

Article

The Meaning of the Dots on the Horses of Pech Merle

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Abstract: Recent research in the DNA of prehistoric horses has resulted in a new interpretation of the well-known panel of the *Spotted horses* of Pech Merle. The conclusion that has been popularized by this research is that the artists accurately depicted the animals as they saw them in their environment. It has long been evident that some artists of the European Ice Age caves were able to realize graphic mimesis to a remarkable degree. This new study of the genome of ancient horses appears to confirm the artist's intention of creating the actual appearance of dappled horses. I will question this conclusion as well as the relevance of this study to the art by examining the *Spotted horses* in the context of the entire panel and the panel in the context of the whole cave. To further enlarge our view, I will consider the use of similar dots and dappling in the rock art of other paleolithic people. The visual effect of dots will be seen in terms of their psychological impact. Discoveries by neuroscientists regarding the effect of such stimuli on human cognition will be mentioned. I will conclude with another possible interpretation of the meaning of the *Spotted horses* of Pech Merle.

Key words: Pech Merle; dappled horses; dots; perception; cognition

1. A New Theory

Has the enigma of the *Spotted horses* of Pech Merle finally been solved? Science journals world-wide have been reporting since the end of 2011 that the well known image from the cave of Pech Merle undoubtedly was an attempt to show actual Paleolithic horses. This information spread rapidly. It quite soon became virtually common knowledge that the two horses on the famous Pech Merle panel were a depiction of indigenous and contemporaneous spotted horses that the artist or artists would have actually seen. (Figure 1)

This theory, so widely promulgated, came as a result of a research paper that had been published in *The Proceedings of the National Academy of Sciences* in October of 2011: *Genotypes of Predomestic horses match phenotypes painted in Paleolithic works of Cave Art*. The paper had been produced by eleven members of an international group working in the field of evolutionary genetics [1].

That paper derived from an earlier study by an evolutionary genetic research group published in the journal *Science* in April 2009: *Coat Color Variation at the Beginning of Horse Domestication*. In an effort to discern the coat color of ancient horses this group had analyzed the DNA in fossilized bones of wild horses from the late Pleistocene and early Holocene that had roamed Siberia, East and Central Europe and the Iberian Peninsula. According to the timeline chart published with this paper the Pleistocene horses tested dated to about 14,000 years ago [2].

After publication of the 2009 paper, it was learned that other geneticists had deciphered the underlying DNA code for ‘leopard spotting’ in horses. Hoping to make use of their information, a new research group with many of the same participants went back to reexamine their material, looking this time for the leopard sequence. In their research they found six animals that shared a genetic marker associated with spotting in horses. Four were from the Pleistocene and two were more recent. The authors of this new paper came to the conclusion that spotted or dappled horses might have existed in the areas studied. The paper continued: “This finding lends support to hypotheses arguing that cave paintings might have contained less of a symbolic or transcendental connotation than often assumed.” [2].

This definitive opinion of the respected geneticists and archeologist was taken up by journalists. A science writer for the *New York Times* wrote in headline fashion: “Spotted Horses in Cave Art Weren’t Just a Figment DNA Shows” [3] and another respected archeology source, *Deutsch Weile*, began with a headline: “New DNA evidence ... shows that the spots on the horses depicted in the famous Pech Merle cave paintings are realistic, potentially changing our view of what the images mean.” [4]. Terry O’Connor, an archaeologist at the University of York who collaborated on the study, summarized the results pithily when he was quoted as saying, “People drew spotty horses because they saw spotty horses.” [5]. It seemed that questions about the meaning of the spotted horses might well have been resolved by the results of this recent experiment with the DNA of ancient horses.

2. Questions of Chronology

The scientific research was impressive and seemed to support the scientists’ conclusion that spotted horses might have been among those that roamed Europe in the Paleolithic. However, it does not support the conclusion of Mr. O’Connor nor that taken up by many science journalists. The research does not question and certainly not prove that spotted horses were in the geographic area or chronological period in which the artists of Pech Merle lived.

