

Coat of many colours

The realist style was current among artists in ancient France, says s ananthanarayanan

THE depiction of horses with spotted coats in cave paintings in Pech-Merle, just above Toulouse in France, has been suspected of being imaginative or symbolic, rather than realistic. This was largely because existing studies of horses of 25,000 years ago showed evidence of their having only bay or black coats. An international team of scientists now reports in the *Proceedings of the National Academy of Sciences* that "leopard" spotted horses did exist among pre-domesticated horses of the period.

The earliest horses are thought to have been earth-toned reddish-brown. The genetic make-up of the pre-domesticated horse DNA did contain the "Extension" or "E" gene, which allows the formation of *eumelanin*, the dark pigment, but it was only with breeding that horses with the deeper coloured coat came about. When the black pigment is partially present, the horse may be bay, and when it is present everywhere, the horse is a true black. The place on the DNA where the gene is located is called its *locus* and alternate forms of the same gene are called *alleles*.

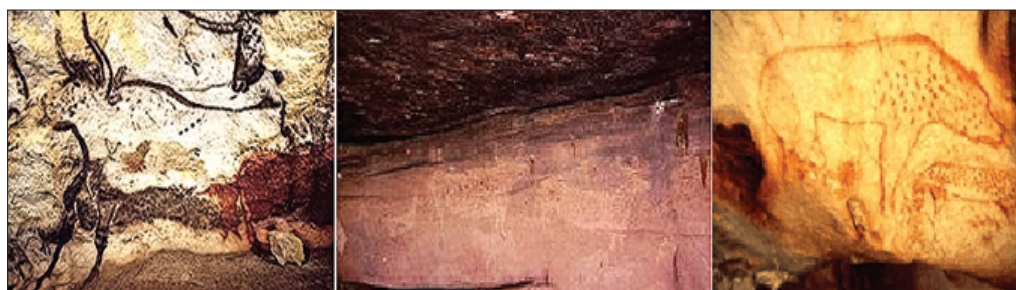
When the gene at the locus for E has the dark pigment allele from both or at least one parent, it is called E/E or E/e and the horse is capable of producing black hair. Horses that are e/e cannot produce black hair and these are always chestnut or "red". When only one parent is E/e, the offspring may or may not be black, but as E is always present, they cannot be "red".

In horses that can produce dark pigment, whether the dark pigment would be restricted, allowing for a bay coat, or present everywhere for a black coat, depends on another gene, *agouti*. Horses that have E but not the normal form of *agouti* have dark hair everywhere. And there is a third option of *agouti* that restricts the dark pigment to a black-and-tan pattern called *seal brown*. And there are other factors, the dilution gene, the cream gene and the champagne gene, which allow other shades of hair colour — including the *LP* or the *leopard spotting* gene that produces spotting patterns, mottling over otherwise dark skin. This last factor is a popular variety in several modern horse breeds displaying patterns that range from white spots on the rump to completely white horses that have pigmented ovals — the leopard spots after which this variety in any breed has been named.

Other, *modifier* genes are thought to be responsible for the variations in the nature of spotting or dappling. In some breeds, finding LP in both the genes at the LP locus has been found to result in *congenital stationary night blindness*, which should have resulted in such double-LP genes being selected out.

Occurrence of varieties

The prevalence of animal species and breeds in prehistoric times is documented in the cave art of primitive peoples. The best known are in about 350 caves in France and Spain, placed, by carbon dating of the



Aurochs on a cave painting in Lascaux, France.

Spanish cave painting of bulls.

30,000-year-old spotted hyena painting found in the Chauvet Cave, France.



The prehistoric cave of Pech-Merle, situated some 20 miles east of Cahors, at Cabrerets in the Quercy region of France, contains some of the oldest and most spectacular examples of cave painting in the world — including the celebrated "Dappled Horses of Pech-Merle".

pigment used, torch marks, animal bones and charcoal, at 30,000-35,000 years ago.

Subject matter, for instance the motif of reindeer, found in the paintings in Spain also indicates the age of some paintings as that of the last Ice Age. The paintings in the caves are mostly of large animals, tracing of hands and abstract patterns. The species depicted in the animal drawings are usually ones suitable for hunting, whether actually hunted or not.

There are similar ancient rock paintings in Africa, Australia, the Americas and India (Bhim Bhetka, near Bhopal), but of lesser antiquity and motifs — more of groups of persons. The paintings in France and Spain are, thus, of greatest relevance as eyewitness accounts of contemporary animal species. Where the species can be identified, the most common animal depicted is the horse.

