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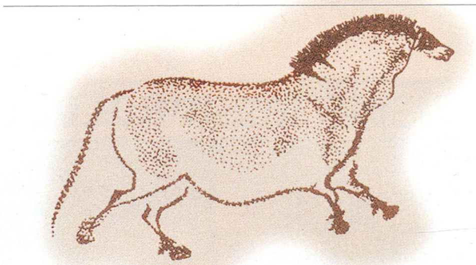


THE ORIGIN OF **HORSE BREEDS**

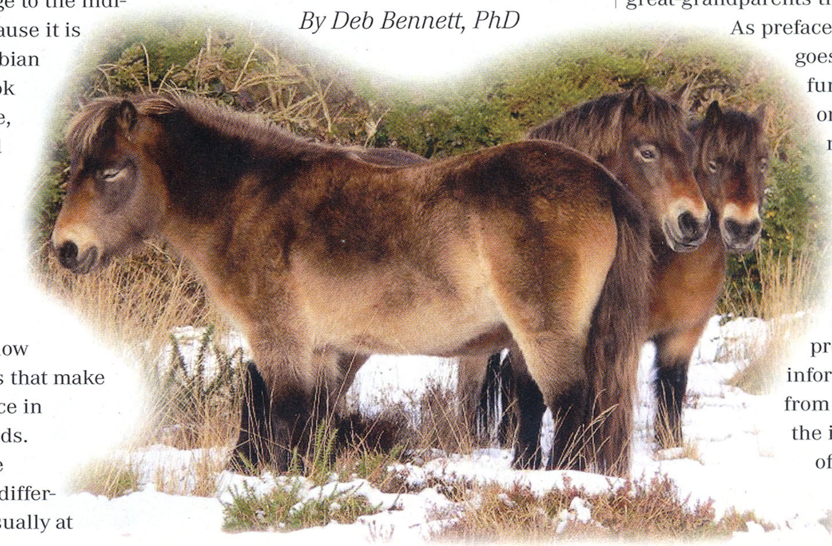
Twenty-six years after my landmark EQUUS article, we now can use new scientific technology to better understand the interrelationships between horse breeds, bloodlines and the factors that make for individual excellence.

By Deb Bennett, PhD

In an effort to teach the principles of conformation analysis, over the past several years I have written numerous articles that provided a virtual tour of the horse's body, looking at the points of the horse from the tip of the nose to the tip of the tail.

We've looked at conformation as it relates to bone structure; we've asked hard questions regarding substance, the proper construction of joints, the alignment and orientation of the limbs, the size and shape of a normal hoof, and the structure and function of the horse's neck and back. Now it's time to apply that knowledge to the individual breeds—because it is obvious that an Arabian does not usually look like a Quarter Horse, nor a Thoroughbred like a Lipizzan, and yet each can be a fine horse to own. With the principles of conformation analysis at our fingertips, we can now tease out the factors that make for unique excellence in many different breeds.

A knowledgeable equestrian can tell different breeds apart, usually at a glance. Experience leads to connoisseurship—the appreciation of different temperaments, athletic potentials and ways of going characteristic of different breeds. An important part of horse connoisseurship is some knowledge of the history of each breed, its country or region of origin, and how it came into existence. This makes for fascinating study—as addictive as any other form of genealogical research. Thus, wherever possible in this series, we will be presenting old photos or paintings of founding sires and dams so that you can see for yourself the kinds of horses that our great-grandparents thought superior.



As preface to that, this article goes back a good deal further—to the very origin, some five million years ago, of the horse species itself.

As we unfold the history of each separate breed, I also intend to present the latest information stemming from DNA research on the interrelationships of horse breeds and bloodlines. I am tasking myself here with truth-telling: There will be no quarter given to Internet rumors, myths, falsehoods or sales tactics sometimes used to make horses seem more glamorous so that they will bring a higher price. My firm belief is that the readers of EQUUS not only desire, but deserve, to know just what they're getting with the purchase of an Arabian, Tennessee Walker, Appaloosa, Warmblood or any other breed.