The authors wrote that the samples analyzed for leopard spotting had previously been analyzed for “eight coat-color”. Six of the first group of scientists plus five new ones went back to the original horse artifacts. Using the samples they had worked with, the researchers were seeking evidence of the leopard sequence in horses that lived in Europe in the “late Pleistocene and early Holocene” and most were much more recent [2]. Nowhere in either the first or second research paper is there mention of employing samples that were old enough to have derived from the time of the art-making of Pech

Merle. Using the samples they had, the researchers looked for evidence of spotted horses in the Magdalenian and in more recent periods. The Magdalenian period has been dated from 18,000 to 10,000 years ago. The art of Pech Merle is Gravettien, a period for which the accepted dating is from 28,000 to 24,000 years ago. The *Spotted horses* themselves have been dated to 24,640 plus or minus 390 years ago. Therefore the *Spotted horses* are at least 10,000 years older than even the oldest horses studied in the DNA search for “leopard spotting”.

It is well accepted that many of the artists of the Franco-Cantabrian regions in the Magdalenian era aspired to make their animal naturalistic. To a large extent many of the most gifted of these artists succeeded in this quest. However, the artists of the Gravettien period seem to have been less motivated to render their animals with what would now be called photographic realism. Animals were recognizable but sometimes highly exaggerated, or even what we might call stylized. The Pech Merle *Spotted horses*, unlike those of the Magdalenian, do not seem to be intended to be as optically realistic as possible.

Bearing in mind that the conclusion reached by the geneticists and other researchers of this report, was based on material that seems not to have belonged to the period in which the Pech Merle horses were painted, let us, nevertheless, examine this new theory by first regarding the *Spotted horses* in the context of the entire panel on which they appear.

3. Context of the Spotted Horses

The horses were not the first images to be painted on the panel on which they are situated. Initially the site appears to have been selected for at least two reasons. Firstly, Pech Merle Cave is spectacular with its profusion of aciculate crystalline formations, stalactites, stalagmites, baroque shapes and discs. Secondly, the site of the panel is one of the few open spaces where those who entered into this extensive cave could have gathered as a group. Many of the stalagmites have been broken, which might have served to enlarge the space for human presence, but it is not known when that destruction took place. The panel on which the composition is placed is a large, flat, smooth vertical limestone surface in a cave with limited stalactite-free areas to decorate.

A further possible reason for the selection of this panel seems to be a natural formation in the upper right hand corner that looks like a horse’s head.