And some of the drawings are quite detailed and realistic enough to be taken as reliable indicators of what the animals were really like. The colours used also appear to be realistic; for instance the brown and black used in the paintings at Lascaux and Chauvet in France correspond to the colours of bay and black of actual horses of the time. DNA studies of animal remains have also confirmed that there were bay and black horses at the time. The difficulty has been with the frieze in Pech-Merle, where there are depictions of horses with spotted patterns that are similar to the modern, leopard spotted or the dappled horse, but there had not been instances of the variety in DNA studies.

The fact that the horse pictures, along with tracings of hands and abstract patterns of spots, has led many to seek other

explanations than a depiction of the real environment. That many researchers consider the genetic variation for the spotted pattern as unlikely at the time of Stone Age people is another reason. Suggestions have, hence, been advanced that the paintings may have religious or symbolic meaning and these depictions, at any rate, are not of actual surroundings.

But they were there

The group of researchers featured in *PNAS* investigated the question by genotyping or examining the exact variations in the genetic structure of DNA at the relevant loci of remains of horses that belonged to that period — from Siberia, Western and Eastern Europe and the Iberian Peninsula. The genetic forms actually associated with leopard complex spotting had been narrowed down to six genes, where it was also found that the LP factor allele was single, not double, and, hence, was not selected out as it did not cause congenital night blindness.

The survey conducted revealed that the leopard spotting variation did exist and for a long time in Western Europe horses. No evidence of the genetic features of chestnut, white, diluted or other spotted varieties — which were also not seen before domestication, only the leopard spotted variety — has been found in pre-domesticated horses.

How this could be is the question that arises. Most modern populations of wild animals have uniform colouration, whereas domesticated species show marked variation. This is apparently a result of cross-breeding for greater speed, strength, endurance, disease resistance, etc. But the spotted coat is also found, with similar genetic requirements, in a number of animals.

Related variations are of stripes and other colour patterns on animal coats. The obvious reason for selection is the survival advantage such a coat provides in acting as camouflage. The real leopard, with its dappled coat, merges into the light pattern of the sun coming through the forest cover and so does the tiger, with its stripes, merge into the surroundings. The leopard spotted horse, too, may have enjoyed an advantage of camouflage in the snowy climate of the declining Ice Age.

But the discovery shows that ancient cave art did reflect the genetic varieties of the natural environment of the time, and that realism in art was the style of painters of France and Spain well before its reappearance after the French Revolution!



Pix: THOMAS HACKMANN

A modern leopard spotted horse.

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We lived with Neanderthals

Two sets of radiocarbon dates suggest that anatomically modern humans were widespread in both the north and south of Western Europe many thousands of years earlier than previously thought, writes steve connor

THE long scientific dispute over when anatomically modern humans first arrived in Europe on their long trek out of Africa has come close to resolution — with the help of a fragment of jawbone belonging to an elderly person who lived near present-day Torquay in the UK.

Radiocarbon tests have shown that the piece of upper jawbone, containing three well-worn molar teeth, is between 41,000-44,000 years old. This is at least 7,000 years older than previously thought, suggesting that anatomically modern humans arrived in northwestern Europe while the Neanderthals were still



The jawbone unearthed from a cave called Kent's Cavern on the Devon coast coincides with a study on milk teeth (below) found in a similar Stone Age cave site called Grotto del Cavallo in the Italian region of Abruzzo.

in residence.

The new analysis of the jawbone, unearthed in 1927 from a cave called Kent's Cavern on the Devon coast, coincides with a study on a pair of milk teeth found in a similar Stone Age cave site called Grotto del Cavallo in the Italian region of Abruzzo. New tests date these teeth to between 43,000-45,000 years old.

The two sets of radiocarbon dates for the jawbone and milk teeth, published in the journal *Nature*, suggest that anatomically modern humans were widespread in both the north and south of Western Europe many thousands of years earlier than previously thought. The dates also help to resolve another long-running dispute by confirming that modern humans lived alongside the Neanderthals, who had arrived in Europe many tens of thousands of years earlier. This raises intriguing questions about whether there was any cultural or even social interaction between these two species of early Europeans — DNA studies suggest limited interbreeding.

"It changes our picture of Europe 40,000 years ago. Modern humans were there and that was contested up to now," said Professor Chris Stringer of the Natural History Museum in London.

