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欧亚大陆东部新近纪气候与生物群变化——序言

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欧亚大陆东部新近纪对于全面认识现代全球气候与生物群的形成过程起到重要的作用。最近的研究表明，该地区在整个新生代不仅是动植物发源地，而且也是周围大陆之间的生物地理通道。有科学家提出在上新世/更新世期间该地区也可能是人类演化的中心。新近纪青藏高原的隆升深刻地影响了全球气温与降雨的分布格局，导致了亚洲季风的形成与加剧以及中亚干旱化。这些气候的变化推动了草原植被及相关生物群在欧亚大陆的扩展，以及晚中新世 C_4 植物的生态扩张。最近几十年来，越来越多的科学家致力于对上述问题的研究。古生物学家们研究或修订了自20世纪早期以来发现的大量动植物化石并逐步纳入到数据库中，如NOW（欧亚大陆新近纪数据库）。新的发现不断填补着空间、时间以及分类上的空白。这些工作使得新近纪大尺度动植物群演化模式的研究成为可能。古地磁地层学的引入提供了更为精确的年代标定，为长期困扰学术界的全球对比问题提供了可靠的时间标尺。大量新的手段，如稳定同位素地球化学、磁化率、植硅体以及有蹄类牙齿磨蚀分析等，为欧亚东部生态系统演化的研究注入了新的活力。新的定量分析方法被应用于气候变化的研究。尽管取得了一系列重要的进展，但是这项研究仍然处于开始阶段。化石地点的时间与地理覆盖范围还不理想，地层学框架仍然需要完善。因此，综合利用古生物学资料全面恢复古环境的研究工作还非常少。

2006年6月在北京召开的第二届国际古生物学大会上，我们组织了题为《欧亚大陆东部新近纪气候与生物群变化》的专题报告会，旨在对上述问题进行交流与探讨。来自亚洲、欧洲、北美的20余位专家汇报了各自的最新研究进展。学科覆盖沉积学、地层学、古土壤学、同位素地球化学、海洋微体古生物学、古脊椎动物学、古植物学等。会后我们组织了这期专辑，发表其中的部分研究成果。尽管只是其中的一部分，但基本涵盖了主要的研究范围。

NEOGENE CLIMATIC AND BIOTIC CHANGES IN EASTERN EURASIA: PREFACE

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The Neogene of eastern Eurasia plays a key role in our understanding of the processes that led to the establishment of modern climates and biotas worldwide. Recent work indicates that this region was as a source of new plant and animal taxa, as well as a biogeographic gateway between the surrounding land masses (Europe, Africa, North America) throughout the Cenozoic (e.g., Jacobs et al., 1999; Tiffney and Manchester, 2001; Beard, 2002). Indeed, some authors have argued that eastern Eurasia may have been a center for human evolution during the Plio-Pleistocene (Dennell and Roebroeks, 2005). It is also thought that the uplift of the Tibetan Plateau during the Neogene profoundly impacted global temperature and rainfall patterns, leading to the onset, or intensification of the Asian monsoon and increased aridification of central Asia (Ramstein et al., 1997; Fluteau et al., 1999; Dettman et al., 2003). These climate changes may have promoted the spread of grassland vegetation and associated faunas across the Eurasian continent and, in the latest Miocene, the ecological expansion of C_4 grasses (Dettman et al., 2001; An et al., 2001; Wang et al., 2006). The transformation of environments further stimulated zoogeographic differentiation and affected patterns of diversity in the region (Qiu and Li, 2003, 2005; Zhang et al., 2006).

These important topics are of wide scientific appeal, and the last few decades have witnessed an accelerating effort among both Asian and international workers to address them. The large collections of fossil plants and animals made by international and national explorations in, for example, China since the early 20^{th} century are being revised and incorporated into large databases such as NOW (Neogene of the Old World) (Fortelius, 2006). In addition, many new discoveries are beginning to fill spatial, temporal, and taxonomic gaps in the fossil record (e.g., Munthe et al., 1983; Wang et al., 2004). This work has allowed reconstruction of large-scale patterns of faunal and floral change during the Neogene (Hsu, 1983; Fortelius et al., 2002, 2003; Sun and Wang, 2005). The initiation of magnetostratigraphic work in eastern Eurasian sections has been vital for these analyses, providing the temporal control that previously hampered comparison with the Neogene of Europe and North America (Tedford, 1995; Li et al., 1997; Suganuma et al., 2006). A host of novel proxy methods, such as stable isotope geochemistry, magnetic susceptibility, phytolith analysis, and ungulate tooth wear analysis are now in use, shedding new light on eastern Eurasian ecosystem evolution (Guo et al., 2002; Zazzo et al., 2002; Merceron et al., 2004; Wang et al., 2006). In addition, new analytical approaches for inferring climate are being applied to already described floras (e.g., CLAMP, Coexistence Approach; Sun et al., 2002; Liang et al., 2003) and faunas (mean faunal hypsodonty; Fortelius et al., 2002, 2003, 2006).