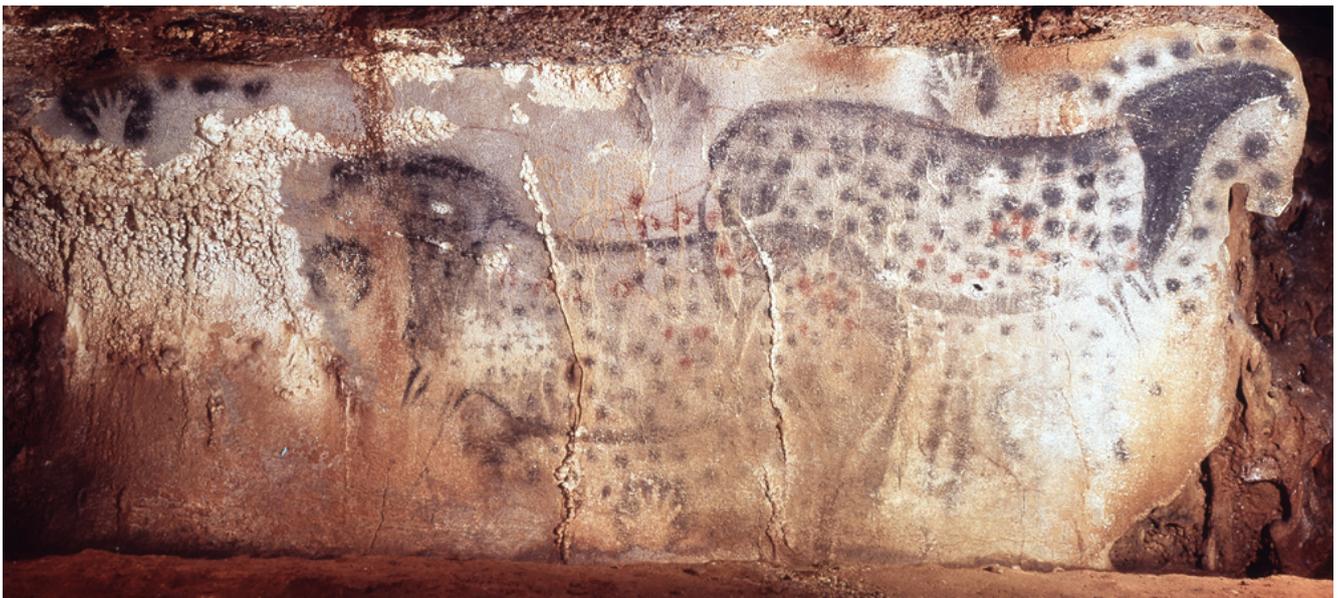
In this instance, the “found” image of a horse on a panel deep underground may have seemed fortuitous, even magical. Recognition of partial or suggested animals figures is extremely common in the caves of Franco-Cantabria and is seen in rock art almost everywhere. For example, a virtually complete natural horse was discovered in Ekain Cave on the Spanish side of the Pyrenees. This horse figure serves as an important central icon in that cave.

Horses are one of the most frequently depicted animals in the Upper Paleolithic. They alone represent about 30 per cent of the animals in all the caves. Pech Merle is known for the horses although, in actuality, mammoths are the dominant animal in that cave.

The recognition of the readymade horse shape in the cave was instigated by a universally shared human cognitive process called *projection*. Projection occurs when a viewer looks at an ambiguous or suggestive subject, for example in clouds or smoke or rock formations. That formation may then be read as a complete picture. It may be that projection takes place because it has served a protective

evolutionary purpose. It may permit the viewer to use limited visual information to call forth a completed image in the mind's eye- that of a partially hidden predator, for example. It may enable the viewer to react to this danger before it is absolutely clear but also before it becomes unavoidable. In a more extreme form, projection is known as pareidolia and leads to the many vivid examples in which someone is convinced that there is an image of Sister Theresa in a breakfast roll, or Madonna or Ganesh on a tree trunk, or Christ on a Tortilla. Projection produces convincing optical illusions. It is common in rock art worldwide.

Figure 1. *Spotted Horses* Panel of Pech Merle Cave. Each horse 1.6 m. By permission Centre de Préhistoire du Pech Merle.



4. Deconstructing the Panel

The archeologist Michel Lorblanchet has made a meticulous study of Pech Merle and other caves in the Quercy region of France. Among his many achievements he has analyzed the marks on the Spotted horse panel to find the order in which they were made [6]. He has discovered that among the first marks to be put down was a hook shape on the natural horse's muzzle. At about the same time, to the left of the head, a red arc was made that was later completed to become a red fish on the back of the right horse. Why the fish and the horse? The fish is rare in Gravettien cave art. Lorblanchet has discovered another at Pech Merle and also describes finding part of a fish in the back of Pergousset, another Quercy cave. Here, it may allow us to interpret a clearer meaning because it appears to emerge from a source of subterranean water.

After the initial red marks two horses were drawn in black. They are overlapped, but transparent, so that both animal bodies can be seen at the same time. The horses face in opposite directions. Next, around this composition were placed six black hands. These are in three pairs of right and left. The hands were used as stencils while liquid pigment was blown around them. Lorblanchet believes that the pigment was mixed in the mouth with saliva and then sprayed out through pursed lips. Next, black dots were blown on and around the horses: 212 of them. The dots are not limited to the inside of the horse contours but encircle the animals and are especially clear and dark above the back of the left

hand horse. The black dots relate to the two black outline horses but they extend around them as well, rather than being confined to the interior as they would be if they were intended to describe the animals' coats.