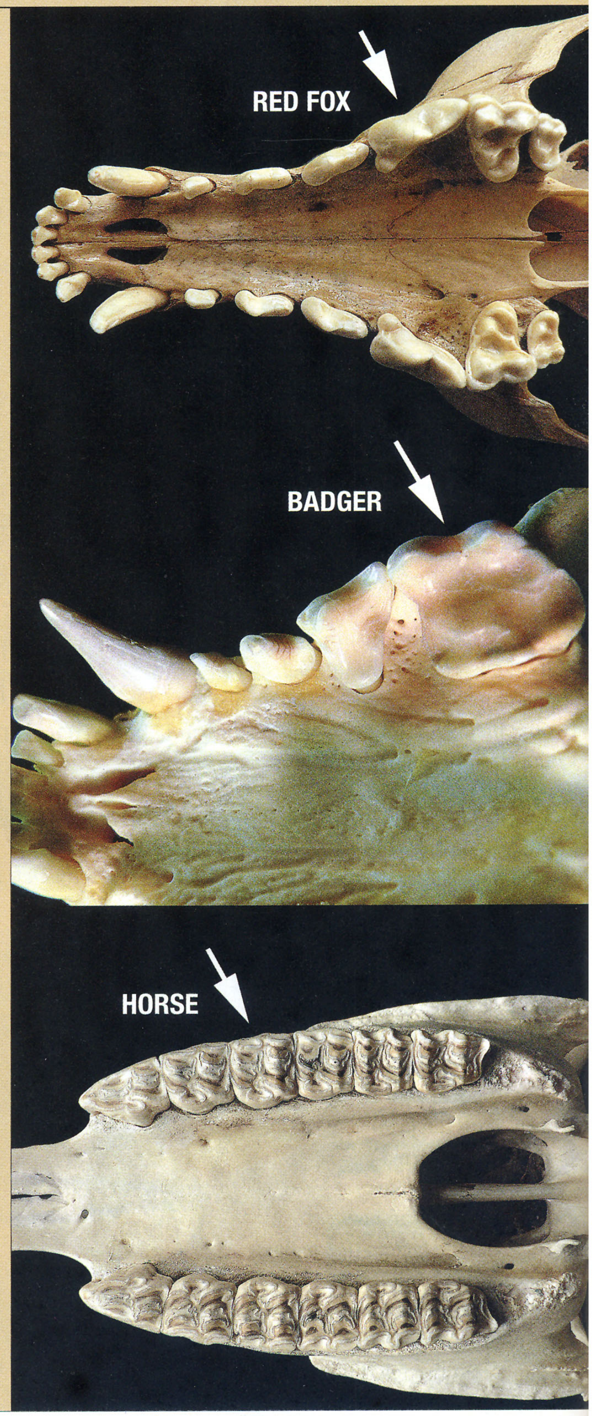
Already in the above preface I have used the word "breed" several times—but what exactly is a horse breed? The term, it turns out, is difficult to define, so much so that it has been the subject of debate by archaeologists, zoologists,

What exactly is a horse breed? The term, it turns out, is difficult to define, so much so that it has been the subject of debate by archaeologists, zoologists, mammalogists, geneticists and breed historians.

mammalogists, geneticists and breed historians. According to Webster's, a breed is "a group of animals or plants presumably related by descent from common ancestors, and visibly similar in most characteristics; especially such a group differentiated from the wild type under the influence of man." Thus a breed is something created by choices made by people, and it is different from the "wild type." Speaking as a biologist, I think that the concept of "breed" can only be understood by first getting clear on "species" and "subspecies"—the scientific classification of "wild type." To gain this insight, we must travel back 10,000 years, to a time when the Earth was experiencing not global warming, but extensive freezing.

