts and the lack of precise location of obsidian deposits in the detailed geological maps of North Korea, it remains unclear whether all obsidian was sourced in the vicinity of Paektu-san.

Here we report the results of handheld X-ray Fluorescence (hXRF) provenance analysis on 478 obsidian artifacts from the microblade assemblages at the Samgeori site (approximately 29,000-27,000 cal BP; Baekdu Institute of Cultural Heritage, 2019) in Gangwon province, central Korean Peninsula. Following Izuho et al. (2015, 2017) and Otani and Izuho (2023), we examine the mobility patterns and obsidian procurement strategies of foragers by integrating obsidian compositional data with lithic compositional and reduction sequence analysis. Our hXRF results shows that (1) none of the obsidian originated from southern Japan, and all obsidian artifacts were of continental origin, and (2) while most of the obsidian was sourced from PNK 1, a small number of artifacts were assigned to other distinct sources (or sub-sources of Peaktu-san).

These findings are consistent with previous researches, suggesting that microblade assemblages were produced using obsidian from the hyper-distant Peaktu-san, including PNK 1. However, due to the limited geological knowledge of North Korean obsidian deposits, it remains unclear whether the minor sources identified are sub-sources of Paektu-san or originate from other miscellaneous localities. Despite these unresolved issues, it is unlikely that foragers equipped with microblade technology adopted to the local ecosystem in the central part of Korean Peninsula simply traveled back and forth between their sites and Peaktu-san. Instead, their seasonal movements and foraging strategies, which planted the obsidian acquisition in their mobility, appears to be far more complex. We aim to further elucidate these patterns by applying our integrated obsidian analysis to additional Upper Paleolithic sites in the central Korean Peninsula.

Tracing Upper Paleolithic Transitions in Korea: A Case Study of the Suyanggae Site

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Abstract: The Korean Peninsula, located at the eastern edge of the Eurasian continent, has received direct cultural influences from the adjacent regions and developed its own unique cultural characteristics over time. Research on the Upper Paleolithic of the Korean Peninsula gained attention with the discovery of stone tools during the excavation of Suyanggae Site Loc.I in 1983 (Lee Y.J., 1985). The lithic industries of the Upper Paleolithic, particularly tanged points and microblade technology, are critical in understanding cultural lineages and technological developments within East Eurasia.

The 2013 excavation of Suyanggae provided further valuable data. At Suyanggae Site Loc.VI, tanged points and microblades were found stratified across four cultural layers (Lee et al., 2018). These layers offer insight into the gradual transformation of Upper Paleolithic industries, with possible connections to cultural exchanges with the Japanese archipelago.

The cultural patterns observed at Suyanggae can be divided into three phases:

The emergence of blade technology and tanged points: Cultural Layer (CL.) 4 at Suyanggae VI contains an extensive assemblage of tanged points and blades, representing the largest concentration of this industry in Korea. Radiocarbon dating places this layer at around 35,000-40,000 calBP, identifying it as one of the oldest Upper Paleolithic tool assemblages in Korea and marking the introduction of blade and tanged point technology.

The emergence of microblade technology: In CL.3, tanged points were found alongside microblade and bladelet technology. This layer dates to around 35,000 calBP, suggesting the presence of early microblade technology in Korea. However, further studies are required to better understand the development and regional variations of microblade technology during this period, as well as its potential connections to neighboring regions.

The spread of microblade technology: CL.2 at Suyanggae VI, dating to around 22,000–20,000 calBP, contains evidence of extensive microblade production, including the Yubetsu technique, representing the largest microblade workshop in Korea. Various other microblade techniques, unrelated to the Yubetsu method, were also identified, suggesting the diverse origins of microblade technology in this region.

These findings underscore that the technological developments at Suyanggae were part of broader cultural transformations across East Eurasia. Shared cultural elements between Korea and the nearby Japanese archipelago provide evidence for some sort of cultural relationship between the two regions during the Upper Paleolithic.

Future research should focus on conducting more detailed stratigraphic and technological analyses of the microblade industries, particularly in relation to the Yubetsu technique and its diffusion across East Eurasia. Additionally, comprehensive sourcing studies of raw materials, such as obsidian, would shed light on mobility patterns and interaction networks. Cross-regional comparative studies with other Upper Paleolithic sites in East Asia could further clarify the nature and extent of cultural exchanges between Korea, Japan, and mainland Eurasia. Lastly, refining the chronological framework through high-resolution dating techniques would provide a clearer understanding of the tempo and mode of these technological transitions.

The earliest post-LGM eivdenced human presence from Gobi desert Mongolia

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Abstract: The complex of high-quality flint and chalcedony outcrops known as Flint Valley is located in the southern rim of Arts Bogdyn Nuruu, in the Altai-Gobi region in southern Mongolia. Since the 1960s, this area has been the subject of research by The Joint Russian-Mongolian-American Expedition. Numerous archaeological sites have been discovered here, and the first findings link the recorded traces of human activity with the Middle and Upper Paleolithic. In recent years, field work south of the Arts Bogdyn Nuruu massif led to the discovery of a series of paleolakes around which the remains of prehistoric settlement.

One of the researched areas was the so called Lake V, Baruun Khuree. Both, peloenvironmental research and excavations were undertaken at 4 of the dozen or so archaeological sites discovered on the northern shore of the paleolake. Numerous isolated clusters of lithic material, concentrated around hearths, were recorded here. The main purpose of stone processing was the production of blades and bladelets using the pressure technique. Significant share of characteristic "inserts" with square proportions with surface retouching deserves special attention. In all the mentioned concentrations, the presence of animal bone fragments was also recorded, and numerous macroremains were observed in the fillings of the fires. Pottery and pieces made from ostrich egg shells were also recorded at some sites. A series of AMS C14 charcoal datings obtained from sites located on the shores of Lake Baruun Khuree confirm several episodes of hunter-gatherer presence in the early Holocene in the northern parts of the Gobi Desert. All of them fall within the period of approximately 9300-9800 BP, which proves that the sites discovered at Lake Baruun Khuree are among the earliest confirmed traces of human presence in the Gobi Desert after the Last Glacial Maximum (LGM), and the pottery found here is at least several or a dozen or so centuries older than previously known examples from Mongolia.

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Pleistocene and early Holocene societies in the borderland between the Gobi-Altai Mountains and the Gobi Desert, Mongolia

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Abstract: This research is focusing on the prehistory of the area surrounding a vast flint outcrop, so-called Tsakhiurtyn Hundi in Mongolia (Rus. Кремневая Долина, Eng. Flint Valley), located about 700 km south of Ulaanbaatar, is one of the most extensive prehistoric sites of Central Asia. The complex of high-quality flint and chalcedony outcrops known as Flint Valley is located in Arts Bogdyn Nuruu, in the Altai-Gobi region, which was researched by the Russian-Mongolian-American Expedition.

The surrounding of the Tsakhiurtyn Hundi flint outcrops, was densely inhabited. In addition to Tsakhiurtyn Hundi flint, commonly used especially in the lowland, around paleolakes areas, yellowish and reddish jasper was commonly used. Its outcrops were discovered in Arts Bogdyn massif. It is common also on mountainous sites, including the caves but also present in the lowland.

In the paleolakes area, located south of Tsakhiurtyn Hundi, there are nearly a hundred of Pleistocene and early Holocene settlement remains. The lakes themselves bear deep sediments confirming more than 100ky preferable conditions for human settlement. The intensive exploration of the mountainous territory is confirmed by more than fifty surface lithic clusters. Khutul Usny cave shows the sequence with the stratigraphy reached up to 3.6 m deep so far. Chronology established for the lower layers confirms human sheltering in the cave from the extreme climatic conditions around the beginning of last glacial maximum (LGM). Those two environments, the lakeland in the lowlands and the mountainous valleys including the caves, could

possibly be used in the different parts of the seasons and periods. Lakeland area was surely intensively exploited during the early Holocene while the mountainous area bears more traces of human activities from the Pleistocene, including human remains from LGM cave horizons. The palaeogeographical results, chronology determinations and archaeozoological analyses as well as other research aspects will be the subject of the presentation.

The project is funded by the National Science Centre, Poland (NCN2019/33/B/HS3/01113), directed by Mirosław Masojć. The research is supported by the Institute of Archaeology, Mongolian Academy of Science and Mongolian National University of Education (www.archeo.mongolia.uwr.edu.pl/en/).

Lithic technology and ecological adaptation in Northeast China during the terminal Pleistocene

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Abstract: The terminal Pleistocene (ca. 20~11.7 cal kyr BP) witnessed significant climatic variability, marked by several paleoclimatic phases, including the Last Glacial Maximum, Henrich stadial 1, the Bølling-Allerød (B-A) interstadials and the Younger Dryas stadial, which profoundly affected technological behaviors and subsistence strategies of prehistoric hunter-gatherers. Here we examine the characteristics and temporal trends of lithic technologies, subsistence and habitation modes in Northeast China during the terminal Pleistocene, placing emphasis on the sites of Taoshan, Huayang and Xiaonanshan, along with other contemporaneous sites with good stratigraphic integrity and reliable chronologies. On this basis, the dynamic process of cultural adaptation has been investigated by taking the climate, environment, and population size into consideration.

Our research indicates that lithic technologies, subsistence strategies and mobility patterns evolved synergistically in Northeast China during the terminal Pleistocene and showed obvious successive and staged features. In the later Upper Paleolithic, the lithic industry was dominated by microblade technology, and the hunting-and-gathering economy continued for a long time. With environmental amelioration during the Late Glacial phase (ca. 15~11.7 cal kyr BP), the hominin population density seemed to have increased, and the genetic continuity began to emerge in Northeast China. New technological signatures (e.g. ground stone tools and pottery) increasingly arose and showed a tendency of more diversified and intensified exploitation of local resources and decrease of mobility frequency. All these phenomena together marked the transition towards entirely new lifestyles, referred to as the Neolithic.