To continue the order in which the panel was decorated, next came 29 red dots that were made in the same way. This was followed by most unusual hooked marks in red. It has been determined that these hooked marks were made by bent fingers that were dipped in red pigment and then pressed on the wall both under and over the backbone of the left horse. It seems possible that the position of the fingers indicates some finger sign that the group understood. Following that, also in red, are two small rectangles on either side of a black hand in the upper right. Not all dots were blown. There is also a relatively small grouping of finger-made marks on the lower part of the dotted horses. Finally, returning to the use of black pigment, there is a rectangular sign made by smaller black dots under the belly of the right hand horse. Other figures and marks appear to have been made but they are now barely discernable. This is a visually compelling panel with complex additions.

5. Contextual Comparisons

At an important site in Pech Merle cave is another composition called the *Black Frieze*. Among the many animals depicted on this large panel is a mammoth, overlain with digital markings. Although these markings cover part of the mammoth in a manner similar to the markings on the horses of Pech Merle, they have not been interpreted as descriptive of the mammoth's coat. (Figure 2.)

Figure 2. Mammoth detail from *Black Frieze* of Pech Merle Cave. Photograph by B. Alpert.



To enlarge the context of comparison, Pech Merle cave is linked with another cave called le Combel, discovered 35 years after Pech Merle was explored. It is more difficult to access and has not been modified for public entrance. However, it is essentially a part of the large system of caves that includes Pech Merle. In le Combel there is a panel with a lion image referred to as the *Lion's Den*. On this panel is another group of horses covered with blown dots that wander on and around the animal. (Figure 3)

Figure 3. Spotted horses from *Lion's Den*, le Combel Cave. Photograph by B. Alpert.



This composition is like an echo of the *Spotted Horses*. Once again there are two stylized horses, facing in opposite directions. Once again these horses are shown as overlapped and transparent. Again, there is an overlay of blown dots. This panel, so like the one at Pech Merle, reinforces my conclusions because there is no possibility here of interpreting the dots as a spotted coat. The similarity of the two images and their appearance in linked caves makes clear that the two images are related in meaning. Therefore, an interpretation of the dots on the *Spotted Horses* of Pech Merle as descriptive of a dotted coat seems even more untenable.

6. Changing Proportions

Unlike the realistic proportions of the natural stone head found on the panel, the *Spotted Horses* are distorted with extremely short legs and very small black heads. Accuracy and naturalism are not the compelling motives involved in their depiction. However, they fit well into the Gravettian period. Horses from that earlier period tend to have large bodies and small heads. The heads of these spotted horses are so extremely small that have been called *duckbill* heads. In addition, the painted legs are much too short and the body overlong. One might call this look “mannerist” because it reduces some body parts and elongates others¹. Other animals in Pech Merle are distorted in a similar way. The bodies of the bison particularly have been stretched with special concern for the rhythmic flow of the line. A concern for the freedom of the line and its lyric possibilities seems at times to take precedence

¹ In art history ‘mannerism’ is a term applied to certain Italian artists of the 16th century who elongated some body parts and reduced others. I am using it in a more generic way to refer to horse proportions in the Gravettian period. Such distortion as is seen in Pech Merle and le Combel can be seen in horse imagery from disparate areas and times, for example on some early Greek vases and in some Navaho ledger books.

over the use of line for realistic, descriptive purposes. We see this particularly in the Gravettien cave of Cussac that is dated to about the same time as Pech Merle. It is evident that the artist who painted the *Spotted Horses* with its exaggerated proportions was not seeking to make those horses appear realistic. That fact refutes the argument that the dots were used to create a realistic looking coat, even assuming that spotted horses existed in their environment. Moreover, the only evidence that they existed in their environment is from that very panel. This seems to involve circular reasoning.