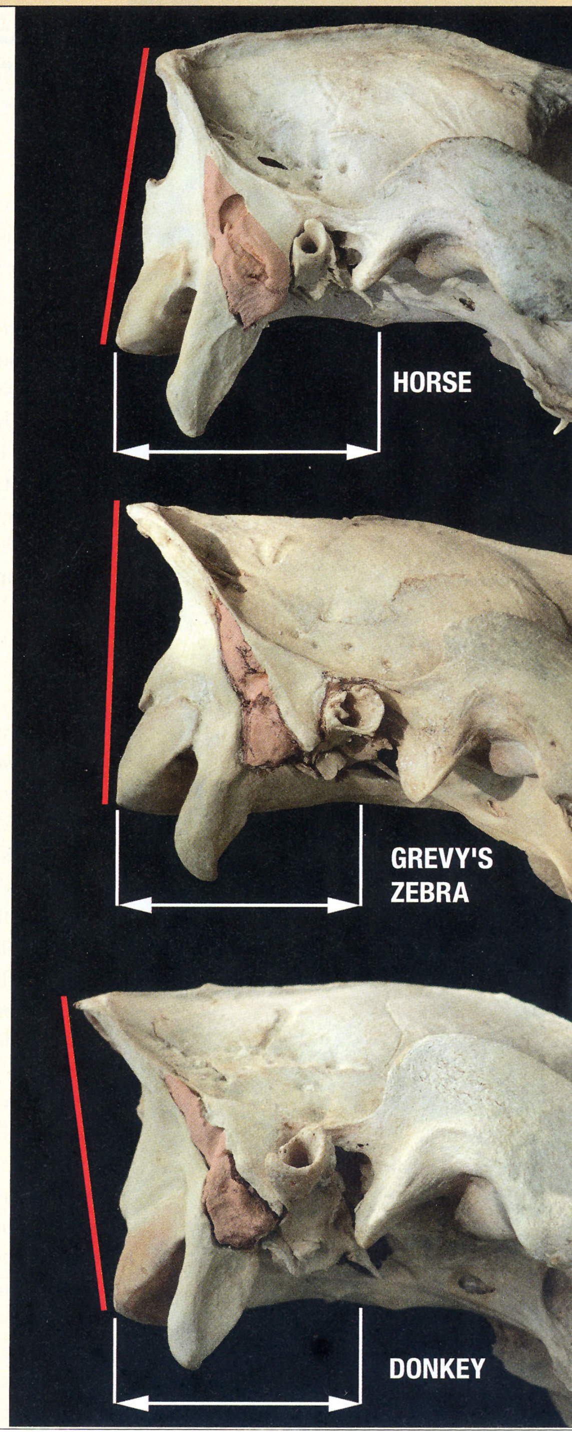
USING **MORPHOLOGICAL CHARACTERS**

These are views looking up at the palate of three animals, to show the upper teeth. The arrows highlight the fourth premolar tooth, which in carnivores and omnivores is usually the largest and functionally the most important tooth in the cheek dentition.



TO **IDENTIFY** EQUINES

At a fairly coarse level of differentiation, grass-eating equines can be told from carnivores or omnivores. The red fox has teeth typically shaped for meat-eating: large canines in front, with narrow, bladelike cheek teeth that function for slicing. Only the hindmost two teeth in the upper jaw are broad enough to support significant crushing or chewing, and even these teeth have sharp cusps and ridges. The badger has teeth typical of an omnivore: its diet contains meat but also insects, fallen fruit, carrion and plant material. Its fourth premolar has two sharp cusps along the outer edge but also a very wide "basin" for crushing. Note that carnivores and omnivores have tooth shapes that are noticeably different. Equines by contrast have all cheek teeth shaped similarly; the set of six that make up each row form a flat "grinding battery" that has no sharply upstanding cusps or ridges.



At a finer level of differentiation, the horse can be told from its near relatives by looking at the braincase and the part of the skull that houses the organs of hearing. The tubelike structure near the center of each image is the external auditory meatus, which conducts sound from the pinna (the more or less long, pointy external "ear" that you can see and touch) to the middle and inner ear and the brain. The area colored pink in each image is the mastoid bone of the skull. In horses this element is broad; likewise, the base of the braincase is long (white arrow). This combination of features forces the occipital condyle rearward relative to the poll, so that the occiput (the rear surface of the skull) slants back (red line). Zebras display these characteristics to an intermediate degree, while in asses the mastoid is narrow and the base of the braincase is relatively short, so that the occiput slants forward.

