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Editorial: Overview and progress in bioarchaeological research in East Asia

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Editorial on the Research Topic
[Overview and progress in bioarchaeological research in East Asia](#)

1 Introduction

Bioarchaeology applies the methods and techniques from the geological, biological, and environmental sciences to analyze biological remains at archaeological sites. This interdisciplinary approach addresses important archaeological questions relevant to past human behaviors and society. Bioarchaeological research in East Asia has accelerated since the 21st century given the application of new analytical techniques and access to biological remains at important archaeological sites. This Research Topic, *Bioarchaeology in East Asia*, presents the latest research and systematic review of bioarchaeology in East Asia. It provides a platform to communicate among scholars who are interested in East Asia and better understand the biocultural evolution of human ancestors in this region.

A total of 12 articles contributed by Japanese and Chinese scholars have been published in this Research Topic. They can be divided into two categories according to article styles, *i.e.*, reviews and original research. The reviews offer a systematic overview and perspectives on radiocarbon dating, ancient DNA, rice domestication, and bioavailable Sr isoscapes in China and bioarchaeology in Japan. The original research presents analytical results from animal assemblages, human skeletons, and red substances covering chank-made shell beads and discusses the archaeological implications in depth.

2 Contributions to this research topic

2.1 Review articles

Chen summarized the process of establishing ¹⁴C dating laboratories and analytical techniques since the 1960s in China and proposed that the golden age for ¹⁴C dating arrived at the beginning of the 2000s. Chen pointed out that the technical improvement from β -decay counting to accelerator mass spectrometry had great impacts on Chinese

archaeology. [Chen](#) introduced several case studies to set up chronological frameworks for discussing the origin of early *Homo Sapiens*, the neolithization processes, and the Xia–Shang–Zhou dynasties. Lastly, [Chen](#) proposed four future directions to guide research in China, such as the establishment of more radiocarbon dating laboratories, further development of protocols for sample preparation and radiocarbon measurements, close cooperation between dating specialists and field archaeologists, and the need to establish a chronology of the historical era.

[Gao and Cui](#) summarized the chronological improvement of ancient DNA extraction techniques since the 1980s and emphasized the importance of next-generation sequencing (NGS) for ancient DNA research, indicating the arrival of the paleogenomic era. Using the accumulated paleogenomic data from China in recent years, they extensively summarized the migration and admixture histories of humans during the periods of the Upper Paleolithic, the Neolithic, and the Bronze Age. They also presented some unresolved questions to be investigated in the future, such as the Tibetan genetic history and the southward expansion of farmers in the Yangtze River region.

[Pan](#) re-evaluated the concepts of domestication in detail and drew a schematic paradigm to show the relationship of changing human behavior and variations of rice phenotypes and genotypes with the process of rice domestication. Based on the systematic review of archaeobotanical data (spikelet base, seed size, double-peaked tubercle phytolith, bulliform phytolith, and phytolith in spikelet base), four criteria were forwarded as empirical evidence to indicate the status of rice cultivation in either wild or domesticated variants. Subsequently, the spatial and temporal framework of rice domestication and dispersals was discussed according to different regions in the human behavioral perspective.

[Tang and Wang](#) overviewed the research history of Sr isotope analysis from its initial introduction to China in 2003. They constructed the first bioavailable Sr isoscape in China by compiling Sr isotopic data to identify human migration patterns and different patterns of utilizing animal resources in Chinese prehistory. Furthermore, they updated the Sr isoscape by the addition of newly produced Sr isotopic data from Southeast and South Asia, shedding new light on human communications and connections between customs and technologies at a broader spatial scale. Lastly, they investigated new analytical techniques to reconstruct the mobility of animals and humans at a lifetime scale.

[Nagaoka](#) presented a systematic review of bioarchaeological research in Japan. Since the first work on medieval human skeletons in 2003, bioarchaeological research in Japan has developed quickly and diversified. The author performed a statistical analysis of bioarchaeological articles published in the journal *Anthropological Science* between 2003 and 2022. The results showed that the proportion of articles focusing on ancient human skeletons increased from 42% in 2003–2007 to 85.1% in 2018–2022. Additionally, the number of articles covering diverse subjects such as paleopathology, stable isotopes, and bioarchaeology increased in contrast to the decrease in the number of articles related to human morphological analyses. The author also demonstrated the challenges facing the further pursuit of bioarchaeological research in Japan, including the dearth of physical

anthropology laboratories and the disciplinary separation between archaeology and physical anthropology.

