



## 马圈沟遗址古地磁测年结果在欧亚大陆 猛犸象演化研究上的重要意义

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河北泥河湾盆地马圈沟遗址古地磁测年结果(朱日祥等, 2004)的重要意义, 不仅仅在于其确立了远古人类在亚洲北部首次出现的最早年代。除人类文化遗物外, 马圈沟遗址还同时出土了大批对于我们理解上新世—更新世期间哺乳动物演化具有重要价值的化石材料。尤其重要的是该遗址第三文化层中的真象类牙齿标本(“*Elephas* sp.”: 朱日祥等, 2004), 已被鉴定为草原猛犸象(*Mammuthus trogontherii*)(魏光飚等, 2003)。

马圈沟的臼齿标本在如下形态学特征上符合猛犸象属(*Mammuthus*)的定义(Maglio, 1973; Lister and van Essen, 2003; 魏光飚等, 2003): 颊齿为板状齿, 齿板的前、后边(mesial and distal surfaces)近于平行; 臼齿磨蚀面上由两个或两个以上的釉质环(enamel ring)融合形成的釉质圈(enamel loop)的前、后边近于平行; 齿板的中央部位缺失一个向后和/或向前的明显突出的尖状构造(称为中尖突 loxodont sinus); 在一些相对原始的种里, 齿板的中央部位常发育一个向后和/或向前呈圆钝状突出的构造(称为中间突 median sinus); 一些中等磨蚀的齿板在磨蚀面上表现为明显的三分结构: 两个几乎等大的、近长方形的侧部釉质圈和一个呈圆形或不规则形状的中间釉质圈; 门齿弯曲并呈强烈的螺旋状旋转。

马圈沟遗址第三文化层的绝对年龄已被测定为 1.66 Ma(朱日祥等, 2004)。这一测年结果证实了该层出土的草原猛犸象化石是该种的全球最早记录。这非常重要, 因为草原猛犸象被认为是长毛猛犸象的直接祖先。在此之前, 草原猛犸象化石的全球最早记录分别是东欧的 1.0~0.8 Ma 和西伯利亚东北部的 1.2 Ma (Lister and Sher, 2001)。系统关系上, 草原猛犸象是由形态特征上明显更为原始的南方象演化而来的, 这两个祖裔种之间的演化过程最初被认为是在欧洲完成的(Maglio, 1973)。近年来, 西伯利亚东北部地区被主张为草原猛犸象的起源地点(Lister and Sher, 2001)。

马圈沟遗址第三文化层的绝对年龄测定结果强烈表明华北地区是草原猛犸象的起源地点。该论点被发现于华北地区更早期沉积物中的大量南方象化石材料所支持(魏光飚等, 2003)。从最初适应于温带森林环境的南方象, 向大家所熟知的适应于末次冰期时西伯利亚苔原地带的长毛猛犸象演化的一个重要环节, 草原猛犸象的成种过程很可能是随着更新世早期开放性草原环境和大陆性气候在华北地区的扩张而同步完成的。华北地区更新世早期的古环境特征已被孢粉证据(闵隆瑞、迟振卿, 2000)及动物群组合特征分析(蔡保全、李强, 2003)所证实。从草原猛犸象向适应于更恶劣气候条件的长毛猛犸象演化的最后过程很可能是在西伯利亚东北部地区完成的(Lister et al., 2001, 2005)。

## SIGNIFICANCE OF THE DATING OF THE MAJUANGOU SITE FOR UNDERSTANDING EURASIAN MAMMOTH EVOLUTION

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The dating of the Majuangou site in North China (Zhu et al., 2004) has significance beyond the timing of the earliest human occupation of northern Asia. This locality has also yielded fossil remains of great importance for understanding Plio-Pleistocene mammalian evolution. In particular, elephantid teeth discovered *in situ* in layer MJG-III (and noted as "*Elephas* sp." in Zhu et al., 2004) have been identified as steppe mammoth, *Mammuthus trogontherii*, their morphology falling within the "primitive" part of the range of the European material on which this species was founded (Wei et al., 2003; Lister et al., 2005). The dating of the MJG-III level to 1.66 Ma (Zhu et al., 2004) confirms this as the globally oldest record of *M. trogontherii*. This is of particular significance because *M. trogontherii* is regarded as the immediate ancestor of the woolly mammoth *M. primigenius*. The formerly oldest records of *M. trogontherii* are in the interval 1.0 ~ 0.8 Ma in Eastern Europe, and up to 1.2 Ma in northeast Siberia (Lister and Sher, 2001).

*M. trogontherii* itself derived from the considerably more primitive *M. meridionalis*, this transition having first been thought to have occurred in Europe (Maglio, 1973), then in northeast Siberia (Lister and Sher, 2001). The dating of MJG-III strongly suggests China as the locus of origin, a model consistent with the occurrence of *M. meridionalis* fossils in earlier deposits there (Wei et al., 2003). This major step in the transition from the originally temperate, woodland-dwelling *M. meridionalis* in the direction of the familiar grazing woolly mammoth of the late ice age, may have occurred in response to extensive areas of open vegetation and continental climate in North China during the Early Pleistocene, attested by pollen evidence (Min and Chi, 2000) and fauna assemblage feature (Cai and Li, 2003). It is likely that the final transition to *M. primigenius* occurred in the harsher environment of northeast Siberia (Lister et al., 2001, 2005).

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