MORPHOLOGICAL FEATURES THAT DIFFERENTIATE BREEDS

These six skulls represent some of the morphological variation that can be found among domestic horses. The Arabian and Welsh Pony have braincases that are relatively long and broad, and they both show negative flexion of the bones that support the face upon the braincase, which produces a "dished" profile. This Thoroughbred was a champion racehorse from New Zealand, bred from British and French bloodlines; its very deep face is more characteristic of European Thoroughbreds than of American ones. Despite its deep face, the Thoroughbred is not as arch-headed as the Mustang, whose skull is structured with positive flexion. The Quarter Horse is blended from ancestors of many bloodlines, and this skull shows some features more similar to the Arabian and others more like the Thoroughbred. The Przewalski horse is not the wild ancestor of domestic horses, and indeed has contributed very little to the development of European and American breeds. It went entirely extinct in the wild and is bred in zoos (although several hundred now roam free in Hustai National Park in Mongolia). Its braincase is smaller and its face longer and heavier than that of most domestic horses because it has not been subjected to selection for tractability or beauty.

ZOOGEOGRAPHY AND MORPHOLOGY MEET DNA

Twenty-six years ago in 1988, equine genetics researcher Gus Cothran, PhD, was eating lunch with colleagues at the University of Kentucky. Cothran was taking a brief break from an ongoing study of blood proteins sampled from horse breeds worldwide. Before modern DNA studies, blood proteins were used, because like DNA, they are unique to each breed and bloodline. The object of Cothran's work in the veterinary science lab was to clarify relationships between extant horse breeds, and it happened that the batch of samples being analyzed that morning had come from Spain. Between bites of salad, Cothran shook his head. "I can't understand these results," he said. "I keep getting draft-horse markers in the blood samples we took from Andalusians."

Someone at the table tossed over a copy of EQUUS magazine and said, "Well, Gus, I was reading this in my office this morning and you ought to look at it, too. Looks like this lady with the maps has got your problem solved—she says there's some draft ancestry in all the Iberian breeds."

"The lady with the maps," as it turns out, was me—in the very first article I ever published in EQUUS ("The Origin of Horse Breeds: How Time and Circumstance Have Shaped the Horse in Your Pasture," EQUUS 110). I got the story about the lunch conversation, of course, from Dr. Cothran himself, when he telephoned later. Through subsequent years, Gus has been a helpful and congenial colleague whose research I always look forward to reading. Now at Texas A&M University, he has shifted his focus

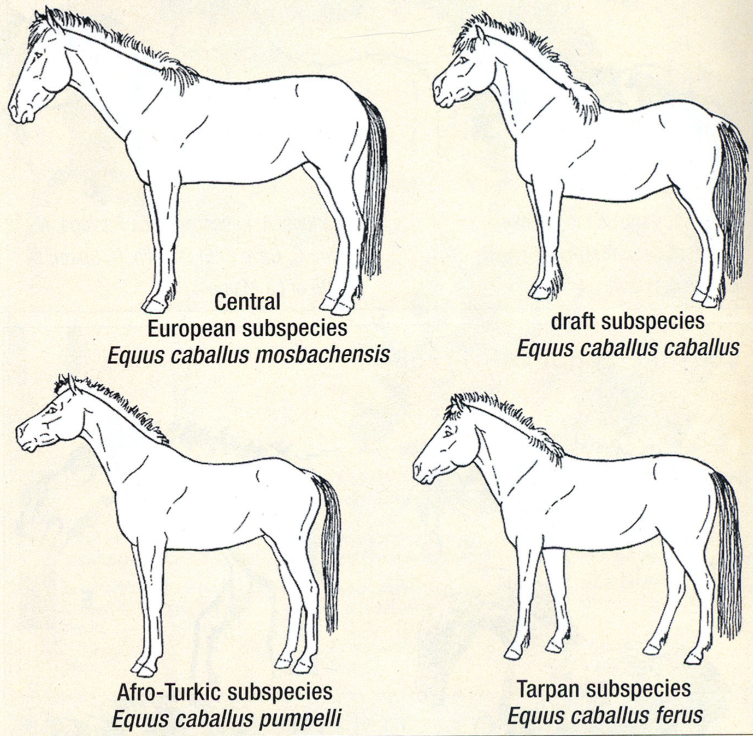
WHAT DID THE **ANCESTORS** OF DOMESTIC HORSES **LOOK LIKE?**

These drawings, originally published by a German researcher Ernst Trümler in the 1960s, are reconstructions of the appearance of wild (pre-domestication) horses from actual skeletal remains. The appropriate scientific name of each subspecies is given. These are the actual ancestors of all breeds of domestic horse, drawn in a modern style.