The *Spotted Horses* must be contrasted with and distinguished from the Magdalenian horses. Although not all of the horses are by the hand of a master almost all have more realistic proportions. Many of the later artists appear to have aspired to optical verisimilitude. The horses at Combarelles or Cap Blanc are examples of the naturalism of the Magdalenian period at its most fully realized.

7. Dots Used for Description

It is evident that dots can be used to describe. They could indicate a spotted coat. That use of descriptive dots occurs very rarely in prehistoric rock art. In the earlier cave of Chauvet, a bear and a smaller mammal thought to be a hyena are shown with marks that could be convincingly be interpreted as a spotted coat even though we do not normally think of a bear as spotted. (Figure 4)

Figure 4. Spotted animals from Panel of the Panther, Chauvet. Photograph by J. Clottes by permission J. Clottes.



The hyena is similarly spotted and that would be consistent with the hyenas we are familiar with. These descriptive dots are finger-made, not blown. Dots that may be descriptive were occasionally placed on the heads and forequarters of several of the monumental extinct Ice Age bulls, identified as aurochs, that were painted in the *Rotunda of Lascaux*. Again at Chauvet, dots were placed on the muzzles of lions, perhaps meant to indicate the animals' whiskers.

A sandstone fragment found in a quarry at Boutigny-sur-Essone in Ile de France shows the well defined body of a horse. It is covered with finger-made dots in the same manner as the animals at Chauvet. (Figure 5)

Figure 5. Sandstone slab from Boutigny- sur-Essone. Now in the Museum of Saint Germain-en-Laye. Size: 46 cm by 35 cm. Photograph by B. Alpert.



This piece, although missing its head, has a clearly delineated body. It has been studied and authenticated by the preeminent archeologist André Leroi-Gourhan who dated it from the Magdalenian period. [7] If there indeed does exist among the known Paleolithic artifacts a naturalistic depiction of “leopard coat pattern” on a horse, it is very likely seen here on this modest and little-publicized piece.

8. Dots as Signs and Symbols

Some of the marks on the horse panel may be signs. To define sign I use the traditional distinction that a sign stands for something specific that has an assigned meaning understood by the members of a group. One example, from the caves of this area is the aviform sign, so called because of its resemblance to an image of flying. Another sign associated with this region looks like rods and a branched pattern. It seems likely that the bent finger-pressed red paint on the back of one of the horses may be a sign indicating something specific to those who are privy to this information and who share this knowledge. The hooked fingers are apparently unique to Pech Merle. Finger prints are all the more

apt to be signs because it is likely that prehistoric hunters made use of a sign language of some kind in addition to a vocal language.

In rock art in Franco-Cantabria, repeated use of dots may give clues to their assigned meaning in specific caves. At Lascaux, dots were used to mark the ends of some passages. There are dots after the decorated area in the *Axial Gallery* and in the *Meander*. Two of the most inaccessible chambers at Lascaux are the *Shaft* and the *Chamber of Felines*. Each one of these areas concludes the decorated portion with six dots. The dots could have served as signs. Some dots seem to function as a warning sign for dangerous areas or at least for changes in cave topography. It has been suggested that dots may mark areas of extreme resonance. Attention to resonance, in turn, might be another way of exploring the cave topography [8].

Based on their research, the aforementioned geneticists who studied the prehistoric horse genome concluded that the dots were probably used to describe the reality of spotted coats and, therefore, that “cave paintings might have contained less of a symbolic or transcendental connotation than often assumed.” (See Note 3). Michel Lorblanchet and other archeologists who are very familiar with the art hold firmly that the dots in the Quercy and in other caves are symbolic. The term symbolic refers to something less limited or specific than a sign. It has a much broader range of meaning. Often, symbols are associated with myths that may be rich with layered associations. The wounded man images that occur in the closely related caves of Pech Merle and Cougnac may be myth-based. Symbols, in my use here, are less directly translatable than signs and may carry a penumbra of meaning.

