

“Responses to Anomalies and the Assimilation of New Knowledge in Pre-Modern Chinese Astronomy”

**Panel Organizers: David W. Pankenier, Lehigh University, Xu Fengxian, Chinese
Academy of Sciences**

This panel brings together four different perspectives on Chinese responses to anomalous celestial phenomena and the accommodation of new knowledge. Shi Yunli's paper concerns the first official efforts to translate and assimilate Islamic astronomical and astrological knowledge during the Ming Dynasty and the impact of that information on the work of the Bureau of Astronomy and the Calendar. Rivalry and mutual suspicion between Han Chinese and Muslim astronomers at court were long thought to have arisen in part from the suppression of key features of the Islamic astronomical tables by Muslim astronomers. Shi Yunli's recent discovery of an important work by one of Zhu Yuanzhang's astronomers has now shed important new light on the process of translation and the role of secret knowledge in the transmission of Islamic astronomy to China. The second paper is a historical survey of the elite response to celestial anomalies during the 2,000-year span of the imperial period. Xu Fengxian's study charts the changing socio-cultural response to unpredicted celestial events against the backdrop of China's dynastic history. In the process, the study reveals how the notion of mutual influence between the celestial and temporal realms expressed itself differently over time, and she finds that the 'astrological' mindset never again achieved the degree of influence it had in the Han Dynasty. The third paper deals with Zhang Zixin's (6th century AD) scientific analysis of the planet Mercury's perplexing failure to appear as predicted and with the modern verification of aspects of Zhang's new theory of Mercury's behavior and their origins. Finally, David Pankenier's paper recovers a practical method used by the late Bronze Age Chinese to accurately locate the position of the north celestial pole. An intense politico-religious focus on cardinal orientation and the pole in the early dynastic period, together with the lack of a functional pole star, made it imperative to devise a practical astral method for aligning high value structures on true north. The result was the discovery of a unique indirect method of architectural alignment using the stars.

Individual Paper Abstracts

“Knowledge Secrecy and the Early Ming
Assimilation of Islamic Astronomy”

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Islamic astronomy was first supported and adopted systematically by the Yuan Dynasty for “granting seasons” to the Muslims in China as well as for astrological service to the emperor. But the Yuan government failed to encourage any effort in translating Arabic works in astronomy into Chinese. Islamic astronomy and Chinese astronomy were maintained separately by two competitive bureaucratic institutions dominated by Muslims and Han Chinese who enjoyed no freedom of mutual-communication. After the founding of the Ming Dynasty, Zhu Yuanzhang inherited the institutionalized segregation and competition

between Muslim and Chinese astronomers at court, but he made the first official effort to translate and thus to assimilate Islamic astronomy and astrology into the Chinese system of astrological-calendrical service. The result can be seen in two works: *Ming yi tianwen shu* 明译天文书 (Ming Translation of [Islamic] Astrological Writings) and *Huibui lifa* 回回历法 (Chinese-Islamic Astronomical Tables). The latter became for Han Chinese astronomers an important source of exotic astronomy and the inspiration for astronomical reform in the subsequent years of the Ming Dynasty. It was not until the late Ming Dynasty that some Han astronomers eventually realized there was a crucial deficiency in the available Chinese version of the tables. While the tables themselves were complete, a key algorithm was not provided without which the entire tables were useless. Hence arose the accusation that the Muslim astronomers who helped in translating the tables had “deviously hid the root numbers” 巧藏根数 of the *Huibui lifa* to “fool the eyes and ears” of their rivals, the Han astronomers at the official Bureau of Astronomy. The accusation persisted for more than 300 years up to the present as a major issue in the spread of Islamic astronomy to China. Recently, I found an important work on the adaptation of the Chinese-Islamic Tables to Chinese use, written by an official astronomer under Zhu Yuanzhang. He turns out to have been a key person in the translation project ordered by Zhu Yuanzhang, and his long lost work sheds new light, not only on the notoriously obscure process of how the *Huibui lifa* was translated, but also on the role played by secret knowledge in the Muslim astronomers’ transmission of astronomical know-how to their Chinese rivals. This paper is an analysis of this newly rediscovered work of great importance.

“Changing Perspectives on Anomalous Celestial Phenomena in Ancient China”

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In ancient China, the dominant view of anomalous celestial events was that they were a response to human affairs, so that they could have widespread social consequences. In order to compare these effects at different times, Xu Fengxian divides the span from Han to the end of the Qing into 11 periods. By analyzing the timing and contents of imperial edicts concerning anomalous celestial phenomena in each period, and taking into account the historical background, she finds that it was the Han Dynasty that attached the greatest importance to such events. This effect was observed to decline markedly from the Wei to the Sui Dynasty. It began to rise again in the Tang Dynasty, reaching a second peak in the Song Dynasty, and then decreased again from the Yuan to the Qing.

“On Zhang Zixin’s Mercury Theory and its Possible Origin”

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Niu Weixing's paper starts with the mysterious astronomical discoveries by Zhang Zixin. Five important aspects of Zhang's discoveries are discussed first, pointing out that Zhang's discovery of Mercury's "*Should-Appear-But-Did-Not*" (应见不见) phenomenon is the finest. Records of Mercury's "*Should-Appear-But-Did-Not*" preserved in the Chinese astronomical literature are listed and explained, and it is also shown that Zhang's discovery was followed by some later Chinese astronomers. Zhang's Mercury theory is carefully investigated using modern theoretical and numerical astronomical methods, and it is concluded that the phenomenon of Mercury's "*SABDN*" could actually occur. Zhang Zixin's claim about the phenomenon is essentially true, however some of his views about Mercury and the other planets do not agree with the facts. Finally, the possibility of foreign influence on Zhang Zixin's discovery is discussed.

"Bringing Heaven Down to Earth in Ancient China"

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Study of the cosmological significance of the North Pole in ancient Chinese thought suggests that ritual specialists in Bronze Age China, like their earlier counterparts in ancient Egypt, used the circumpolar stars to find true north, a challenge complicated during the last two millennia BCE by the absence of a comparatively bright star at the pole. Archaeological discoveries from the Xia, Shang, and Zhou periods show that it was crucial to achieve a cardinal orientation of the built environment—walls, palaces, temples, tombs, common graves, and even sacrificial burials give evidence of a preoccupation with N-S axial alignment. It has long been understood that cardinality is an index of the paradigmatic roles of "the center" and "the four quarters," both core organizing principles of early Chinese cosmological thinking. Here, however, my concern is less with cosmology than with how, in practical terms, cardinal orientation was achieved in the early period and what this tells us about a fundamental mindset that figured importantly in the formation of early Chinese civilization. This paper focuses on recovering an early technique that appears to be a uniquely Chinese solution to the problem of achieving cardinal alignment. Until now, researchers appear to have overlooked this surprisingly well-documented method, which takes advantage of the orientation of the Great Square of Pegasus (known as *ding* 定 in pre-Qin China). The study reveals that by the late Bronze Age the Chinese had discovered an indirect technique capable of achieving a high degree of accuracy in aligning structures on true north.