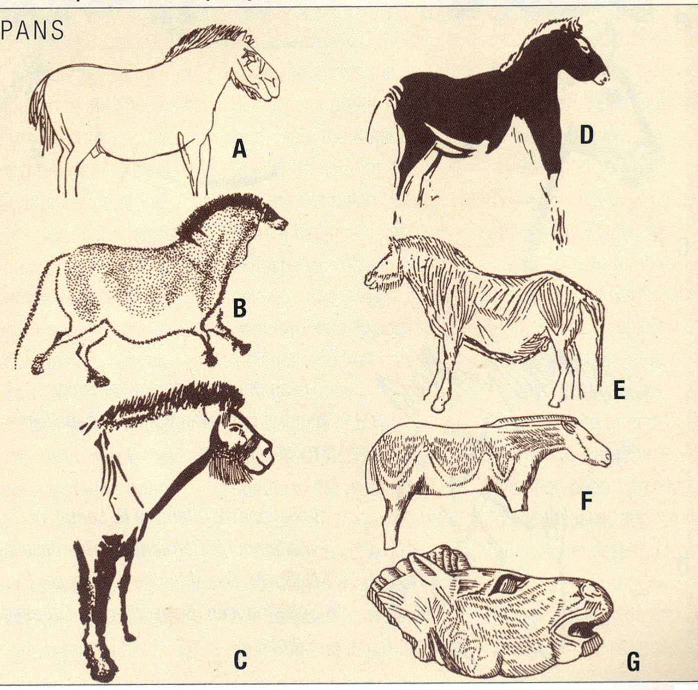
How did Ice Age hunters see wild horses? A survey of cave drawings, sculptures and carvings done by horse hunters before the dawn of history demonstrates the presence of all four mapped subspecies. The images at right are depictions of Tarpans, *E. caballus ferus*. Many of these come from the French or Spanish Pyrenees, through the passes of which migrating herds had to pass in order to reach the Spanish grasslands, and thus an ideal area for horse-hunting.

Locations: A, Les Combarelles, S. France; B, Lascaux, S. France; C, Niaux, S. France; D, Altamira, N. Spain; E, Niaux; F, Les Espelugues, S. France; G, Mas d'Azil, S. France

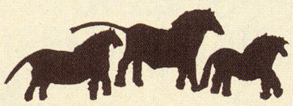
THE FOUR PRIMARY ANCESTORS OF DOMESTIC HORSES



TARPANS



DRAFT PONY TYPES



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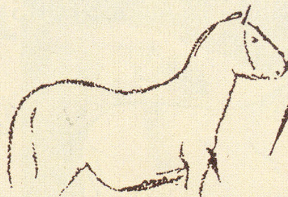

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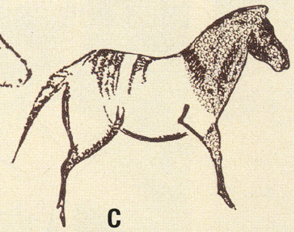

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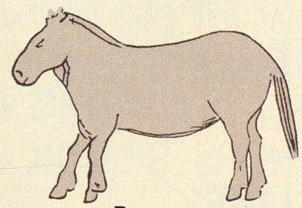
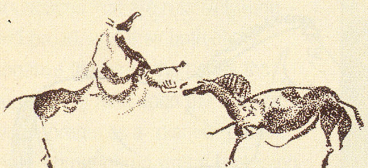


D

This series shows the chunky west European draft/pony types, *E. caballus caballus*.

Locations: A, Lascaux; B, La Pasiega, N. Spain; C, Cave of El Castillo, N. Spain; D, Grotto of La Mairie

CENTRAL EUROPEAN TYPES



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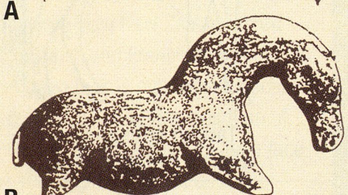

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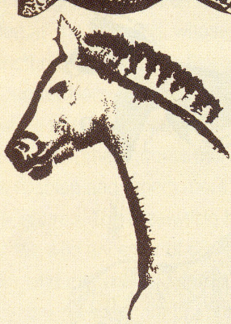