中国东北地区更新世末期的石器技术演化与生态适应

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摘要：更新世末期（距今约 2~1.17 万年前）作为晚更新世向全新世气候转型的关键时期，发生了一系列全球性和区域性的气候突变事件和短期的冷暖交替过程。伴随着气候环境的快速转变，旧大陆的狩猎采集者在技术、行为和生计模式等方面也发生着显著的变化。本研究聚焦于我国东北地区桃山、桦阳、小南山等遗址，并结合区域内新近发现的其他相关遗址，探讨该地区更新世末期的石器技术、生计模式和栖居方式等的转变；在此基础上，结合气候环境、人口规模等背景信息尝试构建其文化适应的动态过程。

研究表明，东北地区更新世末期的石器技术、生计模式和栖居方式等文化要素协同演化，表现出明显的连续性和阶段性特征。旧石器时代晚期晚段，以细石器技术为主导的石器工业和狩猎采集的经济形态长期延续。距今约 1.5 万年以来，随着博令-阿勒罗得（Bølling-Allerød）暖期气候向暖湿发展，适宜期植被景观大量发育，东北地区人口数量显著增长，遗传连续性开始出现。史前人群在承袭旧石器时代晚期文化传统的基础上创新工具生产技术，开始运用磨制技术和陶器技术，并伴随着对石料和鱼类等本地资源的强化利用，人类历史发展阶段逐渐由旧石器时代向新石器时代过渡。

分组报告 3：古人类遗址多学科综合研究

Session 3 Multidisciplinary Integrated Research on Fossil Hominins Sites

主题：古人类适应策略 Adaptation Strategies of Hominins

Climatic stresses during the Middle and Upper Paleolithic in the Caucasus

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Abstract: The available data allows us to accosiate cultural events of the Late Pleistocene history of the Caucasus with the Heinrich cold events in the Northern Hemisphere and the Greenland NGRIP scale giving the most complete sequence of climatic events in the Northern Hemisphere over the past 100,000 years. Six most pronounced cooling phases, which correlate with Heinrich events, can now be identified during the Middle and Upper Paleolithic in the Caucasus. Most of the coolings correlate with volcanic events.

For the Middle Paleolithic, multidisciplinary investigations in several sites make it possible to identify stadials corresponding to Heinrich 6 (63–60 ka) and Heinrich 5 (48–47 ka) events. In some multilayered sites, changes in the lithic industry by the end of the Middle Paleolithic are revealed. The results of genetic study of a Neanderthal individual from layer 2 at Mezmaiskaya Cave in the North Caucasus and several late Neanderthals from Europe showed that a large-scale genetic turnover occurred among the Neanderthal population in Europe and North Caucasus during the late Middle Paleolithic.

In the South Caucasus, the deterioration of climatic conditions was recorded in the upper Middle Paleolithic layers in Kudaro 1 and Kudaro 3 caves. This

stage has an uranium-series date of 65000 ± 5000 ka, corresponding to Heinrich 6 event. It separates the early Middle Paleolithic industry of the Dzhruchula type (similar to Tabun-D) and later Middle Paleolithic industry of the Tskhinvali type (similar to Tabun-B).

At the turn of the Middle and Late Paleolithic (about 40–38 ka), a break in sedimentation or sterile layers are recorded in a number of multilayered sites. An interdisciplinary study of this transition period revealed extreme colding and powerful volcanic eruptions. Chronometric results indicate this stage of the Pleistocene history in the North Caucasus can be correlated with a global cooling event of Heinrich 4 (~40–38 ka). It became a frontier, after which the Middle Paleolithic and Neanderthals disappeared, and the initial penetration to the Caucasus of the Upper Paleolithic industry associated with *Homo sapiens* is documented. During the Upper Paleolithic, five Heinrich global cooling events are distinguished. The most pronounced of them there are Heinrich 4, Heinrich 1 (~20-15 ka ago), which falls at the Last Glacial Maximum, and Heinrich 0, which correlates with the Younger Dryas and Greenland Stadial 1 (12.9–11.7 ka).

One important result of interdisciplinary research in the Late Pleistocene sites in the North Caucasus is understanding the impact made by climatic stresses and coolings associated with volcanic activity on ecological niches of different Paleolithic populations.

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Humans and landscape transformation: a case study from the Hunan-Jiangxi border region of China

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Abstract: Human impact on landscapes has been broadly described for Eastern Asia but impacts recorded from point sources of human settlements is not widely reported. Here we describe records from two wetlands near a virtual point source on the Luoxiao mountains on the Hunan/Jiangxi border. Human settlement in the broader regions of Hunan and Jiangxi began in the late Pleistocene and it appears that agriculture may have been widespread by the mid-Holocene. The historical record suggests that people first settled in the general region in the late Tang Dynasty and the wetland sediments show an increase in charcoal from about this time. From the Qing Dynasty in the mid-17th Century a temple complex was established along with a Tea and Salt trade road. In the area these are quite isolated from other areas of human activity. The wetlands record an increase in charcoal and erosion at about the time as the temple and road construction. The impacts are recorded at higher levels in the wetland closest to the temple site. In the last few hundred years there is a general decline of forest cover and expansion of open lands of grasses and shrubs as the lowlands were cleared for expansion of settlements and agriculture.

A design to date surface stone artifacts in the Tengger Desert northern China

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Abstract: Deserts accounting for approximately 1/4 of the main land area, are important geomorphic units on the Earth's surface. During the Pleistocene and Holocene, some desert regions around the world might become habitable in certain periods due to the paleoclimate changes, and became temporary locations for human activities, such as in the Africa, Levant, and India. The sedimentary of desert surface is characterized by repeated process of sedimentations and erosions. When the climate is livable, accumulation may occur, and when the climate deteriorates, erosion occur. After the erosion, relics of humans such as, stone artifacts and pottery shards, will be exposed. It is acknowledged that the archaeological remains exposed on the surface of the modern deserts are a mixed accumulation of a long history, possibly containing materials from multiple cultural periods. Therefore, it is difficult to carry out dating work on these desert surface sites.

Although a lot of surface Paleolithic and Neolithic relics have been discovered in the desert regions around the world, except for a few sites that can be dated using surface materials, such as ostrich eggshell, the age of most surface sites cannot be dated. For example, although some surface sites have been discovered for a long time in the Badain Jaran and Tengger Deserts in the East Asia, but no further investigating and dating work were carried out there. Dating the age when hunting and gathering people settled in the desert environments is the most crucial first step for understanding of how humans adapted to the

paleoenvironmental changes in the desert. This study takes the Tengger Desert as an example. We conducted a survey of surface stone artifacts relics in the study area. Based on the three types of preserved geomorphic features of the stone artifacts, and then through systematic sediment dating by OSL dating method, we obtained the age range of these desert surface sites. We hope this study will provide feasible method and strategy for dating desert surface archaeological sites all over the world.

Adaptive strategies and hunting models in the Late Pleistocene: Faunal remains from Khutul Usny Cave, Gobi Altai, Mongolia

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Abstract: This paper presents the results of zooarchaeological research conducted on faunal remains from Khutul Usny Cave, located in the Gobi Altai region of Mongolia, dated to the Late Pleistocene. The research aimed to reconstruct the adaptive strategies and hunting models of hunter-gatherer societies in this region, focusing on their subsistence patterns and interactions with the environment.

The study employed a comprehensive analytical approach, combining traditional zooarchaeological methods with advanced techniques such as Zooarchaeology by Mass Spectrometry (ZooMS) and stable isotope analysis. These methods provided a more detailed understanding of species identification, hunting practices, and resource management. The broad spectrum of analyses allowed us to identify previously unknown species in the region during the Late Pleistocene, significantly expanding our knowledge of the area's faunal diversity and the ecological conditions in which human populations operated.

By examining butchery marks, species diversity, and isotopic signatures, we were able to reconstruct the subsistence models of these hunter-gatherer communities, revealing a flexible adaptation to a wide variety of game species. This study also highlights the complex interactions between humans and their environment, showing how these early societies adjusted their strategies to the shifting ecological landscape of the Late Pleistocene.

The research at Khutul Usny contributes to our broader understanding of the ways in which prehistoric hunter-gatherers navigated the challenges of harsh environments, relying on innovative hunting strategies and diversified resource use to survive and thrive in an unforgiving landscape.

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Late Pleistocene human hunting strategies and competition with hyaenas in mountainous regions of southern Siberia and Mongolia

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Abstract: Direct evidence of Paleolithic human hunting is very rare in Northern and Central Asia. Prey choice, transportation of specific anatomical portions of animal carcasses to homebases, and bone marrow extraction can often be reconstructed through analyzing fragmentary bones found in stratigraphic association with lithic assemblages. In those parts of Mongolia where bone preservation is very poor, only sedaDNA can reveal the presence of animals in buried deposits, but the relationship between such traces and human hunting activity remains questionable. Late Pleistocene cave sites generally preserve richer faunal assemblages than their open-air counterparts, but the problem of distinguishing the activity of various agents of cave taphoceonosis formation, such as hyaenas, foxes, wolves, sables, bears, and raptorial birds from human activity remains. Here, we present preliminary reconstructions of human hunting strategies revealed in Middle and Upper Paleolithic occupational episodes in the Orkhon Valley, Khangai Mountains and at Tsagaan Agui Cave in the Gobi Altai Region, Mongolia. Excavations in the Orkhon Valley yielded the first direct evidence of Final Middle Paleolithic human hunting in Northern and Central Asia, and aDNA evidence revealed the presence of equine prey species, previously unknown in Mongolia. We also analyzed the faunal composition of each

stratigraphic layer in cave sites in the Russian Altai Mountains and Mongolia to better understand the “carnivore-large and medium ungulate” trophic chain, revealing species interdependence and carnivore-human competition. Correlation revealed that Pleistocene hyaenas and humans had similar diets, and that hyaenas focused their predatory behavior on equids. The 87Sr/86Sr ratio of preserved bone samples revealed that remains of some ungulates may have been transported to sites or the animals died during migration, because their Sr isotope composition fell outside of regional isoscale maps and/or sedimentary isotopic composition.

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The easternmost Neanderthals of Eurasia: origin and hunting strategies.

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Abstract: The Altai Mountains are the easternmost known boundary of the Neanderthal habitat. There were two waves of Neanderthal occupation of the region: about 120 kEa, this population was found in the Denisova cave (Denisova 5), and the second wave about 60-40 kEa comes to the Okladnikov, Chagyrskaya and Verkhnyaya Sibiryachikha caves. Technical and typological analysis of the Chagyrskaya cave industries and DNA analysis of anthropological remains found that the most likely ancestral homeland of these Neanderthals was the territory of Central and Eastern Europe populated by Micoquian/KMG Neanderthals (Kolobova et al., 2020).

Data from full genome studies conducted of 14 individuals revealed that Chagyrskaya cave individuals were more similar to the around 50,000-year-old Neanderthal genome from Vindija Cave (Vindija 33.19) in Croatia (Mafessoni et al., 2020; Skov et al., 2022), than to the neighbouring early-wave Neanderthal population. The large number of well-preserved human bones revealed a genetic study of the intrapopulation structure and detailed documentation of the social organisation of an isolated Neanderthal community. The long segments of homozygosity suggested that the Chagyrskaya Neanderthals were part of a small community, in which even close first-order relatives (father and daughter) could be detected. Y-chromosome diversity is an order of magnitude lower than mitochondrial diversity, and this pattern is best explained by migration of females between communities, suggesting population patrilocality (Skov et al., 2022).

