

**METEORITIC ARCHAEOLOGIC OBJECTS AS A KEY TO UNDERSTANDING
TRADE IN ANCIENT EASTERN NORTH AMERICA**

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Prior to the beginning of the Iron Age ~1200 BCE, iron artifacts are exceptionally rare and those that are known often use of meteoritic iron. These include meteoritic metal beads from Egypt that date to ~3400-3100 BCE [1], a Chinese bronze age dagger with a meteoritic metal blade dating to ~1,000 BCE [2] and a variety of implements made from meteoritic metal and excavated from Hopewell era (~500-100 BCE) mounds in the Eastern United States [3,4] at modern-day Chillicothe, Ohio and Havana, Illinois. The Hopewell beads from Ohio have been convincingly linked to the Brenham, Kansas pallasite [5] and the Havana beads to the Anoka, Minnesota iron [6]. These latter occurrences are of particular interest, as the Hopewell engaged in systematic exchange of exotic objects including obsidian, mica, copper, silver, bear teeth and shells. The movement of material between Hopewell sites has alternatively been envisioned as a regularized exchange system with material moving through multiple exchanges before reaching their destination – the Hopewell Interaction Sphere [7] – or through long-distance logistic trips to sites of known resources – the “one-shot” model [8]. The linkage of these Hopewell meteoritic beads to specific sources provides a unique test of the competing hypotheses for trade of meteorites in Eastern North America more than 2,000 years ago.

The movement from source to final location for these meteoritic beads provides an interesting test of the competing models of the Hopewell Interaction Sphere and the “one shot” expedition model. While most of the exotic materials (e.g., obsidian, mica, copper) used by the Hopewell occurred in abundance at their sources, that is not universally true of meteorites. The Brenham meteorite, which is the source of the meteoritic metal beads identified at the Hopewell mounds in Ohio, has produced many tons of material up to the present. As such, the idea that an expedition might visit that site for the specific purpose of returning material to Ohio seems tenable. In contrast, the 22 metal beads identified from the Havana mound almost certainly originated from a single small mass and additional masses were likely not known to the Hopewell.

The first Anoka, Minnesota iron mass was found during excavations about four feet beneath the surface. An additional mass of the Anoka iron was discovered in Champlin, Minnesota in 1983 while excavating a sewer, the new mass was chemically identical to Anoka. Interestingly, Champlin and Anoka bound the Mississippi River at its intersection with the Rum River. Thus, at least two and quite probably more iron masses were deposited along a major Hopewell era waterway travel route. Evidence for a shower of irons is supported by measurement of cosmic-ray produced rare-gas isotopes [9]. The unusually low ^{10}Be of 1.6 ± 1.0 dpm/kg suggests a pre-atmospheric radius in excess of 40 cm and associated pre-atmospheric mass in excess of 4000 kg, far in excess of the recovered mass (K. Welten, pers. comm., 2016). Based on the measured $^{36}\text{Cl}/^{10}\text{Be}$ ratio of ~5, [9] suggested a relatively young terrestrial age of less than 100 ka. This minimal constraint on the terrestrial age of Anoka allows the possibility that they were deposited in the area during the most recent glacial period ~10 ka, although a more direct explanation for their occurrence is a shower of occurred in this area in the post-glacial period. At the site of Anoka, erosion along the Mississippi has created banks some 15-20 feet high in which an iron meteorite could have been exposed.

The pathway from the fall location of the Anoka meteorite in Minnesota and the final location in Havana seems straightforward. The Anoka meteorite fall occurred across the Mississippi and the Havana mounds were located along the banks of the Illinois River, which is a tributary of the Mississippi. The Havana Hopewell center likely interacted with both the adjacent Trempeleau Hopewell, which extended from southwestern Wisconsin up the Mississippi river to the find site of the Anoka meteorite, as well as the more distant Ohio Hopewell which centers in southern Ohio. Given the singular nature of the Anoka mass used to form the Havana beads, the most likely scenario for recovery was by local inhabitants who were part of the Trempeleau Hopewell. Metal working was common among the Hopewell, with copper being the most commonly worked metal to manufacture a variety of ceremonial objects including beads. Copper beads are known from Ohio, Havana and Trempeleau sites [10]. Given that copper beads have been identified in all three Hopewell centers, the direct connection between Anoka and the Havana site via the Mississippi and Illinois rivers, and the absence of comparable composition meteoritic beads among either the Trempeleau or Ohio Hopewell sites, the most likely scenario suggests manufacture by the Havana Hopewell.

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