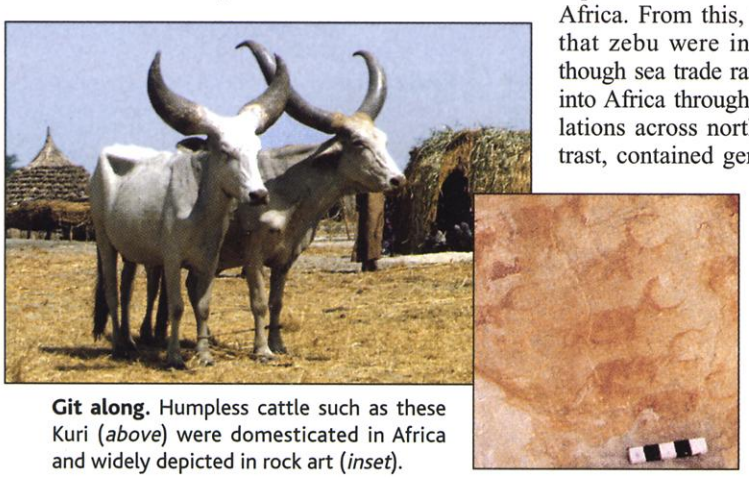
ARCHAEOLOGY

Early Cowboys Herded Cattle in Africa

Humans and cattle go way back, but the origins of this relationship have been murky. Now on page 336, a team led by Olivier Hanotte, a molecular geneticist at the International Livestock Research Institute (ILRI) in Nairobi, Kenya, and J. Edward Rege of ILRI in Addis Ababa, Ethiopia, shores up the controversial idea that humans domesticated cattle in Africa, not just in Near East Asia as archaeologists have believed for decades. The study also fills in details of how domesticated cattle were herded across the continent, and it could provide insights into how humans learned to produce food.

Cattle were domesticated several times, archaeological and genetic studies suggest. By 8000 years ago, a humpless sort known as taurine cattle came under the yoke in the Fertile Crescent of Turkey and other countries. And some 6000 years ago, a kind of humped cattle called zebu was domesticated in the Indus Valley in what is now Pakistan.



Git along. Humpless cattle such as these Kuri (*above*) were domesticated in Africa and widely depicted in rock art (*inset*).

Rock art in the Sahara depicts taurine cattle, which led researchers to conclude that domesticated cattle appeared in Africa via the Isthmus of Suez, perhaps as much as 7800 years ago, when domesticated sheep and goats arrived from the Near East.

But in the 1980s, archaeologists Fred Wendorf of Southern Methodist University in Dallas, Texas, and Romuald Schild of the Polish Academy of Sciences in Warsaw began to argue for a controversial idea: Cattle were domesticated independently in northeastern Africa some 10,000 years ago. Many thought that their archaeological evidence—poorly preserved bones—was ambiguous, and the idea languished. In the 1990s, however, further analysis of bone morphology and a series of findings in cattle genetics began to make an African domestication seem more plausible.

Now Hanotte and colleagues have painted the most complete picture yet of the origins of humans' favorite beast of burden. "This is the first genetic history of cattle throughout the African continent," says Diane Gifford-Gonzalez of the University of California, Santa Cruz. The researchers started out charting the diversity of African cattle to help set priorities in conservation efforts. Since 1994, they have sampled 50 indigenous cattle breeds in 23 African countries—just about the entire range of cattle in Africa today. Realizing that this could shed light on the origins and migrations of domesticated cattle, Hanotte's group teamed up with Dan Bradley of Trinity College in Dublin, Ireland, who had participated in earlier genetic studies of cattle history.

The researchers used a statistical technique called principal component analysis to figure out the major genetic trends within current cattle populations. They found three major sources, two of which matched the genetic makeup of the types of cattle known to have been domesticated outside Africa. The genetic signature of the zebu breed was most prominent in cattle in the Horn of Africa. From this, the team concluded that zebu were introduced primarily though sea trade rather than by walking into Africa through Egypt. Cattle populations across northern Africa, in contrast, contained genetic influence from taurine cattle, suggesting that these cows' ancestors did travel by land.

The third component featured neither zebu nor the Near East's taurine influence. Hanotte's team suspects that it represents a unique domestication of native wild cattle in Africa. This component is most prevalent in southern Africa, however. Because thousands of years ago there were no wild cattle in this region, they must have been domesticated elsewhere. Based on analysis of the genetic data, Hanotte's team concludes that the center of this domestication was likely in northeastern Africa; archaeological evidence supports the idea that wild and later domesticated cattle roamed this region. Humans migrating south then herded the domesticated cows through East Africa with them to their current locations, the team proposes.

To Fiona Marshall of Washington University in St. Louis, Missouri, the picture reinforces the idea that people living in Africa during the last 10,000 or so years took an unusual path to food production: domesticating livestock before plants. Archaeologists suspect that indigenous populations in the Andes have a similar history; all other human populations are thought to have first tamed plants.

Now that genetic historians are beginning to accept an independent source of domestic cattle in Africa, the question remains of where the beasts were first tamed. "The article does not prove an earlier independent domestication event in Africa," says Andrew Smith of the University of Cape Town, South Africa. For that, he wants to see archaeological evidence for African cattle domestication that might place it before the same achievement in Near East Asia.

–ERIK STOKSTAD

MEXICAN MAIZE

Transgene Data Deemed Unconvincing

Last week, the Mexican maize wars took a startling new twist. In an apparently unprecedented "editorial note," published online, *Nature* declared that, in retrospect, it should not have published a controversial paper that claimed to have detected illegal transgenic maize growing in Mexico. The note accompanied two highly critical letters attacking the paper's conclusions. But the authors of the article, University of California (UC), Berkeley, biologists David Quist and Ignacio Chapela, refused to accept the journal's judgment. Indeed, they claimed that an additional round of tests "confirms our original detection of transgenic DNA." (The exchange will be printed in a forthcoming issue of *Nature*.)

The maize wars began on 29 November 2001, when the Quist-Chapela article appeared—and created an immediate international furor. The two scientists claimed to have discovered transgenic DNA in traditional varieties of maize grown in Oaxaca, one of Mexico's southernmost states. Because southern Mexico is the "center of diversity" for maize—the place where its native gene pool is based—the Mexican government imposed a moratorium on planting genetically modified versions of the crop in 1998. The Quist-Chapela report not only suggested that transgenic corn had been widely planted, it also reported that the foreign DNA appeared in diverse locations within the maize genome—in other words, the transgenes that were spliced into corn plants were able to jump around the chromosomes. Such movement would pose the risk of disrupting the functioning of other genes.

Even before the paper was published, Chapela briefed Mexican officials on its contents. In September the Mexican environmental ministry unofficially confirmed the UC Berkeley scientists' findings. Within days

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