2.2 Original research articles

[Sawada et al.](#) investigated the pathological conditions of human skeletons at the Tianluoshan and Hemudu sites in China during the Hemudu culture period (7000–5500 BP) and compared the health conditions between early farmers and hunter-gatherers. They suggested that low rice production and the diverse lifestyles of Hemudu farmers did not lead to an extreme decline in human health but, rather, to a decline in oral health. However, the long-term work in rice fields and their environment caused more physical stress for farmers than hunter-gatherers.

For the first time, [Zhang et al.](#) reported the bioarchaeological data (ages, sex, stature, and pathological conditions) of 16 skeletons from the cliff necropolises on the Chengdu Plain in China dating to the Iron Age. Based on their discussion of human demography, burial practices, stature, oral health, and dietary patterns, this study provides new insights into the physiological stress and health of the humans interred in the cliff tomb.

[Hu et al.](#) collected zooarchaeological data from 26 Neolithic and Bronze Age sites in the Guangzhou region, Shaanxi, China, to reveal the diachronic change of meat procurement strategies and its association with different factors. They found that the meat procurement strategies were not linear, *i.e.*, simply from hunting to husbandry, and that different strategies existed between settlements with different ranks instead. Furthermore, they discovered more reliance on domesticated bovids during the pre-Zhou and Western Zhou periods. They argued that the meat procurement strategies in the Guanzhong Basin were influenced by population sizes, social forms, and the natural environment.

[Festa et al.](#) investigated the exploitation of animal resources during the period of the Shang–Zhou transition (11th century BCE) by examining the faunal assemblages at the Sunjia and Xitou sites in China. They found that animal husbandry was mainly composed of pig farming and supplemented by extensive herding of goats and cattle. They suggested that the diverse use of animal resources by humans could have been regarded as a response to the growing climatic deterioration and also have been caused by the increasing interaction with pastoral communities in the north.

[Eda et al.](#) examined four immature Phasianidae bones by collagen peptide fingerprinting and radiocarbon dating to investigate the origin of domestic chicken in the Japanese archipelago. The results showed that the domestication of chicken in Japan occurred in the fourth and third centuries BCE. Therefore, they have proposed that the earliest domestic chicken in Japan can be dated to the middle Yayoi period, the lower chronological limit for the introduction of chickens to Japan.

[Li et al.](#) reported a comprehensive dataset obtained by the analyses of zooarchaeology, stable isotopes, and radiocarbon dates of animal remains at the Heishuigou cemetery, encompassing the Han Dynasty (202 BCE–220 CE) in the Hexi Corridor. These results showed that humans utilized multiple animals as funerary objects and that chickens, pigs, and dogs mainly ate C₄ foods (millets or their byproducts). In combination with previously reported isotopic data of animals, they found an

increasing reliance on herbivorous livestock, with a decrease of C_4 fodders from 2300 to 200 BCE, and a counter situation during the Han Dynasty. This consequence might be probably due to the military control by the Han Empire and the massive immigration of populations from the Yellow River Valley.

Wang et al. analyzed the red substances covering shell beads made of chank from the Indian Ocean, which were unearthed at the Qulong site (c. 800–500BC) on the Tibetan Plateau, by several analytical methods (pXRF, XRD, FTIR, and laser Raman spectroscopy) to reveal the chemical properties of red pigments and binding media. The results showed that the red pigments were iron oxide and that the binding media originated from pulverized bones and other proteinaceous materials. However, different formulas of bone powders and associated binders suggested the cultural complexity and diversity of local “applying red” traditions in the Tibetan Plateau and adjacent areas in prehistoric times.

3 Concluding remarks

I am encouraged to see the 12 publications of this Research Topic in *Frontiers in Earth Science*, which enhance our understanding of bioarchaeological research in East Asia. Moreover, this is the first time that bioarchaeological studies in East Asia have been combined and published within one Research Topic. I am looking forward to seeing more scholars in East Asia becoming interested and involved in another Research Topic in the future.

Author contributions

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