9. Cross Cultural Parallels

Symbols do occur cross culturally. Surprisingly similar, even identical forms, may sometimes be found to exist in completely unrelated societies. This occurs even in places where there could not have been any contact or cultural diffusion. The Bushmen/San of the Drakensberg in South Africa often drew or painted elands. Elands are sometimes shown spotted with small dots in a manner similar to the horses from Chauvet or Boutigny-sur-Essonne. The eland is considered a very important animal, primarily being associated with rain. Certain animals are called “rain animals”. There are a number of different animals that have been assigned this term, such as hippopotamuses and snakes. However, elands seem to be the most fraught with significance and they are the most numerous, so much so that the archeologist Patricia Vinnicombe called the Bushman/San *The People of the Eland*. This creates a parallel with the horse that is the most frequently depicted animal in Franco-Cantabria. White dots in some depictions of animals are believed by Jean-Loic LeQuellec and other authorities to denote raindrops because they are found both on mythical snakes and on other rain animals and cannot in most instances be construed to depict a spotted coat.

A tracing by Helen Tongue of a painting at Willow Grove, Wodehouse District South Africa shows two elands. (Figure 6) The lower animal is embellished with black and red spots. In referring to this particular tracing, Le Quellec writes that spotted bodies seem to be a “monopoly of mythical beings” [9]. Curiously, the animals are surrounded by fish. Some other examples of spotted elands from rock art of this area also depict fish. This recalls the unexplained fish on the back of one of the spotted horses at Pech Merle. Such a surprising reiteration could be due to the commonality of human experience. Ultimately, it must result from the universality of human perception and cognition.

Figure 6. *Spotted Elands*. Traced by Helen Tongue 1906/7. Willow Grove, Wodehouse District, South Africa. Published in *Bushman Paintings*, 1909, Pl. XVIII-29, Reference in Le Quellec, *Rock Art in Africa: Mythology and Legend*.



10. Origin of Dot Making

The antiquity and ubiquity of dot making is not surprising because dots and lines are the two basic components of a graphic vocabulary. Dot making appears in the normal development of childhood worldwide. In general, children begin to grasp markers to make lines when they are about 18 months old. At about two years of age they discover the possibility of using a marking implement to make a pounding movement that results in dots. That percussive, plosive motion is often found to be extremely satisfying [10]. Psychologist Howard Gardner, who is a specialist in cognition described how his young son discovered dot making. Gardner wrote that the boy found the physical movements and resulting marks to be so pleasurable that he immediately favored them over his earlier linear scribbles. The origin and early development of children's art has been shown to be similar worldwide, reinforcing the belief that, like aural language, it is innate [11].

Dots may be the earliest marks that European Paleolithic artists placed on the walls of caves. Recently, some of the red dots in the cave of el Castillo in Cantabria, Spain have been dated, using uranium-thorium testing, to a minimum of 40,800 years ago [12].

11. Perception and Psychology of Dots

The Gestalt school of psychology that was particularly active in the early 20th century studied the perceptual organization of visual stimuli. Often, these stimuli were dots. They formulated laws to explain how dots appeared to be organized in groups. They also studied the effect of apparent motion that was produced by groups of dots. However, neither they nor other scientists have, to my knowledge, examined the psychological effect of the perception of dots on the mind of the viewer. The effect of viewing a variety of shapes, including dot-like ones, has been a subject of research not in humans but in macaque monkeys. These monkeys often serve as surrogates for human subjects in studies of vision². One group of researchers has studied the parts of the brain involved in vision when confronted with a variety of shapes. They do this by causing the subject to gaze at a visual array and then measuring the electrical pulses that result from this exposure. The pulses are called action potentials.

When displayed on a graph to plot the degree of arousal they appear as spikes so they are normally referred to as neuronal “spikes”. In one experiment the spikes were found to be twice as large when the monkey was looking at a round spot-like shape as compared to a straight line [13].