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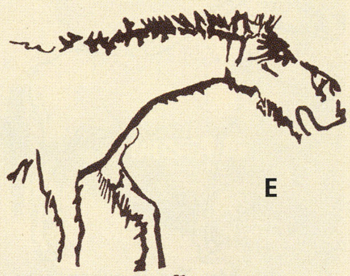


E

F

These drawings depict the lanky central European horse, *E. caballus mosbachensis.*

Locations: A, Altamira; B, Lental, nr. Würtemburg, Germany; C, Ribadesella, N. Spain; D, LaMouthe, S. France; E, Schäffhausen, Switzerland; F, Labastide, S. France

AFRO-TURKIC HORSE

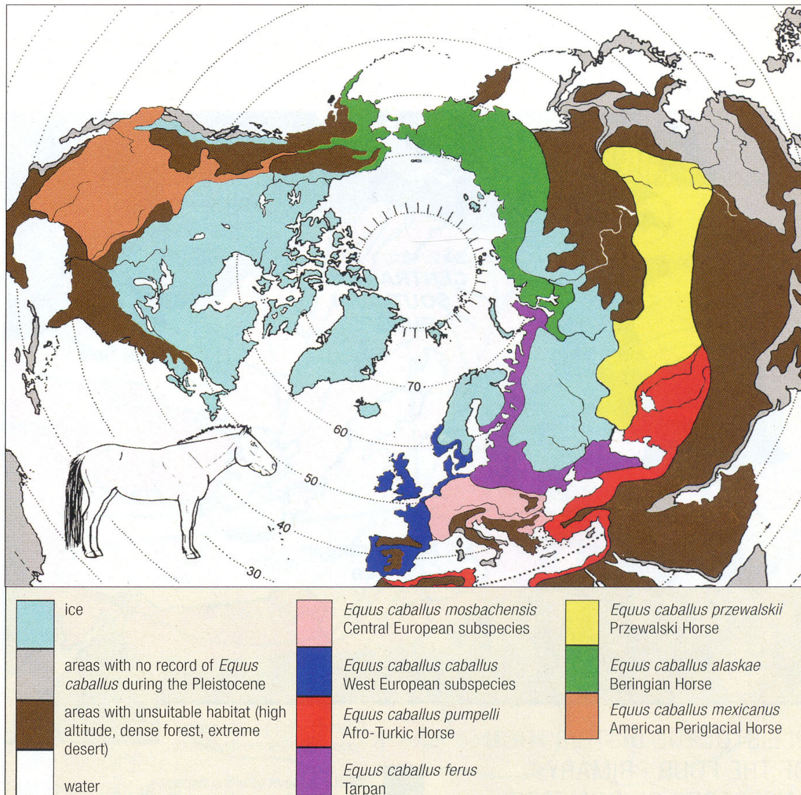
These drawings from North Africa depict the light-bodied Afro-Turkic horse, *E. caballus pumpelli.*

Location: Eastern Atlas, Algeria

from blood proteins to DNA in order to gain new insights concerning relationships among, and diversity within, horse breeds.

DNA studies are not my primary area of expertise. Rather, I am a morphologist—someone trained to detect, measure and analyze differences in the shape of an animal's body or bones. Where it concerns bones, the object of morphological study is not merely to describe their interesting shapes, but to figure out which particular curves, bulges, knobs, holes, cusps, loops or planes can most reliably be used to tell different species of animals apart. For example, equine skulls are distinguished from those of foxes, cats, badgers, bears or humans by looking at the teeth, which differ in shape according to the type of food that a given species eats. At a finer level of differentiation, the skulls of horses can be distinguished from those of their near relatives—asses, onagers and zebras—by looking at the area that houses the organs of hearing. At the most detailed level, skulls of different breeds can be told apart by looking at proportions such as the ratio of braincase or cheekbone width to skull length while at the same time considering other factors including braincase size, negative or positive cranial flexion, and the facial profile.