Although significant strides are already being taken in the documentation of this critical interval of earth history in eastern Eurasia, the research is still in its infancy. Locality coverage is poor for many areas and time periods, and a robust and comprehensive stratigraphic framework is lacking. As a consequence, relatively few efforts have been made to synthesize different aspects of paleontological data for more complete paleoenvironmental reconstructions. Notable exceptions from this rule include the Miocene Siwaliks of Pakistan, which has contributed substantially to our current knowledge of eastern Eurasian faunal exchange, expansion of C_4 grasses, and the development of the Asian monsoon (Barry et al., 1991; Barry et al., 2002).

In June of 2006, we organized a theme session, "Neogene climatic and biotic changes in Eastern Eurasia", at the 2^{nd} International Paleontological Congress (IPC 2006) in Beijing, China, to focus attention to this growing field of scientific inquiry. By bringing together specialists in a wide range of disciplines, from sedimentology, stratigraphy, paleopedology, and stable isotope geochemistry, to marine microfossil paleontology, vertebrate paleontology, and paleobotany, we aimed to assess the current state of knowledge of the terrestrial or near-terrestrial Neogene of eastern Eurasia. A sizeable group of Asian, European, and American scientists shared their latest results during the one-day session. This special issue of *Vertebrata PalAsiatica* represents a subset of the papers presented in Beijing, which captures the scope of investigation presently underway.

To identify and understand patterns of past biodiversity in eastern Eurasia, updated revisions of paleontological data are badly needed. The paper by Chen and Zhang on the Late Miocene and Early Pliocene Chinese bovids referred to the genus *Protoryx* illustrates the efforts to reevaluate the systematics of previously described mammalian taxa.

The study of Liddicoat et al. erects a magnetostratigraphically controlled record of vertebrate faunas of Nei Mongol (Inner Mongolia). This record will serve as a vital reference for the many poorly dated localities resulting from nearly 80 years of collecting in the region, and provide improved means for correlation within eastern Eurasia.

Stable isotopes have only recently been employed for paleoecological investigation in eastern Eurasia, but have already significantly increased our knowledge of mammal diet and climate (e. g., Yang et al., 1999; Ding and Yang, 2000; Vidic and Montanez, 2004; Wang et al., 2006). Passey et al. present new data on stable carbon isotopes of tooth enamel from the Baode Formation, north China, to test longstanding hypotheses concerning the diet and environment of Late Miocene ungulates and the spread of C_4 grasses in China.

The study of vertebrate tracks in terrestrial deposits may supplement the record of fossil vertebrates where body fossils are wanting, and also add crucial paleoecological detail (Demathieu et al., 1984; Antunes et al., 2006). Ataabadi and Abbassi use the ichnological record from sites in northern and central Iran to fill fundamental holes in our record of Miocene mammals, at the crossroads between two important faunal regions: the eastern Mediterranean and the well-known Siwaliks of Pakistan.

Eronen devotes his paper to explaining the concepts of metapopulations/metacommunities and commonness, which have garnered attention among paleontologists as of late (e. g., Alroy, 2002; Jernvall and Fortelius, 2002), and how they relate to the familiar notion of chronofaunas. He further uses the distribution of faunal communities in Europe and East Asia to illustrate how metacommunity dynamics applied to the fossil record may offer a link between processes occurring on ecological and evolutionary scales, and temporal and spatial scales.

Phytolith analysis has in recent years become more prevalent as a paleoecological tool that can complement other paleobotanical methods of inference (Pinilla and Bustillo, 1997; Zucol and Brea, 2000; Strömberg, 2002). However, it has only rarely been applied to the Neogene of eastern Eurasia (among notable exceptions is Wang et al., 2003). In their contribution, Strömberg et al. use biosilica analysis to show that, contrary to what was previously thought, grasses played an important role in the Miocene ecosystem of Shanwang, China.

Finally, the paper by Dong et al. exemplifies the integrative approaches that are becoming more prevalent for examining paleoenvironmental change relating to climate and sea level fluctuation. These authors combine study of microfossils, geochemistry, and magnetic susceptibility for a detailed reconstruction of the evolution of the Late Quaternary Pearl River Delta of south China.

We thank the organizing committee of IPC 2006 for inviting us to host talks on Neogene environmental change. We appreciate the contribution of all enthusiastic participants of the session and especially the authors of this issue. We owe gratitude to Mikael Fortelius of Helsinki University, Finland, for his advice and help in preparing the session. We also thank Prof. Chang Meemann, Editor-in-Chief of *Vertebrata PalAsiatica* for making the journal available for publication of the papers that resulted, and Editor Ms. Shi Liqun at *Vertebrata PalAsiatica* for all her assistance in the publication process.

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