Visual psychology is an area where the experiments by artists have preceded scientists by thousands of years, at least 40,000 years. Neuroscientist Adam Zeman has written: “...artists are seasoned experts on sight and their work has much to teach us about the workings of vision and the visual brain.” [14]. We are increasingly finding that from very early in human history, artists have been aware of optical phenomena just as they have known about and used many optical illusions. Neuroscientist Samir Zeki has written: “Artists are in some sense neurologists studying the brain with techniques that are unique to them.” [15]. Artists have experimented with the aroused interest and excitation produced by the perception of arrays of dots. Many artists have explored the effect of dots. The art movements of *Pointillism* and *Impressionism* were largely based on the perception of black and white dots and colored dots. A few of the artists who experimented with these are Seurat, Signac, Van Gogh, Picasso, Calder, and Op artists Vasarely and Riley. Contemporary artists who have used dots extensively are: Lichtenstein, Warhol, Hirst, Steinberg, Kusama and Close to name only the most prominent.

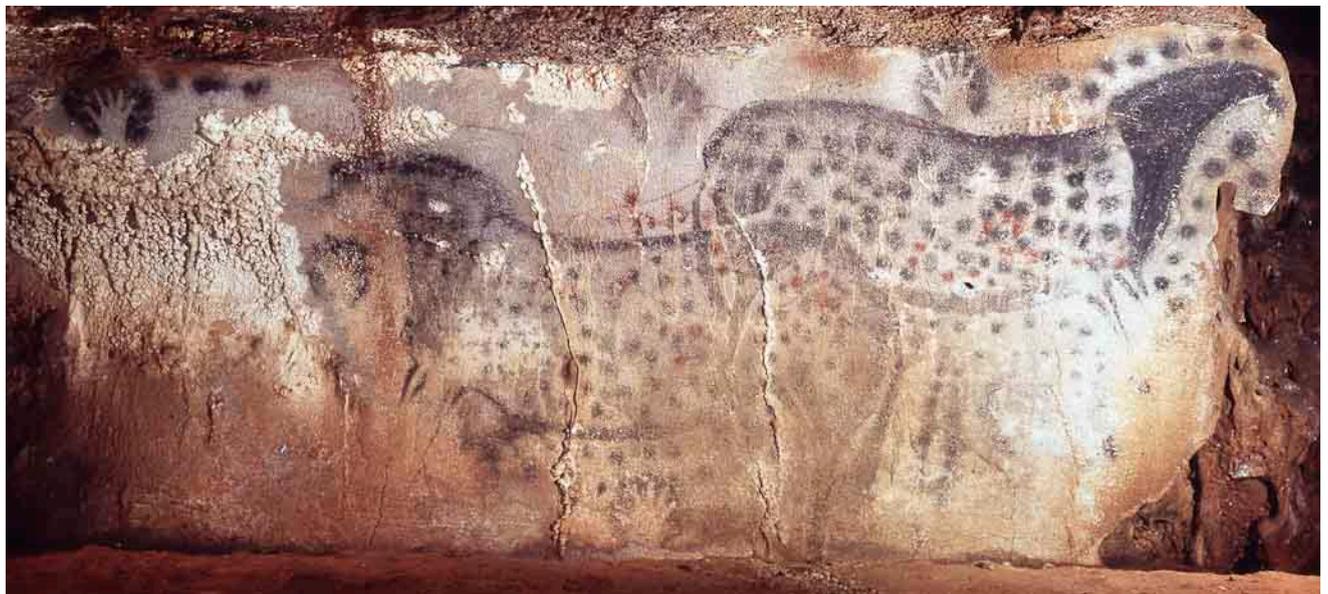
The artists from Pech Merle may have been using spots for their psychological impact. To explore the powerful effect of the dots in the panel of the *Spotted horses* I showed two pictures to groups of my students and to other groups as well. The first picture consisted of the horses from the Pech Merle panel with their spots removed. (Figure 7) The second picture was the original panel of the Spotted horses. (Figure 8) Without exception, viewers found that the spots made the image much more compelling. To me it seems evident that the spots were used, at least in part, to cause the viewer to receive a jolt of visual energy.