Zoogeography—the mapping of different physical types—is another powerful approach to elucidating the history of the horse species on Earth. Morphology studies and zoogeographic mapping go hand in hand because the morphology of most mammalian species is not uniform across its entire geographic range. This is because of variation in the Earth itself: Equine populations may live in forests, mountains, river deltas, hills, mesas, canyons, deserts, islands or



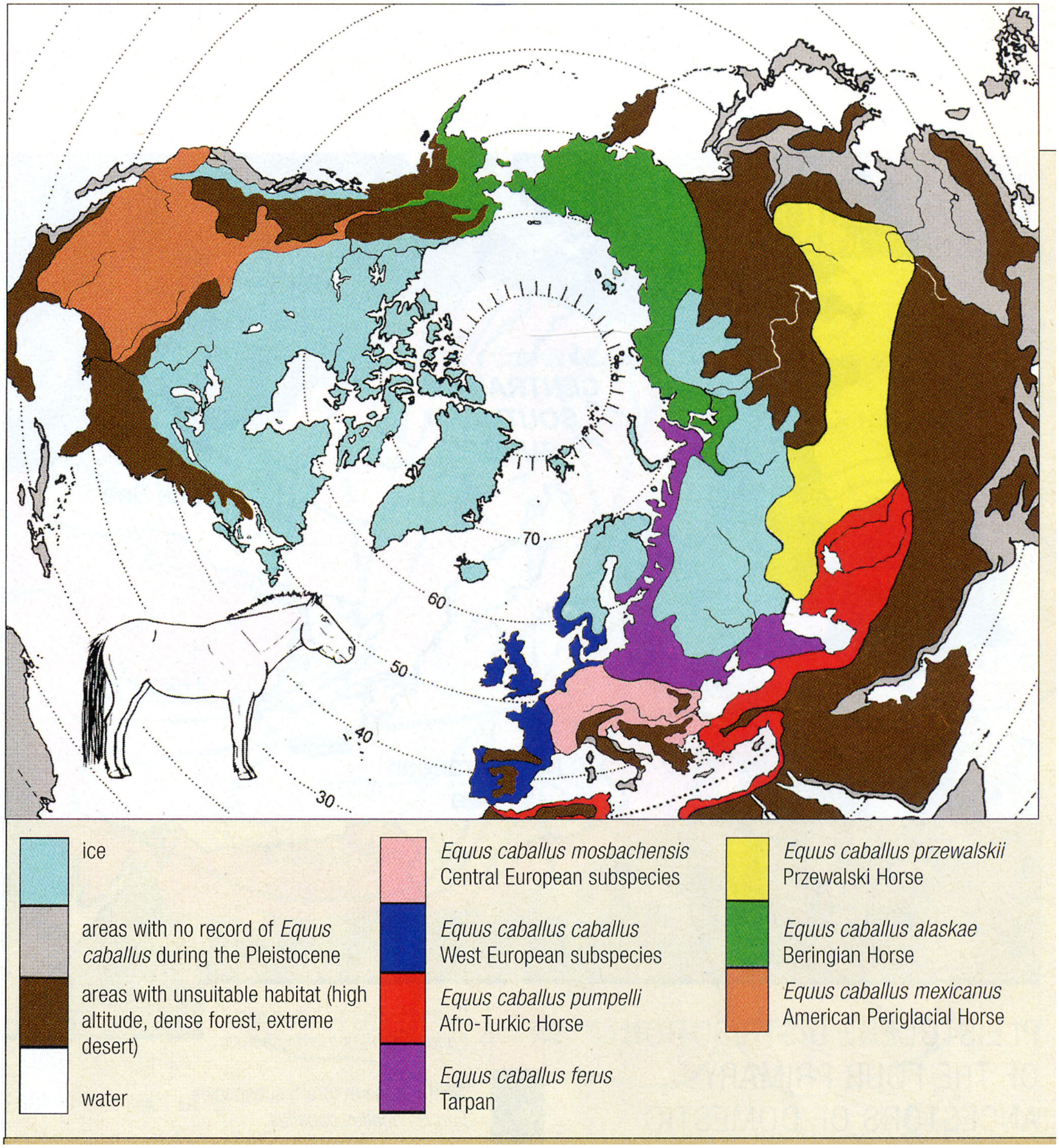
MAPPING WILD HORSES

This map shows the distribution of subspecies of the horse, *Equus caballus,* during the last Ice Age. The geographic range of the species was restricted at this time due to the large amount of continental ice. Horses are a northern and cold-adapted species that can live in close proximity to glaciers and at altitude. By contrast, they are not adapted to living in dense forest and also never naturally occurred in humid tropics, nor at any latitude lower than about 30 degrees except at altitude.