The application of new techniques is expanding our understanding of Neanderthal daily life. For example, applying the peptidome analysis method of sex determination developed for human tooth enamel to bison, the main prey of

Neanderthal populations in the Altai, allows a better understanding of hunting strategies in the Palaeolithic period (Berezina et al., 2024).

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The significance of Pleistocene antelopes from Mongolia for Paleolithic man

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Abstract: The Central Asian faunal complex is characterized by the presence of small-sized antelopes. Among modern representatives of antelopes in Central Asia there are Saiga tatarica, Gazella subgutturosa, Procapra gutturosa, Procapra picticaudata, Procapra przewalskii, Pantholops hodgsonii. In Mongolia, Quaternary paleontological materials on antelopes are limited to Paleolithic sites. For the Late Pleistocene of Mongolia, finds of such species as Mongolian gazelle, black-tailed gazelle, Tibetan antelope, spiral-horned antelope are known. Here we consider their ditribution within the known localities.

The fossil Mongolian gazelle is known quite widely on the south of Siberia, from Transbaikalia to Altai. Within Transbaikalia, this gazelle was actively preyed upon by Paleolithic inhabitants of the Uda River basin (Vasiliev et al., 2023). For Mongolia, Paleolithic Mongolian gazelle has been reliably identified for the Moiltyn am site. Neolithic gazelle is identified for the Tamtsag-Bulag site. In 2022, for the first time in Mongolia, a fossil specimen of a black-tailed gazelle skull was discovered in Tsagaan Agui. It is very likely that other fragmentary gazelle bones from early (Baryshnikov, 1998) and modern cave excavations belong to this species. The presence of the remains of the Mongolian gazelle, which still lives in the Gobi Altai, is not excluded. Morphological and metric parameters Mongolian gazelle and black-tailed gazelle bones overlap significantly.

The Tibetan antelope (orongo) in the fossil state was first identified precisely in Mongolia, in 1989. Horncorns of this antelope were found in two locations at once: at Orkhon-1 in Khangai mountains and in Tsagaan-Agui cave in Gobi Altai. Apart from being mentioned in brief reports (Baryshnikov, 1998, Ovodov, 2001) these remains have not been described in detail. As a result of excavations of the Tsagaan Agui cave in 2021-22, horncorns and fragmentary bones of orongo were discovered. An extinct antelope, Spirocerus kiakhtensis, was first discovered from Transbaikalia. It is also a representative of the Mongolian Paleolithic fauna. Fossil horncorns were identified at the Orkhon-7 site (Derevyanko et al., 1992). Reliable postcranial elements of the Kyakhtas spiral-horned antelope have not been described in the

complete set with the skull. It is necessary to identify fragmentary remains of the spiral-horned antelope skeleton among the material from Paleolithic sites of the Selenga River basin.

Reliable finds of Late Quaternary predecessors of modern antelopes in Mongolia are confined to Paleolithic sites, making them to be the part of the fauna, hunted by Paleolithic human. Among the sites with archaeozoological materials, Moiltyn am, Orkhon-1 and Orkhon-7 contain the remains of fossil antelopes. The remains of quaternary antelopes from Tsagaan Agui can also be interpreted as waste from butchering, as small and fragile antelope bones are destroyed by large predators to the state of “stomach bones”. In general, the fragility of small antelope bones and the aggressive “soil” of semi-deserts left little chance to finding good specimens in Quaternary sediments.

It is only through Paleolithic sites that data on the range of fossil antelopes are emerging. This evidence also indicates the hunting value of antelopes in the Paleolithic of Mongolia. The Mongolian gazelle was preyed upon in the Orkhon valley. The black-tailed gazelle was preyed upon by the cave dwellers of Tsagaan Agui in the Gobi-Altai. The Tibetan antelope inhabited both regions. The extinct spiral-horned antelope was found in the Orkhon Valley. The fossil remains of the saiga, Przewalski's gazelle and goa are still unknown in Mongolia.

Thus, the fauna of Pleistocene antelopes in Mongolia was used by Paleolithic man as a hunting resource. In fact, the Late Pleistocene ancestors of Mongolian gazelle, black-tailed gazelle, and Tibetan antelope, as well as the extinct Quaternary spiral-horned antelope, are known in Mongolia.

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Study of the Carnivora at Zhoukoudian Locality 1 and Its Paleoenvironmental Significance

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Abstract: Zhoukoudian Locality 1 is a representative fossil site in northern China from the Middle Pleistocene, known significantly for the discovery of numerous hominid fossils, which lends it considerable importance among global fossil sites. However, since the early reports by Andersson and the series of monographs by W. Pei, there has been a lack of systematic revision of the mammalian fossils from Zhoukoudian. Our series of studies systematically re-examines the carnivore fossils from Zhoukoudian Locality 1 and describes previously unpublished materials. Based on this, through faunal comparisons, analysis of species evolutionary levels, and functional morphological adaptations, the study explores the age and paleoenvironment of Zhoukoudian Locality 1. The research suggests that the main fossil layers of Zhoukoudian Locality 1 date back to around 0.5 Ma, with a warm and humid environment dominated by an open forest.

周口店第一地点的食肉类系统研究和其古环境指示意义

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摘要：周口店第一地点是中国中更新世华北地区的代表化石点，其中发现的大量人类化石使得该地点在全球化石点中占据举足轻重的作用。然而自从师丹斯基的早期报道以及裴文中先生的一系列专著后，鲜有针对周口店哺乳动物化石进行的系统再研究工作。本系列研究系统再研究了周口店第一地点的食肉目化石，并描述当年未发表的材料。以此为基础，通过动物群对比，物种演化水平的分析，物种功能形态适应，探讨了周口店第一地点的时代和古环境。研究认为周口店第一地点的主要化石层位应该在 50 万年左右，环境温暖湿润，是森林主导的开阔镶嵌环境。

Rhinoceros remains from Caune de l'Arago: early evidence of human exploitation of megafauna

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2.

Abstract: Caune de l'Arago is important Middle Pleistocene (MIS 14-MIS 12) site in southeastern France, famous for its rich hominin fossils, Acheulean stone artifacts and faunal remains. A total of 2,400 rhinoceros fossils from the main cultural layers (F, G3/G4, K-Q) of the site were examined in order to gain insight into the exploitation strategy for megafauna of Middle Pleistocene hominins. Morphological research has assigned the rhinoceros remains from the Level Q (55 ka) at the base of the stratigraphy to the narrow-nosed rhinoceros (*Stephanorhinus hemitoechus*), which represents the earliest fossil record of this species in Western Europe. Taphonomic research indicates that 25% of the bones bear cutting marks on the surface, 74.1% of the specimens exhibit green fractures, and almost all limb bone specimens are less than 25% of the total length. In contrast, the proportion of carnivore tooth marks accounts for only 1.7%, due to the activities of small carnivores. The aforementioned evidence collectively supports the proposition that hominins had primary access to rhinoceros carcasses before carnivores. The differential skeletal representation indicates that hominins selectively transported the nutrient-rich parts back to the cave. Furthermore, the distribution of cutting and percussion marks allows us to infer consumption behaviours such as skinning, disarticulation, defleshing, and scaping. The mortality age structure shows that juvenile individuals are significantly higher than that of recent rhinoceros populations, suggesting that hominins probably have hunted some individuals, in addition to scavenging.

Arago 遗址犀牛遗存：人类主动开发巨型动物的早期证据

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摘要：Caune de l'Arago 是法国东南部一处重要的中更新世（MIS 14~MIS 12）遗址，以出土丰富的古人类化石、阿舍利石制品和动物化石而闻名。我们系统研究了该遗址主要文化层（F、G3/G4、K~Q）的 2000 余件犀牛化石，以探讨中更新世古人类对巨型动物的开发策略。形态学研究表明，遗址底部 Q 层（55 ka）的犀牛遗存已为窄鼻犀（*Stephanorhinus hemitoechus*），是该类群在西欧地区最早的化石记录。埋藏学研究显示，25%的骨骼表面见有石器切割痕，74.1%的标本呈现新鲜破裂面，几乎所有肢骨标本都小于全长的 25%；相比之下，疑似食肉类的齿痕仅占 1.7%，且皆属小型食肉动物。这些证据都支持古人类先于食肉动物独占了犀牛尸体。根据各骨骼部位的丰度差异，我们推断古人类选择性地将肉量丰富的部位运回洞穴；而依据切割痕、敲砸痕的分布位置，则可以推知剥皮、肢解、割肉等消费行为。死亡年龄结构显示，未成年个体的比例显著地超过现代犀牛种群，提示古人类获取犀牛的方式或许不限于食腐，有可能狩猎了部分个体。

Elephas maximus of Wajak Karstic Area, Tulungagung, East Java, Indonesia

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Abstract: *Elephas maximus* have existed in Java since the late Pleistocene. The data from a site in Cipeundeuy, West Java, show *Elephas maximus* existed around 35500 + 4600 / -2900 BP to 29600 + 450 / -420 BP. During the last glaciation, *Elephas maximus* was thought to have disappeared from Java along with climate and environmental changes. The finding of a tooth fragment of *Elephas maximus* from Sampung Cave, Ponorogo, East Java, is indicated as the final evidence of its existence. However, data from several sites in Tulungagung indicate that Sampung Cave, Ponorogo, is not the last settlement for *Elephas maximus*. This study aims to describe the *Elephas maximus* remains from three sites in the Wajak Karstic Area, Tulungagung, East Java, i.e. Hoekgrot Cave, Song Gentong Cave, and Tenggar Cave. The tooth fragments from the three sites in Wajak Karstic Area show the morphology of *Elephas maximus* incisors, premolars, and molars lamellae. The dating test at one of these sites also shows a relatively young date (3200 BP), which opens a possibility that Tulungagung was the last settlement of *Elephas maximus* in Java during the Holocene.

Keywords: *Elephas maximus*, Holocene, Wajak, Tulungagung

The use of photogrammetry in assessing surface erosion on fossil hominin footprints at Laetoli World Heritage Site in Northern Tanzania

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Abstract: The Plio-Pleistocene Laetoli World Heritage Site of Human Origins in northern Tanzania preserves the 3.6 million years old fossil hominin trackways documenting our ancestor's positional behavior at Site G. The discovery of the prints at Sites A at Locality 7 in 1976 and Site G at Locality 8 in 1978 divulges conservation challenges stunning the paleoanthropological community. Conservation efforts of these ichnofossil assemblage squarely focused on the hominin trackways at Site G neglecting the enigmatic prints at Site A, initially identified as nonhominin prints. McNutt et al 2022, securely identified the A prints as hominin prints, morphologically different from the G prints. The A prints trackways provide important snapshots of hominin diversity and fauna composition useful in paleoecological reconstruction. During the 2023 and 2024 field seasons, our team conducted extensive photogrammetry work to create a three-dimensional digital model of the site and evaluate the erosional history of the fast-disappearing animal trackways. Using an Unmanned Aerial Vehicle (UAV) and DSLR cameras, we collected data (photos and videos) of the site and post-field processed them to create a high-resolution 3D model of the site. Photogrammetric comparison of multiple sources of data and recent photos of site A trackways were used to create a 3D model, which provides insight into the rate of deterioration of the trackways (degree and speed of erosion) and can be used to guide future conservation efforts at Laetoli. This project highlights the utility and effectiveness of photogrammetry as a method for tracking subtle changes on the fossil footprints that can help to guide conservation efforts and priorities that are sustainable and easily accessible. This method can be employed

at other sites that preserve fossil footprint trackways of paleoanthropological significance.