² Monkeys are used as surrogates because the necessary brain probes would be considered inhumane. Moreover, the subjects are killed after the experiments are completed so that researchers can examine the actual brain tissue.

Figure 7. Spotted Horses panel with spots removed by author.



Figure 8. Spotted horses panel with spots restored By permission Centre de Prehistoire du Pech Merle.



12. Visual Voltage

In the cave of Pech Merle and in a number of other Paleolithic caves in the Quercy region, there is another related optical effect: very small strewn dots are not viewed as individual dots but as a generalized speckling or splattering. Lorblanchet describes these where he finds them in the Quercy caves as “mouchetures” and says they occur in many of the areas where there is graphic decoration. He affirms that they are man made. We may imagine how, in the black caves, these small dots appeared by torch or firelight. Flickering light cast on the splattered wall may have resulted in an effect that caused visual sensations similar to sparkle, shimmer or scintillation. I am not suggesting in any way that this optical effect is associated with the trance hypothesis or has any association with the

“shamanic” theory. Rather, this is a visceral response having to do with the autonomic nervous system’s response to perception. The vibratory excitation caused by a field of dots may be similar to the emotional response to a trill and it is one that artists have learned to use for their own purposes.

In Australia, archeologist Howard Morphy has written relevant to this visual effect. In a study of the Yolngu people of Arnhem Land, Northern Australia, Morphy describes an aesthetic concept they possess called *bir’yun*. He writes that the key concept of *bir’yun* should be translated as “brilliance” or “shimmering”. The Yolngu, he explains, believe this emanates from the ancestral beings associated with a specific place and clan. For them it contains “spiritual power” Morphy further describes their art. They use a special shiny ochre to make their painting glimmer. They place fine cross-hatching on top of their completed paintings to make them sparkle and, in some areas of their territory, the Yolngus had their skin tattooed with finely crosshatched lines. In the paintings and the tattoos, some of these crosshatched lines are interrupted and become, in effect, rows of dots. *Bir’yun* is thought of as “a scintillating quality of light which engenders an emotional response” [16].

In our culture, fracturing of light seems to play an important role in churches, temples, and other places that are meant to induce reflection on the otherworldly. The individual tesserae in Byzantine mosaics break up the image. Gold mosaics, often used behind saint figures, have additional sparkle and the reflections from these causes the image to glimmer. Stained glass does this on a grander scale, capturing the direct light itself. We have all experienced how the effect of bits of colored light appearing in a darkened area such as a cathedral can affect us. Flickering light is another device used to create awe. Despite the availability of electric light, candles continue to be used in ceremonies in many religions. Bouncing the scintillating light off uneven mosaic surfaces adds to this aura. Splattered surfaces illuminated by torches may have had a similar effect in the intense blackness of the caves³.

13. Conclusion

The dots on the horses of Pech Merle do not serve a descriptive purpose. It is probable that they have a symbolic meaning as they do among the Bushman/San, the Yolngu and many other cultures, including the aborigines of central Australia. Dots may also carry a special, perhaps even transcendental connotation. Despite the conclusion of the authors of the article on “leopard spotting”, the horses of Pech Merle remain an enigma and the strong suggestions of symbolic and/or spiritual meaning cannot be dismissed. Both the drive to symbolic creation and the search for spiritual meaning appear to be deeply embedded in the human brain. The English poet and cleric Gerard Manley Hopkins sensed this about the psychological effects of dots in nature when he wrote in his poem *Pied Beauty*: “Glory be to God for dappled things”.

³ Scintillation is sometimes associated with spirituality. Fire can produce it. For example, God appeared to Moses in a burning bush and also, during the Exodus, led him in the form of a column of fire. The Hindu God Shiva dances in a halo of fire. Sacred everburning fires were kept by people as far apart as the Zoroastrians in Persia and the Natchez who were part of the Mississippian culture in North America. Scintillation with spiritual suggestion can also be evoked by light sparkling on water.

Conflicts of Interest

The author declares no conflict of interest.

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