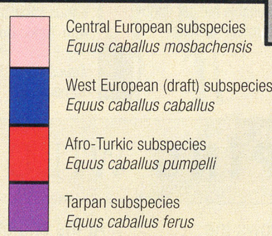
At the end of the Pleistocene about 10,000 years ago, the American Glacial Horse (orange) and the Beringian Horse (green) became completely extinct—possibly in part because of pressure from horse-hunting "paleo-Indians" who had entered North America.

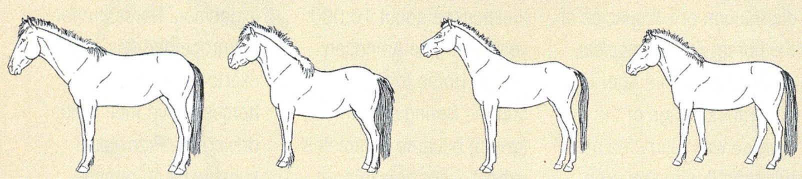
Because of this extinction, there were no horses in the Western Hemisphere from the end of the Pleistocene until 1493, when they were reintroduced from Iberia (Estremadura and Andalucía) during Columbus's second expedition. Horse hunters in Europe and Asia also exerted pressure upon horses within their range, driving the Przewalski subspecies to remote refugia in the Gobi desert and almost completely eliminating the Tarpan.

Almost all horses that survived after 6,000 years ago were those who had been taken into domestication, and almost all of these descend from the Central European, Western European and Afro-Turkic subspecies.


70
60
50
40
30
ice
areas with no record of *Equus caballus* during the Pleistocene
areas with unsuitable habitat (high altitude, dense forest, extreme desert)
water
Equus caballus mosbachensis Central European subspecies
Equus caballus caballus West European subspecies
Equus caballus pumpelli Afro-Turkic Horse
Equus caballus ferus Tarpan
Equus caballus przewalskii Przewalski Horse
Equus caballus alaskae Beringian Horse
Equus caballus mexicanus American Periglacial Horse

PLEISTOCENE DISTRIBUTION OF THE FOUR PRIMARY ANCESTORS OF DOMESTIC HORSES





This enlarged map shows the ranges of horse subspecies in Western Europe, Northern Africa and the Near East at the end of the Pleistocene. It is from these subspecies that almost all domestic horses descend. Ice cover is not shown on this map.

Note that in our original 1988 publication, I called the Western European subspecies the "draft" subspecies because this is the wild population from which all draft horse breeds are derived. This is why Gus Cothran found "draft horse markers" in blood samples taken from Andalusians.

The Western European subspecies can be subdivided into northern and southern populations separated by the Pyrenees Mountains. The Andalusian ultimately derives from mares indigenous to Iberia, which before they were brought into domestication belonged to the Western European or "draft" subspecies.

plains; they may have to deal with differences in soil type and consequently in the vegetation that forms their food. They likewise endure differences in rainfall, dates of first and last frost, percent cloud cover, latitude, seasonality, and extremes of summer and winter temperature.

All of these ecological factors—and more—exert important influence upon wild equines and over time can induce different physical adaptations in populations centered in different places. This occurs through limitations on breeding that are the direct result of geography. If different populations of a species remain relatively isolated for a fairly long time, members of the population will much more often breed together than with members of the same species living in other areas. This induces a relatively high frequency of inbreeding in isolated populations, and as a result the body proportions of each will tend to become distinctive. This is how a "subspecies" comes into existence and how it is defined—as a population within a species that is characteristic of, and physically adapted to, a particular geographic area. During the early 1980s my mentor Robert S. Hoffmann, PhD, and I meticulously plotted the distribution of the subspecies of *Equus caballus* as they were distributed in the period just before the horse became domesticated.

Physical adaptation can, of course, involve the thickness of fur, the length of the ears or coat color, features that cannot be detected when only bones are available for study. Body proportions are, however, usually detectably different in different subspecies. Differences in body morphology—which are differences in conformation—are directly caused by changes in the length and shape of the bones that structure the body.

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