分组报告 4：研究生专场

Session 4　Graduate Student Session

主题：旧石器时代文化

Paleolithic Culture

Technological behaviors in Northern China during the early part of Middle Pleistocene: A case study of Jijiazhuang Site, Nihewan Basin

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Abstract: With the discovery of more than a hundred Pleistocene Paleolithic sites, the Nihewan Basin of North China has become an area of reference for the study of human evolution and behavioral adaptations during and after the spread of early humans out of Africa and into Eurasia. However, most research has focused on the Early and Late Pleistocene archaeological record, whereas studies of the Middle Pleistocene sequence are relatively limited, especially the early part of Middle Pleistocene. Here we contribute to fill this gap by introducing the 26Al/10Be burial dating and archaeological assemblage of the newly discovered Jijiazhuang (JJZ) Paleolithic site. Cosmogenic 26Al/10Be burial dating indicates that early humans occupied the site between 0.49 ± 0.10 and 0.63 ± 0.11 Ma, corresponding to the extra-long interglacial period of MISs 15-13. The JJZ lithic assemblage shows evidence of relatively long-distance resource procurement, efficient flake production, and the increased number of retouched tools indicating specialization and standardization. The JJZ lithic technology shows complicated features that may shed light on the technological variability in Middle Pleistocene. We propose that this regional technology is deeply rooted in a paleoecological context where the extra-long duration of interglacial/mild stadial climate events (MISs 15−13) may have provided

favorable conditions for increased technological capabilities among Middle Pleistocene hominins, and concurrently, the technological behaviors also facilitated their resource exploitation and adaptation to the environment. In this report, we firstly present a detailed techno-typological analysis of a Middle Pleistocene lithic assemblage in the Nihewan Basin and contributes to the characterization of technological adaptions in the high latitudes of East Asia.

中更新世早期中国北方古人类技术行为研究：以吉家庄遗址为例

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摘要：目前，泥河湾盆地已经发现上百处更新世古人类遗址，是早期人类“走出非洲”以后在东亚扩散和演化的聚集区，因此成为研究东亚古人类演化和技术适应的关键区域。相对于大量已发掘和研究的早更新世和晚更新世遗址，该区域已发现的中更新世遗址相对较少，提供的有关古人类技术行为的信息十分有限。本研究将介绍泥河湾盆地中更新世早期的吉家庄遗址，报道其测年和技术分析的相关内容，有望完善区域石制品技术序列。铝铍测年结果表明，吉家庄遗址古人类活动年代为 0.49±0.10 到 0.63±0.11Ma，对应于深海氧同位素阶段 15-13。吉家庄遗址古人类采用远距离搬运石料的策略，石器技术则表现出高效石核剥片和修理工具专门化，这些复杂的技术行为与周边遗址形成鲜明对比，体现出中国北方中更新世石器技术的多样性。分析表明，吉家庄遗址的技术特征与区域生态环境紧密联系，中更新世超长间冰期（MISs15-13）的温暖气候为技术能力持续进步提供了适宜的条件，同时，古人类的技术行为促进了资源开发和对环境变化的适应。

The spread of microlithic hunter-gatherers to the Tibetan Plateau and the possible environment impactors: insights from Jiangjunfu02 site

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Abstract: During the Last Deglaciation (LDG), microlithic hunter-gatherers began to spread to the Tibetan Plateau (TP), possibly due to both climate change and lithic technological developments. The Western Chinese Loess Plateau (WCLP), as so far the only region where older microlithic sites were found comparing to those on the TP around the plateau, is considered to be the main source of TP's microlithic populations. However, the dispersal details of microlithic hunter-gatherers from the WCLP to NETP, including the time, route, environment background and so on, remain unclear, due to the site appearance gaps between these two regions. Here, we report a newly discovered Late Paleolithic site, Jiangjunfu02(JJF02), situated in the transition region between the WCLP and Qinghai Lake Basin on the NETP. Chronological, lithic and biomarker studies of JJF02 reveal the human occupation history and their living environment change history at the site and the region. At ~15.8 cal ka BP, the microlithic and simple core-and-flake industry hunter-gatherers arrived at JJF02, when the climate was warm and the vegetation was dominated by woody plants around the region. During 15.5-13.4 cal ka BP, although the regional temperature kept decreasing, the long-term stable grassland-woodland environment provided hunter-gatherers rich plant resources. During 13.6-13.4 cal ka BP, when the temperature continued dropping, the increased biomass and the use of fire facilitated a more intensive human occupation at JJF02. Around 13.4 cal ka BP, the rapid decline in terrestrial plant resources and persistent cold temperature forced hunter-gatherers eventually leave the area. Synthesizing the research of microlithic site found in neighboring areas, we conclude that JJF02 site is closely connected both with the microlithic populations in the Qinghai Lake Basin on the NETP and the WCLP during the LDG. JJF02 had acted as a suitable living space

for the microlithic populations to adapt to the alpine and hypoxic environment. The arid climatic conditions of the WCLP perhaps prompted the microlithic populations spread to the NETP, where hydrological conditions were better and plant resources were more abundant. Our study offers a comprehensive insight into the dispersal of microlithic populations to the TP, shedding light on studies of prehistoric human adaptation to high-altitude environments.

Keywords: Northeastern Tibetan Plateau; Last Deglaciation; Microlithic hunter-gatherer dispersals; Environment change

JJF02 遗址揭示的青藏高原东北部细石器人群活动及其与环境变化之间的关系

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摘要：末次冰消期以来，受气候变化和技术发展的双重影响，细石器狩猎采集人群开始大规模向青藏高原扩散。陇西黄土高原是目前已知青藏高原周边地区仅有的存在更早细石器人群活动的区域，被认为是最可能的青藏高原细石器人群的来源区域。然而，由于两地之间存在较大范围内细石器人群活动和生存环境背景研究的空白，细石器人群自陇西黄土高原向青藏高原东北部扩散的具体时间、路径和可能的气候环境驱动机制并不清晰。为解决此问题，本研究针对新发现的、位于陇西黄土高原与青海湖盆地之间过渡区的细石器遗址-奖俊埠 02 (JJF02)，开展了年代学、石器技术和遗址原位的生物标志物等分析，以重建 JJF02 遗址的古人类活动历史和生存环境背景，并探讨该遗址在细石器人群向青藏高原扩散过程中的意义。分析结果显示，~15.8 cal ka BP，携带小石片石器和细石叶的狩猎采集人群已扩散到该区域，此时正值该区域气候暖湿化，植被覆盖度增大，木本植物增加的阶段。~14.9 cal ka BP-13.4 cal ka BP 期间，虽然区域温度持续下降，但湿度的增加以及长期稳定的草地-林地环境积累了大量的植物资源，生物量大幅度的增加促使古人类在~13.6-13.4 cal ka BP 期间通过使用火塘的方式应对低温环境，并实现了对 JJF02 的长期占据。至~13.4 cal ka BP，陆生植物资源的迅速减少和持续的低温迫使古人类最终离开该区域。综合毗邻地区多个细石器遗址的相关研究，本文认为，JJF02 遗址与同时期青海湖盆地和陇西黄土高原的细石器人群联系紧密，是两个区域交流的中间枢纽，为细石器人群向青藏高原的扩散和对高寒缺氧环境的适应提供了适宜的生存空间，而陇西黄土高原和高原东北部之间不同的水文条件导致的植物资源的差异可能是促使末次冰消期细石器人群向青藏高原扩散的主要环境驱动力之一。

关键词：青藏高原东北部；末次冰消期；细石器狩猎采集人群；生物标志物

Terminal Pleistocene human activity from the Qomolangma region, South Xizang : New evidence from the Su-re site

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Abstract: The high altitude, hypoxia and lack of resources on the Tibetan Plateau have brought great challenges to survival of prehistoric human beings. Among Paleolithic research, study of lithic artifacts is crucial for elucidation of the temporal and spatial patterns of prehistoric human occupation of the Tibetan Plateau. Core-and-flake technology is particularly noteworthy, as it is distinguished by its broad temporal span and widespread distribution across the plateau. In this study, we present the results of a reassessment of the lithic assemblage from the Su-re site in Tingri County, Shigatse City, Xizang Autonomous Region, China. Its resemblance to lithic assemblages from Southwestern China implies a close relationship between the plateau and its southeastern vicinity, contributing to the diversification of technology and prehistoric humans on the Tibetan Plateau. Moreover, fresh water and gneissic pebbles transported by glacial meltwater in the Tingri Graben—the most suitable raw material available in the vicinity—explain the presence of prehistoric humans in the inhospitable Qomolangma region, indicating that Su-re ancient people exploited a different adaptation strategy from hunter-gatherers using microblade technology.

西藏南部珠穆朗玛峰地区更新世末期人类活动：来自苏热遗址的新证据

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摘要：青藏高原高寒缺氧、资源稀少，为史前人类的生产生存带来巨大挑战，探索史前人类在高原的活动及其时空框架一直是学术界的热点问题。其中，石制品研究对探索史前人类石器技术与行为有着重要意义。近年来，在青藏高原高海拔地区、尤其是高原腹地的西藏自治区，石叶技术、细石叶技术产品的相关研究取得了一些新的进展，石核-石片技术产品方面，尽管分布广泛、数量众多，相关研究却相对缺乏。本次汇报中，作者以西藏自治区日喀则市定日县的苏热遗址为例，对其石核-石片技术产品进行分析与报道，认为其与中国西南地区的石制品更为接近。结合测年结果与古环境分析结果，作者认为苏热遗址史前人类应当出现在更新世末期至早全新世。在气候特殊的冰川环境中，苏热遗址周边的冰川融水、较为适宜石料成为古人类利用的重要资源，亦体现了石核-石片技术人群对高海拔地区的适应策略更为本地化，与高流动性的细石叶技术人群有所不同。

Early Paleolithic technological continuity and innovations in relation to faunal turnovers

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Abstract: Early Paleolithic subsistence in the Levant and other parts of the Old World was facilitated by the production of heavy-duty stone tools, including chopping tools, handaxes, cleavers, massive scrapers, spheroids and other types. These large tools may have been crucial for performing heavy-duty tasks that required significant loading force, enabling the effective processing of substantial megaherbivore carcasses, abundantly recovered from Lower Paleolithic contexts. In the Levant, the production of large implements continued throughout the Acheulian, before its near-complete disappearance after the Lower-Middle Paleolithic transition.