Professor Tom Higham of Oxford University, who was part of the radiocarbon dating team, said that the new evidence from Torquay and Italy showed how quickly people could migrate in the Stone Age. "These people were mobile hunter-gatherers. They didn't have a permanent base camp. They moved a lot," he said.

The Independent, London

Everyone and everything deserves a shot at survival

OVER the past couple of years I have carefully read quite a number of articles, reports and letters concerning bird flu published in the print media and with much anguish I wonder at the need to kill thousands of chickens with diagnostic reports. Were all the hapless chickens infected with the H5NI virus? No, they were culled on the assumption they were. Though a layman, I have a few questions that I hope will elicit replies from the authorities and scientists concerned.

- Has the source or habitat of the H5NI virus been identified in West Bengal or any other part of India? The virus certainly did not come from the cosmos or the hydrosphere but from within the lithosphere. I have come to learn that the virus cannot exist outside the living cells of macro or micro organisms before infecting chickens in West Bengal or elsewhere. So was there a definite pattern of virus radiation from the source to the target (in this case, chickens)?
- How was the H5Ni virus radiated from the source to the chickens and what triggered the hibernating virus to radiate?
- Was the virus also organ-specific? If so, how did it find its way?
- Was the virus immediately activated in the chickens or was there any incubation period?
- Did it produce any toxin? If so, what was the



Red Jungle Fowl

nature of the toxin? ■ Did the toxin (causative factor) damage the immune system of the affected chickens? ■ What morphological and behavioural changes (symptoms) appeared in the virus's incubation period in the affected chickens? Were there any secondary, tertiary symptoms of such infection?

The answers to these questions are important and crucial for necessary steps to be taken to segregate non-infected chickens from an area and alert people and the authorities concerned to initiate required action. Readers will recall that in September an eruption of bird flu was reported in West Bengal's Nadia district that quickly reached a peak, subsided, and then erupted again in new areas, a pattern that spread to 15 of the state's districts. Ultimately, there was no report of avian flu eruption.

Much ado is made of the H5NI virus but were all the chickens slaughtered infected by it, asks sudhin sengupta

It then appears that the H5NI virus follows a typical biological (behavioural and ecological) principle of growth, radiation and inhibition. The experts need to enlarge the public knowledge of the phenomenon.

It is interesting to learn that the H5NI virus was identified in Manipur and some parts of Maharashtra as well as Mongolia's Darkhad Valley during 2005-2006. Consequently, some ornithologists in Europe feared that the Bar-headed Goose (*Anser indicus*) could possibly be the vector of the virus as the species was a common winter visitor to India. But till now no H5NI virus has been found in the species. It may be interesting to know that another winter visitor from Europe, the Greylag Goose (*Anser anser*) is believed to be the ancestor of all our domestic breeds of duck. Again, I understand that till now there has been no report of any H5NI virus infection in the Red Jungle Fowl, the ancestor of all our domestic hens.

Around 350 avian species make their sojourn to India during the winter and while a few of these harbour arbovirus, there is no definite evidence of the H5NI virus in any of these species.



Bar-headed Geese

Arbovirus requires an arthropod (vector) to find its way to a bird, so if the Bar-headed Goose were to be the vector for the H5NI virus, would killing migratory birds be considered brutal action?

Again, if the virus was detected in Manipur and Maharashtra, then the question might arise as to how it radiated from Manipur to West Bengal and vice-versa. It is also feared that the pathogenic virus may mutate and infect people. Actually, mutation is the raw material of organic evolution. Pathogenic and non-pathogenic viruses, bacteria and other micro-organisms exist everywhere and will continue to be around as long as the world turns. So they will multiply, radiate and emit toxins for survival, much as we do.

The authorities concerned directed that all chickens, whether infected or not, were to be killed and buried. Were they, and scientists, sure that the virus was killed along with the chickens? Did "cell death" occur immediately after the chickens were killed?

In the rural areas, stray dogs, jackals, foxes and jungle cats digging up ground in search of food is a common sight. Canine olfactory sensitivity outstrips human ability by more than 100,000 times. Again, rain softens the soil and often exposes buried chickens. Indeed, experts in concerned disciplines need to make an all-round, sustained investigation to find ways and means of checking the dissemination of any viral or bacterial eruption instead of adopting unscientific and futile measures. Recognised experts (and not by official position) need to correctly advise the authorities on sustaining public health and protecting wildlife. Everyone and everything deserves a shot at survival in this green world.

The writer, an avian biologist and ethologist, is with the Centre for Applied Science and Technology