Dental Exam Corrals Early Equestrians

An archaeologist looked a gift horse in the mouth and walked away with the first solid evidence that humans domesticated and rode horses about 6,000 years ago, much earlier than estimated by many researchers in the United States and Europe.

"Horseback riding was the first significant innovation in human land transport, preceding the invention of the wheel by approximately 500 years," David W. Anthony of Hartwick College in Oneonta, N.Y., told SCIENCE NEWS.

Scientists often place the initial domestication of horses at around 4,000 years ago in Eurasia, basing their estimates on historical depictions showing horses used by military cavalry. Indirect measures of domestication – such as sudden decreases in equine bone size, presumed to result from the biological stress of being put to work for humans – have also supported this view.

But horseback riding dates to prehistoric times, contended Anthony at last week's meeting of the International Council for Archaeozoology in Washington, D.C. His argument stems from the analysis of microscopic dental features that develop when a bit – the part of a bridle placed in a horse's mouth – rubs against the teeth as the horse is ridden.

Last year, the Ukrainian Academy of Sciences granted Anthony and colleague Dorcas R. Brown access to equine remains from a site in the Soviet Ukraine. Four radiocarbon dates place the site, known as Dereivka, at 6,000 years old.

Of particular interest to Anthony and Brown was the "Dereivka stallion," consisting of the skull, lower jaw and forelimb bones of a mature horse found buried with two dogs and several ceramic human figurines. The Hartwick researchers obtained casts of both lower second premolar teeth – located in the cheek – and studied them under a scanning electron microscope at Cornell University in Ithaca, N.Y.

The Dereivka stallion clearly was ridden, Anthony says. Both premolar teeth are beveled in front, and tiny enamel fractures appear within smooth, polished areas on the sides and front of the teeth. In the last three years, the researchers have found these features on the cheek teeth of living horses that are ridden, but not among wild horses. Worn, rough patches on the prehistoric teeth suggest the riders used a rope bit.

A Canadian veterinarian took the first steps toward bit-wear analysis several years ago, using X-rays of bits in horses' mouths to show that the animals always grasp the bit between the first and second premolars, Anthony says. In their own studies, Anthony and Brown obtained casts of premolar teeth from domesticated horses ridden with metal bits and from a small group of wild horses, most of which had been illegally killed by Nevada cattle ranchers and were provided to the researchers by state officials.

While the Dereivka stallion displays essentially the same dental wear as that found on living, domesticated horses, four other equine premolars from the Ukrainian site show no signs of bit wear. These teeth were found in small mounds of garbage, suggesting Dereivka's inhabitants may have eaten wild horses, Anthony maintains.

He and Brown also examined horse teeth from several nearby sites dating back as far as 23,000 years, but found no signs of bit wear.

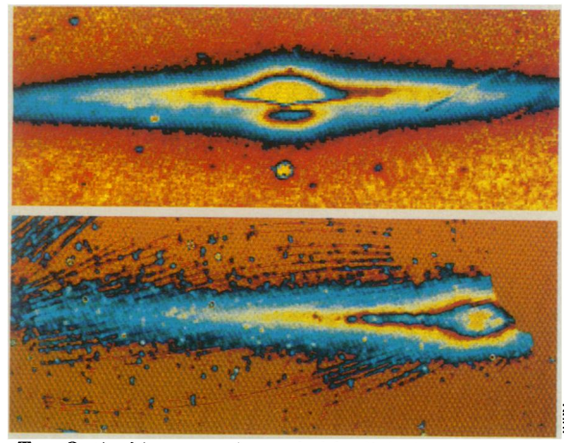
For some time, Soviet archaeologists have argued that horses were ridden at Dereivka and other small settlements of the Sredni Stog culture that flourished from 4300 B.C. to 3500 B.C., "but their voices haven't been heard too well over here," Anthony asserts. Sredni Stog people moved through river valleys into Eurasian steppes where wild horses lived, he says. Horse domestication would have given their simple hunting society a tremendous military advantage over nearby agricultural groups, Anthony adds.

This summer, Anthony and Brown will study dental wear produced by rope, the probable material of choice for early bits.

– B. Bower

Mapping new features of Milky Way's bulge

With their view already obscured by Earth's atmosphere, astronomers have a tough time peering through galactic dust for a penetrating look at the Milky Way's core. But in 1985, the Infrared Telescope (IRT) headed past the atmospheric shroud and took its pictures from space. Flown on the shuttle, it returned with enough data to provide a detailed map of our galaxy's inner bulge.



Kent

Top: Optical image, color-coded for light intensity, shows inner bulge of NGC 4565. Bottom: Infrared image shows extent of Milky Way's inner bulge (fatter area at extreme right); bright patches are diffuse starlight seen in relatively dust-free regions.

While the IRT images are limited to one wavelength and equal the resolution of pictures so far obtained by the Cosmic Background Explorer (SN: 4/28/90, p.260), they capture a greater slice of the Milky Way in the northern celestial hemisphere. An already established calibration between detected light signals and their intensity enabled Stephen M. Kent and his coworkers at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., to compare IRT's Milky Way maps with images of similar spiral galaxies that appear face-on as viewed from Earth. Such comparisons, says Kent, "can help fill in the missing blanks" about galactic structures, hinting at the three-dimensional character of Milky Way features visible only edge-on when viewed from Earth's vicinity.

Kent and his colleagues find evidence that gas in the Milky Way's inner bulge – about 3,300 light-years in diameter – may move in an elliptical orbit, indicating the bulge is much less symmetric than previously thought. He notes that the bulges of other spiral galaxies, including the nearby M31, also show asymmetry. In addition, Kent says the work supports the notion that a star cluster exists just a few light-years from the galactic center. Several scientists have suggested that such a cluster, also seen near the center of other spiral galaxies, may be caused by a black hole lurking at the Milky Way's core.

The team also discovered clues to a Milky Way feature that has no obvious counterpart in other spiral galaxies: an apparent ring of stars about 13,000 light-years from the center. Kent believes this may be an edge-on view of one of the Milky Way's spiral arms.

He and his co-workers, who discussed their initial findings at a conference in Chile last year, are preparing an expanded report for publication. *– R. Cowen*