Meanwhile, the Levantine Late Acheulian is characterized by gradual incorporation of multiple technological innovations, including Quina-like scrapers, bifacial knives, thin double-ventral flakes, early blade production and the proto-Levallois method. Investigations into these lithic innovations suggest a technological and functional continuity rooted in traditional Acheulean technologies, which served as the foundation for these developments. Several new technologies and tool types that emerged in the Late Acheulian eventually became widespread cultural markers in the Levant and beyond, while others remained limited in scope.

The disappearance of heavy-duty implements and the adoption of many lithic innovations in the late Lower Paleolithic correlate with the decreasing availability of megaherbivores and shifting hunting strategies. We suggest that the reliance on medium and smaller-sized ungulates, a hallmark of early human subsistence in the Levant from around 400 kya, was a driving force behind the abandonment of traditional heavy-duty butchering tools and the development a novel, lighter toolkits. We propose the plausibility of this model for the Paleolithic record outside the Levant as well.

Diversification of faunal exploitation strategy and human-climate interaction in Southern China and Southeast Asia during the Last Deglaciation

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Abstract: Southern China and Southeast Asia were favourable habitats for foragers during the Last Glacial Maximum (~25–18 ka BP) and the Last Deglaciation (~18–11.7 ka BP), despite various climate fluctuation. However, the underlying subsistence strategies in these areas remains unclear, due to the lack of systematic chronological and archaeological data. The current study reports new results of radiocarbon dating, U-series dating, and zooarchaeological analysis from the Naminan cave site, located at the boundary between Southern China and Southeast Asia. It reveals that deer was consumed as the primary source of meat (91.7 %), supplemented by turtles, wild oxen, monkeys, wild boars, and mustelids during ~17.35–16.49 ka BP. The subsequent period of ~15.55-15.35 ka BP saw a radical declining proportion of deer, with various new species being consumed, such as shrews, porcupines, fish, crab, canidae, and wild cat. Human occupation of the Naminan cave site might have lasted until the Early Holocene. Comparing archaeological and paleoclimate evidence from Southern China and Southeast Asia, it is reasonable to argue that a progressively drier and colder climate during ~17.35–15.35 ka BP appeared to trigger a remarkable decline in human activity but greater range of diets in locations such as the Naminan cave and Yuchanyan sites, facilitating further expansion of hunting-gathering groups during the late phase of the Last Deglaciation with

warm and humid climate. This study contributes fresh data and perspective to a greater understanding of the evolution of human-climate interactions in low-latitude regions during Late Paleolithic period.

Keywords: zooarchaeological analysis, radiocarbon dating, subsistence strategies, Late Paleolithic period, Southern China and Southeast Asia.

末次冰消期中国南方和东南亚地区动物资源利用策略多样化及其影响

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摘要：末次冰期全球气候波动明显，低纬度的中国南方和东南亚地区是旧石器狩猎采集人群的理想栖居地。但由于目前有限的考古工作和对已发现遗址系统测年的缺乏，该区域史前人类活动及其生存策略转变的过程仍不清楚。基于此，本研究对云南西双版纳景洪市娜咪囡洞穴遗址开展年代学及动物考古学研究，结合已发表的测年和动物考古资料，分析了旧石器晚期人群生存策略转变的过程及其与气候之间的关系。结果显示，在 17.35-16.49 ka BP 期间，娜咪囡遗址人类的狩猎对象主要是鹿科（91.7%）动物，其次是龟科、牛科、猴科、猪科和鼬科动物；约 15.55-15.35 ka BP 期间，鹿科动物的比例下降至 69.7%，同时鼬獾科、豪猪科、鱼科、蟹科、犬科和猫科动物等加入狩猎的对象。结合区域考古学和古气候记录，发现~17.35-15.35 ka BP 期间逐渐冷干的气候可能缩减了人类活动的空间范围，同时也导致了该区域广谱化饮食的出现；约 15ka BP 后多样化的狩猎模式和暖湿的气候可能是导致旧石器晚期中国南方和东南亚地区人类活动强度增强的主要原因。本项研究为进一步了解旧石器时代晚期低纬度地区古人类与气候之间相互作用演变模式提供了新的数据和视角。

关键词：动物考古学、碳十四测年、生存策略、旧石器晚期、中国南方和东南亚地区

The systematic exploitation of large ungulates at Caijiagou-C: a Middle Pleistocene site in the Nihewan Basin, North China

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Abstract: The exploitation of large ungulates addresses key issues in the study of human evolution. Previous research suggested that carcass procurement and consumption by Plio-Pleistocene hominins in Africa has been extensively explored and hunting animals with weapons by Middle Pleistocene hominins were also well documented in west Eurasia. However, the evidence of human systematic exploitation of large mammals from east Asia is still scant. Here, we present a zooarchaeological analysis of the bone assemblage from a newly discovered Caijiagou-C (CJG-C) Paleolithic site in North China. Systematic excavations at the site have yielded well-preserved mammalian fossils and stone artifacts in fluvio-lacustrine sediments. Cosmogenic 26Al/10Be burial dating indicates that the inhabitation of the site by early humans most probably took place at ~ 0.5 Ma. Our results show that the CJG-C occupants had primary access to large ungulates, such as Equus and Bison, and regularly processed fur and soft tissues, and accessed nutrients from bone marrow. Furthermore, the systematic in-situ exploitation mode indicates that hominins possessed knowledge of anatomy and nutritional value of large ungulates, and even their individualized meat-sharing pattern. The systematic exploitation of large animals at CJG-C can be regarded as the earliest evidence of human subsistence strategies associated with the Middle Pleistocene lakeshore landscape in the Nihewan Basin.

中更新世古人类对大型有蹄类动物的系统性开发：以泥河湾盆地的蔡家沟遗址 C 地点为例

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摘要：大型偶蹄动物的开发利用对于研究人类进化中的关键问题具有重要意义。以往的研究表明，非洲的上新世至更新世早期人类对动物尸体的获取与消费已被广泛探讨，并且中更新世人类使用工具猎捕动物的行为在西欧地区也存在确切的证据。然而，来自东亚的古人类系统性开发大型哺乳动物的证据仍然十分稀少。本文对位于中国北方的新发现的旧石器时代人类活动遗址——蔡家沟遗址 C 地点（CJG-C）的动物骨骼化石进行了详细的动物考古学分析。通过对该遗址的系统性挖掘，我们发现了在河湖沉积物中保存完好的哺乳动物化石和石器。宇宙成因的铝-26/铍-10 埋藏测年的结果表明，早期人类在该遗址的居住时间很可能是在大约距今 50 万年以前。我们的动物考古研究结果显示，CJG-C 的居民主要获取了大型有蹄类动物，如马和野牛，有规律地处理其皮毛和软组织，并从骨髓中获取营养。此外，这种系统且原地的动物资源开发的模式表明，古人类对大型偶蹄动物的解剖结构和营养价值已经拥有一定了解，并且出现多人共同处理动物尸体的现象。本文研究表明，CJG-C 古人类对大型动物的系统性开发是与中更新世泥河湾盆地湖岸景观相关的生存策略的最早证据。

The Paleolithic Survey of the Upstream of Daling River Basin in the 2023-2024

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Abstract: The survey area is located in the upstream of the Daling River, the administrative unit belongs to the southwestern part of Chaoyang City, Liaoning Province, mainly involving Lingyuan and Kazou. Since the 1970s, there have been Paleolithic sites discovered in this area, in order to have a deeper understanding of the Paleolithic sequence and the lithic industry in this area, our team conducted field archaeological survey in the 2023-2024. A total of 650 predict sites were surveyed in the 2023-2024, covering the Daling River mainstream and its tributary waters. A total of 258 sites were discovered in Lingyuan and Kazou, mainly distributed in the third terrace of the red soil layer and the second terrace or platform of the yellow soil layer. The initial optically stimulated luminescence dating results show that the red soil layer in Kazou where lithics are found has reached the saturation of dating, and most of the site dates are within 100,000 years. A large number of stone tool sites may have been dated from the Neolithic or Bronze Age based on the observation of artifacts. There are many sectional sites in this area, and the age limit of the strata is large, which has great potential for establishing the regional Paleolithic sequence. In Kazou, there are more stone artifacts made of quartzite cobbles with a raw material of quartzite, which has a certain cobble industry tradition, while in Lingyuan County, the flint and quartzite small flake-core industry features are obvious. Most of the sites are close to the raw material source, and the feature of obtaining materials nearby is also obvious. The next step is to further investigate and study the specific origin of flint and the differences in the different lithic industry features.

2023-2024 年度大凌河流域上游旧石器时代考古调查收获

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摘要：本次调查区域位于大凌河上游地区，行政单元属于辽宁省西南部的朝阳市，主要涉及凌源、喀左两县。自 20 世纪 70 年代起，该地区不断有旧石器时代遗址发现，为对这一地区旧石器时代序列和石器工业面貌有更深层了解，本团队于 2023-2024 年度对这一地区进行田野考古调查。2023-2024 年度共计调查 650 处预设点位，涉及大凌河干流及其支流流域。凌源和喀左两地共计发现 258 处打制石器地点，主要分布于红土地层的三级阶地以及黄土地层的二级阶地或台地上。初步光释光测年结果表明，喀左县存在石制品的红土地层年代测年已经饱和，而大部分遗址地点年代在 10 万年以内。较多打制石器地点从遗物观察年代可能为新石器时代或青铜时代。本区域存在剖面遗址较多，且地层年代限度较大，对于建立区域旧石器时代序列潜力巨大。调查两地中喀左县以石英岩砾石为原料打片的石制品较多，有一定砾石工业传统，而凌源县燧石和石英质的小石片石器工业特征明显。大部分遗址点接近原料地，就近取材特征也较为明显。下一步就燧石具体产地、不同石器工业面貌差异的原因等问题进行进一步调查和研究。

主题：人类骨骼形态与动物资源利用

Human Skeletal Morphology and the Utilization of Animal Resources

The odontoglyphical characteristics in fossil record from China

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Abstract: Odontoglyphics as a branch of dental anthropology was first developed by Soviet anthropologist A. A. Zubov in the 1970s. Odontoglyphics requires the notation and nomenclature of the microrelief on the occlusal surfaces of the teeth as a means of allowing for a more accurate characterization and observation of the variation of the dental morphology. Odontoglyphical pattern, like other features of the teeth, is under strict genetic control and even serve to differentiate between twin types. After decades of practice, some odontoglyphical features have been recognized in modern humans with geographic differences between populations in Eurasia. For example, the characteristics that are more common in the East (Mongoloid) are: M11pr(II), M11pa(eo) type 3, M1 2pa/2pr type 3,M1 1pa/1me type 3, M1 1prd(eod)/1med type 3, M1 2med (III) etc. The characteristics that are more common in the West (Caucasian) are: M1 2pa/2pr type 1, M1 1pa/1me type 1, M1 1prd(eod)/1med type 1 , M1 1hyd(IV) , M1 2med (II) etc.

