

## Early cross-cultural ties arise in China

Chinese archaeologists working at Baifu, a site just north of Beijing, uncovered three Bronze Age graves in 1975 that were radiocarbon dated at about 3,000 years old. After exploring two of the tombs, researchers concluded that the corpses had belonged to an ancient Chinese dynasty.

On closer inspection, however, these dead folks and their belongings assume a different identity, one consistent with the notion that foreigners exerted critical influences on early Chinese civilization, according to a new study.

The distinctive Baifu tombs derived from a poorly understood "northern culture" that included Caucasians, asserts Mrea Csorba, an art historian at Duquesne University in Pittsburgh. Vigorous trading of goods and services apparently took place between northern and Chinese populations, Csorba argues.

"Members of the northern culture were, at the very least, horse traders who went into China and obtained basic necessities such as flour, sugar, and salt," she holds. "They were probably nomadic, but at this point we don't know the specifics of how they lived."

Csorba's research, published in the September *ANTIQUITY*, supports contentions that Europeans—like those whose mummified bodies have been found in 2,400- to 4,000-year-old cemeteries farther west, in China's Xinjiang Province—introduced the Chinese to horseback riding and perhaps other cultural innovations (SN: 2/25/95, p. 120).

"Csorba's work provides one more bit of hard evidence indicating that there were no strict cultural barriers in ancient Asia," asserts Victor H. Mair of the University of Pennsylvania in Philadelphia. Mair, a specialist in ancient Asian cultures, directs ongoing excavations and analyses of the Xinjiang mummies.

The Duquesne researcher compared

descriptions of the Baifu tombs, assembled by Chinese archaeologists, to those of nearby tombs that are from the same period and of undisputed Chinese origin. She also studied artifacts from the Baifu graves. The tombs themselves have been covered by a construction project.

Each rectangular, wooden tomb at Baifu contained a male skeleton resting on its back, its head oriented northward. To the upper right of the corpses lay non-Chinese items, such as distinctively fashioned knives, daggers, axes, axle heads, bronze horse gear, and helmets.

Cast on the handle of one of the Baifu daggers is a Caucasian face, complete

with bushy eyebrows, handlebar mustache, and curly hair, Csorba asserts.

Chinese pots and other items apparently obtained through trade nestled against the walls, she notes.

In contrast to the northern style, ancient Chinese burials contained corpses of high-ranking officials flanked by the bodies of attendants. Ledges inside the graves and compartments outside the burial chambers contained Chinese-style objects, such as bronze vessels and weapons.

Chinese archaeologists are aware of the new findings, but long-standing assumptions that Chinese culture developed in isolation make it difficult for them to reassess the Baifu tombs, Csorba contends. — B. Bower

## Cometary ices may have interstellar origin

About 4.5 billion years ago, an interstellar cloud began to contract, forming a disk of gas and dust that encircled a hot, nascent stellar object. Over time, the disk condensed and heated, undergoing chemical changes as its material gathered into bigger and bigger clumps that became our solar system's planets. Comets are thought to have arisen in the outer, cooler parts of the disk and their well-preserved supply of ices are believed to reveal what conditions were like when the solar system began.

Evidence now suggests that some of the ices hail from a still earlier era. Recently analyzed spectra of Hyakutake, the comet whose ghostly tail captivated skywatchers last spring (SN: 6/1/96, p. 346), indicate that certain cometary ices remain unchanged from their composition in the interstellar cloud that gave birth to the solar system. Comets ferry key organic compounds and water to Earth from the fringes of the solar system. The new finding suggests that comets also deliver material directly from interstellar space, which may have contributed to the development of life on our planet.

In the Oct. 17 *NATURE*, Timothy Y. Brooke of NASA's Jet Propulsion Laboratory in Pasadena, Calif., and his colleagues detail their detection of acetylene boiled off the surface of Comet Hyakutake as it neared the sun. The team reports that the abundance of the compound differs from typical solar system values but matches the estimated abundance in cold interstellar clouds.

The scientists propose that the evaporating material derived from ices frozen onto dust grains in the interstellar cloud "rather than material processed in the... disk out of which the solar system formed," they write.

Their conclusion echoes those of two earlier studies. In the Oct. 3 *NATURE*, William M. Irvine of the University of Massachusetts in Amherst and his collaborators report their detection in Hyaku-



Comet Hyakutake in its heyday.

take of two related organic compounds—hydrogen isocyanide and hydrogen cyanide. The relative abundance of the compounds matches that measured in interstellar clouds and differs significantly from the ratio expected in the outer part of the solar disk.

Last May, a team led by Michael J. Mumma of NASA's Goddard Space Flight Center in Greenbelt, Md., reported high concentrations of ethane relative to methane in Hyakutake, a ratio consistent with an interstellar origin.

Taken together, "these findings suggest strongly that Hyakutake contains ice from the natal interstellar cloud," says Mumma. Neither he nor any other comet observer, however, is willing to go beyond "suggest."

"The problem is that we're ignorant about the chemistry of the interstellar medium and of comets," says Harold A. Weaver, who collaborates with Brooke at Johns Hopkins University in Baltimore. To complicate matters, the solar disk may have vaporized ices that arose in the interstellar cloud, and the sun's ultraviolet radiation may have further transformed the ices. "The data taken so far aren't enough to [indicate if an interstellar origin] is right or wrong," says Weaver. — R. Cowen

Csorba and L. Purvis-Yund



Artist's rendition of Caucasian man's face cast on Baifu dagger handle.