Studies on odontoglyphics have been done independently by scholars from other countries, for example: The odontologlyphicial variation as found in pre-Hispanic population (Guacanda); The individualistic nature of odontologlyphical patterns may play an important role in comparative forensic identification, etc.

The observation of odontoglyphics in paleoanthropology is currently limited,

with only a few studies on Denisovans, Neanderthals and early modern humans: Denisova 4 and 8 present certain accessory grooves of the third order which are different from modern humans; Some of the typical Neanderthals' teeth have both primitive (such as type “con”) and progressive features (such as 2med(II) and 2 prd (II)); Sunghir 2and 3 from upper paleolithic present basically similar odontoglyphical pattern as typical *Homo sapiens*, with few variation which are rarely recorded in modern populations. But until now, there are no odontoglyphical observation on the fossil materials early than Denisovan, such as *Homo erectus* etc. In particular, there is still a gap in this research in the Chinese region, both in fossil and modern human materials.

Our report is the first and preliminary observation of the odontoglyphical characteristics in fossil teeth from China. New discoveries in recent years (especially the Luanchuan juvenile *Homo erectus*) have provided us with a very good opportunity to observe those features. Luanchuan and Zhoukoudian *Homo erectus* share a number of similar odontoglyphical patterns and differ from the modern humans: Such as the falling position and the number of the additional grooves on the anterior fovea on both lower and upper molars; developed third-order grooves on lower molar (on med, end and hyd), type “con”, and central cusp formed by these grooves.

Teeth from Tongzi (240-170 ka) and Tubo (220-100 ka) have similar odontoglyphical patterns and similar to modern human, with some archaic traits such as certain third-order grooves, while they are not so many as *Homo erectus*. It is worth noting that the presence of eastern features, such as: 1pa(eo) type 3, 2 pa/2pr type 3. Meanwhile, there are also some western features present, such as: 1 pa/1 me type1, 1 prd/ 2med type 1. Therefore, it is difficult to say that the eastern features represent continuity or convergent evolution. Teeth from Dingcun (298-225 ka) and Daoxian (120-80 ka) have simple odontoglyphical patterns, which can match to the Zubov’s diagram. Above all, we suggest that the odontoglyphical pattern of modern human appeared at a very early date.

In the future, we look forward to expanding the materials and exploring the relationship between fossil hominin through quantitative studies (e.g., geometric morphology, phylogenetic analyses, etc.). Such a study would requires well-preserved dental materials from young individuals, making extensive research difficult, but the existent studies have demonstrated the value of the odontoglyphics, which is a non-ignorable part of paleoanthropology.

The variation of cranial temporal line in fossil human populations and its evolutionary significance

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Abstract: As the attachment site of the largest masticatory muscle, the temporal line is a valuable subject of research due to its reflection of functional changes in the masticatory muscles. The variation in non-metric traits of the temporal line is relatively complex, exhibiting distinct evolutionary differences across time periods. However, previous studies have lacked a systematic and comprehensive analysis of the temporal line in fossil human populations. To investigate the evolutionary variations in non-metric traits of the temporal line, this study collates data from 104 fossil skulls and 286 recent modern human samples, to conduct a comprehensive analysis of the temporal line's arc morphology, width, development degree, and terminal position. The results demonstrate substantial evolutionary divergences in the temporal line. Over time , the development degree of the temporal line weakened, its width increased, the terminal position shifted further back , and the proportion of double-arc types increased. Furthermore, there were regional differences in the temporal line among *Homo erectus* populations. The temporal line in East Asian *Homo erectus* was weaker, while the Javan *Homo erectus* exhibited the most pronounced development degree. Other *Homo erectus* populations fell between these two extremes. There are regional differences in the width of temporal line, and in Early Pleistocene and *Homo erectus,* Late Pleistocene, and recent modern humans, the temporal line is wider in Asian populations than in other regions.

Keywords: temporal line, non-metric traits, fossil human, human evolution

化石人类颅骨颞线的变异及其演化意义

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摘要：作为最大咀嚼肌颞肌的附着点，颞线能够反映咀嚼肌的功能变化，具有重要的研究意义和价值。颞线各项非测量性状变异较为复杂，且在演化上有明显的时代差异。但以往研究对化石人群颞线未有系统和综合性研究。为探讨颞线各非测量性状的演化差异，本文采用 104 个化石头骨和 286 个现代人样本，针对颞弧形态、颞线宽度、发育程度及末端位置进行了综合研究。研究结果表明，颞线在演化过程中差异显著。整体上，随着时代的发展，颞线的发育程度逐渐减弱，宽度逐渐增加，末端位置更加靠后，双弧型的比例不断上升。此外，颞线在直立人中存在明显的地区差异，东亚直立人颞线较微弱，爪哇直立人发育程度最为显著，而其他地区的直立人则介于两者之间。颞线宽度存在地区差异，在直立人、晚更新世和现代人中，亚洲地区人群颞线较其他地区宽。

关键词：颞线；非测量性状；化石人群；人类演化

Cranial morphology of a 21, 000-year-old modern human from southwest China

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Abstract: Here reports a new fossil human cranium (No. 22IVPP-H-Cr01), which preserves almost the intact face with most part of the frontal bone, left temporal squama and sphenoid bone. Isotopic tracer analyses of bone fragment and the sediment adherent to the cranium show that the cranium was most likely from southwest China. AMS ^{14}C and U-series dating of bone fragment from the cranium yielded a date of 20,846-20,356 years cal BP and 21.65±0.29 thousand years ago (ka), respectively. A surface model of the cranium was obtained using Artec Space Spider, and a more complete virtual three-dimensional (3D) model was reconstructed by mirroring, cutting and splicing processes. In addition, comprehensive morphological description and comparison of the cranium were carried out. In total, 40 cranial measurements were collected on 34 fossil specimens across the world and 43 recent modern humans from China, and used for further statistical analyses.

The results indicate that the 22IVPP-H-Cr01 cranium mostly likely belong to a female individual of 35~40 years old. The cranium exhibits a series of morphological features that are typical in anatomically modern human, mainly including broad and round frontal bone, prominent flatness of middle and upper face, weak postorbital constriction, gracile supraorbital region, pronounced malar incisure and malar tubercle. On the other hand, the specimen exhibits some traits that are uncommon in recent modern humans, including relatively notable sagittal prognathism, great interorbital width with an extremely wide and flat nasal bones. The results of the statistical analyses also indicate that the cranium belongs to anatomically modern human, different from *Homo heidelbergensis* and *Homo neanderthalensis* and other Middle Pleistocene archaic *Homo species*.

As a hominin survived during the Last Glacial Maximum (LGM), the morphology of 22IVPP-H-Cr01 is statistically closer to that of Asian pre-LGM

early modern humans rather than to recent modern humans. Nevertheless, it also presents some anatomical characteristics that are more similar to those of East Asian recent modern humans rather than to early modern humans (e.g., the small facial dimension, steep forehead, conspicuously flattened coronal plane of face, relatively tall face and orbits). In conclusion, the cranial morphology of 22IVPP-H-Cr01 is intermediate between pre-LGM early modern humans and recent modern humans, reflecting the temporal variation of the morphological evolution in modern human cranium from the East Asian continent over the past 40, 000 years.

中国西南地区距今 2.1 万年的早期现代人头骨形态

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摘要：本课题组新发现一个人类头骨化石（编号为 22IVPP-H-Cr01），保存有基本完整的面颅，大部分完整的额骨、左侧颞鳞和蝶骨。对头骨碎片及其表面附着土壤的同位素示踪分析表明，该标本最有可能来自中国西南（云贵）地区。从标本采集的骨骼碎片作直接 AMS^{14}C 测年，结果为距今 17030±100 年（校正年代 20846-20356 BP）；骨骼直接铀系测年结果为 21.65±0.29 ka。22IVPP-H-Cr01 头骨是末次冰盛期（LGM）期间在中国发现的罕见人类骨骼证据，其形态为晚更新世晚期至全新世的现代人头骨形态演化提供了重要信息。

本文通过手持激光扫描仪（Artec Space Spider）获取头骨的三维表面数据，并利用网格镜像方法重建完整面颅。对该面颅进行全面的形态描述，采集 40 项以上线性测量数据，并采集 77 例对比标本（包括 34 例世界范围内的化石标本和 43 例中国地区的全新世现代人标本）的非测量和测量数据作统计学分析。

研究结果表明，22IVPP-H-Cr01 头骨应属于 35-40 岁左右的女性个体。该头骨具有一系列符合解剖学上现代人的形态特征，如圆隆的前额、扁平的中上面部、无显著眶上圆枕、弱的眶后缩窄、明显的颧结节和颧切迹等；也有个别在现代人中比较少见的特点，如宽阔而扁平的鼻子、较大的眶间距离和较明显的矢状突颌。统计学分析结果表明，该头骨属于解剖学上的现代人，明显区别于海德堡人、尼安德特人和东亚中更新世古老型人类。22IVPP-H-Cr01 作为在 LGM 时期存活的古人类，其形态在统计学上接近于 LGM 前的亚洲早期现代人。然而，该头骨也表现出部分更接近东亚全新世现代人的解剖学特征，如面部尺寸较小，额骨宽而圆，上面部高度扁平且相对较高，眼眶较高等。总体而言，22IVPP-H-Cr01 头骨比 LGM 前的早期现代人更接近全新世现代人，反映了四万年以来东亚大陆的现代人头面部形态的演化具有时序上的连续性。

Variation in cranial vault thickness across populations and genders

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Abstract:

Background: Cranial vault thickness (CVT) has been a subject of debate in hominin taxonomy. While once considered a distinctive feature of Asian *Homo erectus*, recent studies have challenged this exclusivity. This study aimed to investigate CVT variation among extant humans, considering gender and population differences.

Methods: CT scans of the mid-sagittal plane were analyzed for 8 ancestry groups. CVT measurements were taken at 60 equidistant points. Statistical analyses assessed size influence, sexual dimorphism, and regional variation. Heatmaps visualized thickness patterns.

Results: A significant correlation between CVT and Glabella-Opisthion length was found. Sexual dimorphism varied among groups. African females exhibited thicker cranial bones overall. Despite thickness differences, the general CVT distribution pattern was consistent across groups. Diploë contributed most to thickening.

现代人群颅骨厚度的性别与人群差异

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摘要：颅骨骨壁厚度这一特征曾作为区分种属的重要标志：厚的骨壁是亚洲直立人的自近裔特征。然而，随后的一些研究发现，这一特点并不是亚洲直立人所独有。因此，骨壁厚度这一特征在人属成员之间的变异仍然模糊不清。在现生人群中，颅骨骨壁厚度也存在着一定程度的变异，可能与多种因素有关，但以往的研究得出了矛盾的结果。本研究目的是检验颅骨骨壁厚度是否存在性别、人群之间的显著差异。

本研究使用计算机断层扫描（CT）将 8 个人群的标本在正中矢状面上的颅骨三层骨壁厚度（外板层、板障层、内板层）进行对比，测量在正中矢状面上的 60 个等距点进行。展开相关性分析、双因素方差分析与协方差分析等，检验现生人群内部的尺寸影响、性别二态性和区域差异。在三维模型上生成 heatmap 观察骨壁厚度的变化模式。在现生人群中，发现骨壁厚度与眉间点—颅底点长度之间的相关关系；性别和人群存在交互作用；发现人群间的显著差异；性别二态性在不同人群中的表现程度不同。非洲女性总体上拥有较厚的颅骨骨壁。

Application of Geometric Morphometrics in the Study of Intentional Cranial Deformation Practices

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Abstract: As a permanent body modification, intentional cranial deformation practice (ICD) can be traced back to the Late Pleistocene and Early Holocene, symbolizing social identity and cultural beliefs. ICD practice alters the infants' skull through external pressure, which would last several years to ensure the modified shape is fixed. In China, ICD was particularly common in northern regions. Various modification methods were employed, including annular deformation, tabular deformation, and occipital compression. The primary tools used for this practice are boards and bandages.

In recent years, geometric morphometric analysis has been widely adopted in archaeological research, particularly in studying ancient cultural practices like ICD. Compared to traditional morphological measurement techniques, the geometric morphometric analysis is notable for its ability to capture three-dimensional shape changes and its high reproducibility. Geometric morphometric studies rely on three-dimensional shape data, collecting coordinates of cranial anatomical landmarks for statistical analysis. This approach quantifies morphological differences between samples and identifies key patterns and directions of shape variation to reveal social and cultural distinctions in ICD practices across populations. Moreover, it can be integrated with fields such as biomechanics and genetics, offering deeper insights into how cultural practices impact individual health and functionality.

Geometric morphometric methods have been applied to examine ICD practices in various places to reveal the regional variations in deformation types. In the case of the deformed skulls from the Songhuajiang region, dated to the Late Pleistocene and Early Holocene, geometric morphometric analysis was employed to compare these specimens with deformed and undeformed skulls. By projecting the specimens in an overall morphospace, our study identified the types and degrees of deformation and visualized the differences in deformation

types. Combined with individual life history traits revealed by isotopic analysis, the GM method provided a deeper understanding of the cultural motivations behind ICD.

几何形态学分析在人工颅骨变形研究中的应用-以松花江记录为例

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摘要：作为一种永久的身体改型习俗，人工颅骨变形（ICD）可追溯到更新世末期和全新世初期，它是社会身份归属和文化信仰的重要象征。颅骨变形通过施加外力于婴儿的颅骨上而进行改型，这一过程通常持续数年，以确定其形状能够固定。这种习俗在中国也十分常见，主要集中在我国北方地区。颅骨变形的改型方法种类繁多，包括环状变形、板状变形和枕骨变形等等。用来改型的工具主要有两种，硬质夹板和绷带。

近年来，几何形态学分析在考古研究中得到了广泛应用，特别是在研究像颅骨变形这样的早期文化习俗时。相对于传统的形态测量方法，几何形态学分析可以捕捉三维形态变化，且可重复性高。几何形态学研究以颅骨的三维形态数据为基础，收集颅骨解剖点三维空间的坐标来进行统计分析，从而量化不同样本的形态差异，找出形态变化的主要方向和模式，用来揭示不同群体在颅骨变形习俗方面的差异及其社会意义。同时，几何形态学也可以和生物力学、遗传学等领域相结合，有助于更好地揭示不同文化习俗对个体健康和功能方面的影响。

几何形态学在人工颅骨变形现象中的应用，主要集中在揭示不同群体间颅骨变形的类型差异上。以松花江地区发现的更新世末期到全新世初期的变形颅骨为例，通过将其与具有不同变形特征以及未变形标本的形态学数据进行对比，通过其在形态空间中的投射位置，可以判断其变形类型、变形程度，进行差异可视化。同时，结合同位素分析所反映的个体生活史特征，几何形态学方法可以为我们进一步了解其文化动机提供更深层次的见解。

Bioarchaeological study of human bones excavated from the Jiahu site

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Abstract: In 2013, the eighth excavation at Jiahu Site unearthed 73 human skeletal remains, dating back to about 9,000 to 7,800 years ago. This paper identifies and analyzes the gender, age, and related phenomena of these human skeletal remains. The results show that the peak of human skeletal death occurred mainly in the prime of life. The existence of injuries and some degenerative diseases indicates that in the prehistoric society of Jiahu, young and middle-aged male individuals, who were the mainstay of social activities, faced considerable survival pressure and bore heavy physical labor or directly participated in violent conflicts. The population buried in the central region of the Jiahu Site had a significantly higher incidence of dental caries and average height than those in the marginal region, showing a marked difference; the newly discovered deformation of the occipital bone of the skull seems to indicate that the population buried in the central region had a higher social status, better nutrition and health conditions, and possibly different identities, statuses, wealth, or burial customs from the grave owners in the marginal region.

贾湖遗址出土人骨的生物考古学研究

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摘要：2013 年，贾湖遗址第八次发掘出土了 73 例人骨材料，距今约 9000 至 7800 年。本文对这批人骨材料的性别、年龄及相关现象进行了鉴定与分析，结果显示，人骨死亡高峰阶段集中在壮年期。创伤和一些退行性疾病的存在表明，在贾湖史前社会中，青壮年男性个体作为社会活动的主体，承受着较大的生存压力，他们承担了繁重的体力劳动或直接参与暴力冲突。埋葬于贾湖遗址中部区域的人群，其龋齿患病率和平均身高显著高于边缘区域，呈现出明显差异；新发现的头骨枕部变形等现象似乎表明，这一位于发掘区中部的人群具有更高的社会地位，其营养和健康状况也相对较好，可能拥有与其他墓地主人不同的身份、地位、财富或埋葬习俗。

Archaeozoological study on fish remains from Late Pleistocene to Early Holocene shell midden sites in Zuojiang Basin, Guangxi, China

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Abstract: This study is an archaeozoological analysis of fish remains from four shell midden sites along the Zuojiang River in Guangxi, namely Zhongxing, Tuozhu, Laochen, and Pohui. The Zhongxing and Tuozhu sites are cave sites dating to approximately 14,000 to 13,000 years ago, while the Laochen and Pohui sites are open sites on the riverbank terrace, dating to about 10,000 to 8,000 years ago. The study materials consist of 1,111 fishbone specimens, including eight kinds of Cyprinidae, four kinds of Siluriformes, and two kinds of Perciformes. This study aims to explore changes in fishing strategies among hunter-gatherer-fishers and the importance of fish resources in their daily diet by comparing the differences in fish remains across the four sites in terms of the number of remains, species, skeletal representation, and fish size. The results suggest that during the Late Pleistocene at the Zhongxing and Tuozhu sites, fishing might have been an episodic activity, with fishers bringing relatively small-sized fish back to their caves intact for consumption. By the early Holocene, although hunting remained the main subsistence activity, the importance of fish increased significantly. At this time, humans may have had the capability and technology to selectively harvest a wide variety of fish, especially large-bodied catfish. Fishers might have discarded poisonous pectoral fin spines in situ after catching these large catfish, bringing only other parts back to the settlement. This shift could relate to advances in fishing techniques or adaptations to the changing landscape. This study is one of the few specialized analyses of fish remains from shell midden sites in the Zuojiang River Basin, and it provides a new case study for discussing the fishing activities of hunter-gatherer-fishers and their adaptive subsistence strategies within the broad-spectrum revolution in the Lingnan region during the Paleolithic-Neolithic transition.

Keywords: Guangxi Zuojiang; Shell midden sites; Late Pleistocene to Early Holocene; ichthyoarchaeology

广西左江流域晚更新世至早全新世贝丘遗址鱼类遗存研究

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摘要：本研究对广西左江沿岸的中兴、驮逐、老称、坡灰四处贝丘遗址的鱼类遗存进行了动物考古学研究。中兴和驮逐遗址为距今约 14000 至 13000 年的洞穴遗址，老称和坡灰遗址为距今约 10000 至 8000 年的河岸台地遗址。研究材料包含出自四个遗址的 1111 件鱼骨标本，包括 8 种鲤科、4 种鲇形目和 2 种鲈形目鱼类。本研究试图通过比较四个遗址鱼类遗存在数量、种类、骨骼单元分布和个体大小方面的差异，探讨古人类渔猎策略的演变及鱼类资源在人类肉食食谱中重要性的变化。结果表明，在晚更新世末期的中兴和驮逐遗址，渔猎活动可能是偶发性的，人类或倾向于将小体型鱼类完整带回洞穴使用。到全新世早期，尽管狩猎仍为主要的经济活动，但鱼类在先民食谱中的重要性显著提升。此时，先民也已具备选择捕捞多种鱼类的能力和技术，尤其是大体型的鲇形目鱼类。人类可能在捕捞这些大体型鱼类后，就地丢弃带毒的附肢骨骼如胸鳍棘，仅将其他部分带回居住地。这一变化可能与捕鱼技术的进步或对遗址周边环境的适应有关。本研究是少数针对左江流域早期贝丘遗址鱼类遗存的专门研究之一，为讨论岭南地区新旧石器过渡阶段古人类的渔猎采集活动和广谱革命的适应生存策略等问题提供了新的实证资料。

关键词：广西左江；贝丘遗址；晚更新世至早全新世；鱼类考古

Poster Session

Technological Analysis of Obsidian Microblade Assemblages from the End of the Upper Paleolithic to the Incipient Stage of Jomon Period in the Northwestern Kyushu, Japan Based on the Concept of Chaînes Opératoires

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Abstract: At the Fukui（福井） and Senpukuji（泉福寺） cave sites (Sasebo city, Nagasaki prefecture：長崎县佐世保市) located in the northwestern Kyushu（九州）, Japan, microblades were manufactured by the Fukui Mètho de（福井方式）, which is similar to the Yubetsu Mèthode（涌别方式）, from the end of the Upper Paleolithic to the Incipient stage of Jomon Period. They were made of obsidian sourced from the Hario（针尾）in Sasebo city and the Mt. Koshi-dake（腰岳）in Imari city, Saga prefecture（佐賀县伊万里市）.

Based on my examination of technological traces left on the microblade cores and related materials, this study presents how the microblades at these sites were manufactured, by applying technological analysis based on the concept of chaînes opératoires（操作链）, which involves replicative experiments of the manufacturing process.

It seems that microblades were made by the pressure flaking specially with a core held only by a hand and thigh muscles, notably without using any fixing devices.

Hafting ochre-based blades in the Gravettian of the Iberian Peninsula. The case of the ochre impregnated tools of Nerja Cave (Malaga, South Iberian Peninsula)

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Abstract: The description of the technique of lithic tool hafting is one of the most difficult facets to describe in any Pleistocene lithic assemblage. Although sometimes it is possible to infer possible areas of hafting due to technological and/or morphological evidence of the artifacts, to assure that these evidences are related to the process of haft is difficult to prove.

In this paper we present the traceological and residue analysis of the lithic tools from the Gravettian levels of the Nerja Cave (Málaga, Andalusia, Southern Iberian Peninsula), which date between 30 and 28000 cal BP. The composition of the lithic industry of this level is based mainly on medium-sized laminar supports made on flint of very good quality. Most of the retouched tools are made on these blades, mostly from simple-discontinuous retouch, as well as endscrapers and burins on truncated blades.

The results of the traceological and residue analysis have made it possible to document a complex ochre-based hafting system, as well as new uses of part of the lithic materials that had gone unnoticed by the techno-typological analysis, as is the case of the tools used for perforating activities. The identification of the hafting systems was established based on the appearance of microscopic layers of reddish pigment (not identifiable a visu) in most of the blades, in areas with no traces. These layers are located in practically all cases in the proximal areas of the tools, leaving the edges of the pieces completely free of this substance.

The data obtained from the function of this assemblage are almost entirely

related to the work on two types of materials, one mostly related to soft materials, especially hides (without ruling out a use in butchery work), and which generated very rounded edges, and the other related to activities on abrasive plant matter, in various actions such as scraping and cutting.

The description of this type of hafting technique is not characterized in any Gravettian site, and there are hardly any references to tools knapped impregnated with ochre, so this contribution may provide a new insight into the technological and cultural behaviors of these hunter-gatherer groups.

Keywords: hafting technique, ochre, hafting ochre-based, Gravettian, Iberian Peninsula

Facial reconstruction of hominins from the Late Middle Pleistocene of China (Hualongdong, Jinniushan, Dali, Harbin)

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Abstract: Our goal is to acquire data on the facial appearance of four Chibanian specimens from China: Dali, Jinniushan, Hualongdong 6, and Harbin, and to compare them to each other and to modern humans.In this study, we applied Gerasimov's method of facial approximation based on the skull to these four individuals in order to create four pencil portraits.

All four have features exhibit features that are clearly distinct from those of modern humans. All adult individuals, which are three out of four, show significant resemblance to one another. The fourth one, Hualongdong 6, while sharing many features with the others, displays some differences, which may be attributed to its adolescent age. Our results support the notion that a distinct hominin lineage, different from early Neanderthals and *Homo sapiens*, existed in Asia, potentially representing Denisovan humans.

Adaptation to a new resource environment in the acceptance of microblade culture in the Central Japanese Archipelago

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Abstract: At the final stage of the Upper Paleolithic period in the Japanese Archipelago, there was an event in which pressure flaking technique was adapted to non-obsidian raw materials, which was a prerequisite for the Neolithic period (Jomon period). Microblade assemblages played an important role in this event.The microblade culture arrived on Kyushu Island via China and the Korean Peninsula. The island is rich in obsidian, and the microblade flourished. This can be called southern microblade culture. The microblade technology that reached Kyushu Island was soon adopted by areas further east where obsidian raw material was not produced. As a result, the southern microblade culture, together with the northern microblade culture that had flowed in via Siberia and the Paleo-Hokkaido Peninsula, formed the boundary between the two cultures that separated the north and south of the Archipelago.

One of the areas where this event took place is the central part of the Japanese Archipelago,where the appearance of lithic culture is evident as a result of diffusion in both the north and south directions. In particular, the microblade assemblages distributed in the central part of the Japanese Archipelago acquired the form of a microcore that is unique to this area as a result of diffusion. Behind the unmixed distribution of the two cultures are the differences in microblade production technology, the resource environment that supports it, and the lineage of lithic culture that existed prior to the microblade. The multilayered and composite influence of these factors has led to the formation of a unique microblade culture in central Japan.

This presentation will collect reports of microblade assemblages in the central Japanese Archipelago. The relationship between the microblade techniques and the use of lithic raw materials practiced at each site will be summarized, and the process of north-south differentiation and formation of the microblade culture will be

explained. Also, this is a case study that will examine how the microblade culture, which exploded throughout the Japanese Archipelago, spread eastward and reached a cul-de-sac, and what kind of microblade production techniques and lithic consumption strategies they acquired.

Production techniques for early upper Paleolithic chopper/chopping tool in the Japanese Archipelago

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Abstract: One goal of human diffusion in East Asia is the Japanese archipelago. Located at the eastern end of the Eurasian continent, the archipelago can be assumed to have experienced cultural influxes via three routes at any given time: southward via Siberia, southward via China and the Korean peninsula, and northward via Southeast Asia. Of particular note is the period of the first human arrival in the archipelago. The oldest known culture in the Japan is the blade industry, which came via the Korean peninsula and is related to the shuidonggou site in China. On the other hand, sites from that period have yielded lithics such as stone axes with polished edges, trapezoidal lithic, and chopper/chopping tool that cannot be explained in relation to the lithic culture of humans who bypassed the Himalayas to the north and reached East Asia. These lithics indicate that the earliest humans to reach the archipelago may have had a southern lithic technology similar to that found in Southeast Asia and Australia by early *Homo sapiens* who traveled south of the Himalayas. Recent DNA analysis is also beginning to show that the period when *Homo sapiens* were expanding into Southeast Asia is old. By elucidating from a technological perspective the introduction of lithic technology developed in the south into Northeast Asia, it attempts to explain the complex diffusion of extant humans in East Asia. As a case study, this presentation will measure and analyze chopper/chopping tool in the central Japanese archipelago, focusing on the selection of raw materials and production techniques.

Examining the distance-decay effect on obsidian lithic technological organization and its implications for raw material transportation: A case study from the Upper Paleolithic of Northeast Asia

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Abstract: This study conducts a comprehensive quantitative comparative analysis of the Upper Paleolithic obsidian industry in Northeast China and South Korea, examining the human adaptation, exploitation, and distribution of obsidian, juxtaposed with migration and interaction dynamics across the Mount Paektu (Paektusan) and Korean Peninsula. Integrating distance-decay theory with the hunter-gatherer social network model, and informed by new archaeological findings, our research addresses three vital domains: the supply zone of Paektusan obsidian, dispersal patterns, and lithic technological strategies correlated to obsidian availability.

An obsidian raw material supply zone hypothesized to extend 100 km from Paektusan is established based on artifact frequency and size variations. Through a novel statistical approach, coupled with extensive database analysis of artifacts from three recent Northeast China excavations and existing Sino-Korean literature, our findings indicate a higher exploitation intensity of limited obsidian resources in South Korea, manifesting in specialized microlith use. The comparative analysis across five distance groups and Least Cost Path (LCP) models suggests the possibility of more geographically restricted southward material transport to South Korea. This research advances our understanding of the regional prehistoric exchange networks and offers fresh insights into the technological organization within the Upper Paleolithic obsidian industries of Northeast Asia. It underscores potential variations in raw material conveyance loss and foreshadows the investigative opportunities that may emerge from future

data accessibility in North Korea.

摘要：本研究对中国东北和韩国旧石器时代晚期黑曜石工业进行了全面的定量比较分析，探讨了人类对黑曜岩原料的适应、开发情况，探讨了长白山区和朝鲜半岛的古人类迁徙和互动。研究将距离衰减理论与狩猎采集者的社会网络模型相结合，并基于新的考古发现，重点研究了三个主要问题：长白山黑曜石的供应区、扩散模式以及与黑曜石供应相关的石器技术策略。

通过对出土黑曜石石制品的类型、占比以及尺寸变化的分析，假设长白山周围100公里范围内为黑曜石原料供应区。研究采用了全面的统计方法，并结合了对中国东北地区三个新发掘遗址的石制品数据和现有中韩文献的广泛数据提炼。研究结果表明，朝鲜半岛南部的韩国对有限的黑曜石资源进行了更高强度的开发，主要体现在细石器的专门化使用上。对五个距离组的比较分析以及最小成本路径（LCP）模型的应用，表明黑曜石向韩国南部的运输可能更具地理限制。本研究深化了我们对该地区史前交换网络的理解，并为东北亚上旧石器时代黑曜石工业中的技术组织提供了新的认知。

乌兰木伦遗址肋骨骨制品研究

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动物骨骼是史前人类的重要资源，肋骨作为动物骨骼的重要组成部分，考古发现表明古人类有意识地对肋骨进行了多方面的开发利用。目前，国外学者对考古遗址的肋骨人工制品进行了大量报道，并对肋骨的开发利用研究有一定程度的进展，但国内对肋骨人工制品仍关注不足。本文对乌兰木伦遗址发现的 500 多件肋骨骨制品的技术和功能进行了详细研究，重建了肋骨骨制品的生产过程，讨论了肋骨骨制品的功能，并对肋骨骨器开展了详细的研究。为我们深入探讨乌兰木伦遗址骨器工业的复杂性提供了新的认知，对于了解中国乃至东亚地区肋骨骨制品的相关问题提供了重要材料。

Animal bones are important resources available to ancient humans. Ribs, as an important component of animal bones, are exploited and utilized by ancient humans in many ways. Currently, rib artifacts in archaeological sites have been extensively reported and studied by foreign scholars, but there is still insufficient attention has been paid to rib artifacts in China. This study provides a comprehensive analysis of over 500 rib artifacts discovered at the Wulanmulun site, encompassing an in-depth examination of their technique and function. Additionally, it reconstructs the production process of these rib artifacts, explores their functional significance, and conducts a meticulous investigation into the rib bone tools. It provides us with a new understanding of the bone industry at the Wulanmulun Site, and provides important materials for comprehending the related issues of rib artifacts in China and and even in East Asia.