

# A Prehistoric Mural in Spain Depicting Neurotropic *Psilocybe* Mushrooms?

by

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**A Prehistoric Mural in Spain Depicting Neurotropic *Psilocybe* Mushrooms?** The Selva Pascuala mural, a work of post-Paleolithic rock art in Spain, contains fungoid figures herein hypothesized to depict neurotropic fungi, especially *Psilocybe hispanica*, a species that occurs in a neighboring region. This hypothesis is based on features of these figures related to fungal morphology, along with ethnographic analogy, and shamanistic explanations of rock art. If correct, this interpretation would support inference of prehistoric utilization of this fungus in the region. The mural represents the first direct evidence for possible ritual use of *Psilocybe* in prehistoric Europe.

**¿Se Representan Setas Neurotrópicas *Psilocybe* en un Mural Prehistórico de España?** El panel de Selva Pascuala (Villar del Humo, Cuenca, España) conserva pinturas rupestres de cronología postpaleolítica entre las que se incluyen figuras con apariencia de seta, para las que aquí planteamos la hipótesis de que representan setas de efectos neurotrópicos, en concreto *Psilocybe hispanica*, una especie que crece en regiones próximas. Esta hipótesis se basa en las características de estas figuras en comparación con la morfología de dichas setas, a lo que se añade la analogía etnográfica y la teoría del chamanismo aplicada al arte rupestre. Si estamos en lo cierto, esta interpretación apoyaría la posible utilización regional de estas setas durante la Prehistoria. El panel supone la primera evidencia directa del posible uso ritual de *Psilocybe* en la Prehistoria europea.

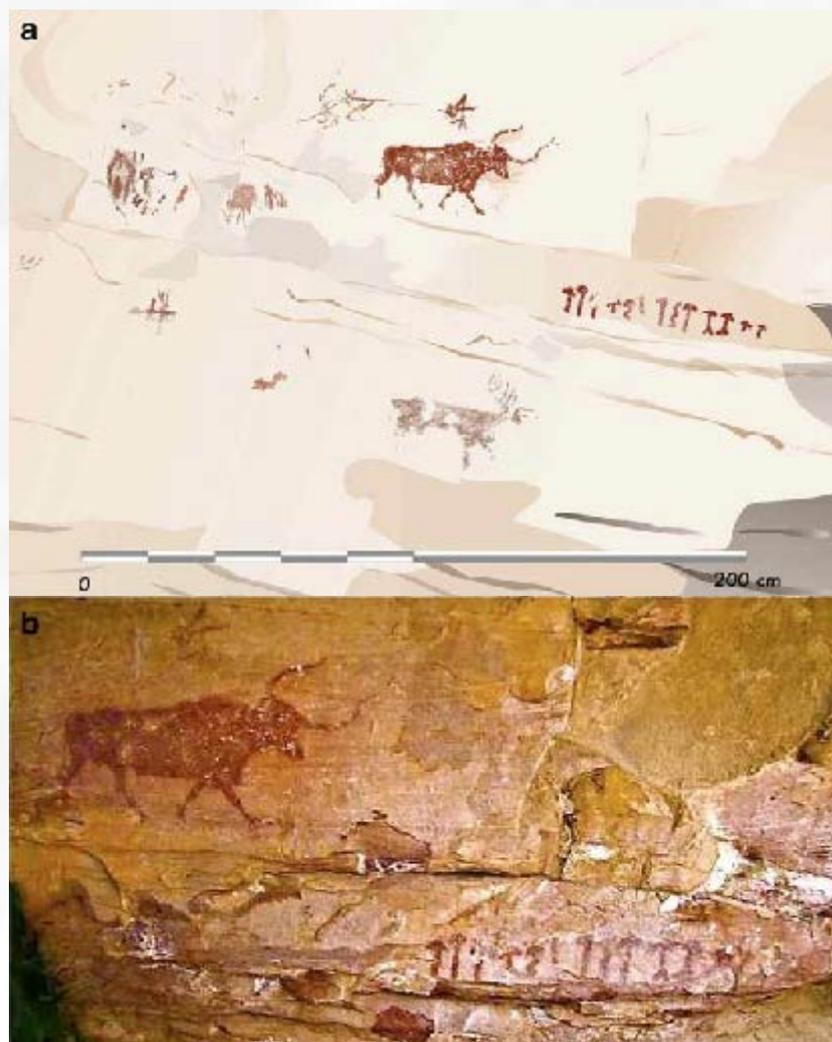
**Key Words:** *Psilocybe*, neurotropic fungi, post-paleolithic, rock art, levantine art, schematic art.

## Introduction

Ritual use of neurotropic fungi has been noted in several culture areas, most notably Mexico and Siberia. Almost 20 *Psilocybe* species have been used in shamanistic rites in Mexico (Guzmán 2008). In Siberia, shamans have made similar use of fly agaric, *Amanita muscaria* (L.:Fr.) Pers., a neurotropic fungus with pharmacology differing from that of *Psilocybe*.

These historic traditions of native Mexico and Siberia are well documented, but their cultural origins are unclear. Archaeological artifacts including ceramics from northwest Mexico, plus the so-called mushroom stones associated with the Mayan Classic and Preclassic periods, have been interpreted as evidence for usage of neurotropic fungi in Mesoamerica spanning more than 2,000 years (Borhegyi 1961; Furst 1974). Based on their studies, Wasson and Wasson (1957) suggested even greater antiquity for such practices, and proposed similar traditions were likely more common and widespread in prehistory. (For a recent critique of Wasson and Wasson [1957], see Letcher 2006.)

Evidence concerning the ritual use of fungi in prehistory is scant, but rock art from several regions has been cited in relation to the idea Wasson and Wasson (1957) put forth. Possibly the most ancient example is from Tassili, in the Sahara desert, southeast Algeria. In a cave there, Samorini (1992) found a painted mural dated 7000 to 9000 B.P. portraying fungi, possibly *Psilocybe mairei* Singer, according to G. Guzmán (pers. comm.), a species known from Algeria and Morocco. In northeastern Siberia, Dikov (1971) discovered fungoid petroglyphs on large exposed rocky formations in the Pegtymel River region, apparently of shamanistic significance and likely representing *Amanita muscaria*.



**Fig. 1.** The Selva Pascuala mural.  
(a) Whole mural (digital tracing, J. F. Ruiz).  
(b) Detail, bull and mushroom pictographs (photograph, A. Piper).

The present paper details findings from study of the Selva Pascuala mural (Fig. 1), a striking work of prehistoric rock art at the Villar del Humo cultural site in Cuenca, Spain. Along with other compositional elements including most prominently a bull, this painted scene contains distinctly fungoid pictographs. Previously described as anchor-like (Acosta 1968) or mushroom-like (Alonso 1983), these figures appear toward the lower right, in a distinct horizontal row of 13. Each consists of a vertically oriented, stalk-like lower portion varying from straight to sinuous, apparently representing the stipe, capped by an upper portion suggesting the pileus, convex to bluntly subconical in form.

Ramón Viñas, a Spanish archaeologist experienced in Levantine and Mexican rock art, was the first to suggest informally that these pictographs, true to their appearance, might in fact represent fungi (Viñas pers. comm. to J. F. Ruiz and J. F. Jordán in 2007). Their portrayal in association with a bull seemed especially interesting in this regard, considering the manure habitat of a few *Psilocybe* species. The purpose of our study was to assess the validity of Viñas' suggestion by testing it against data and analysis from archaeology and mycology. Our objective was to evaluate whether this hypothesis would prove tenable in light of various relevant lines of evidence.

## The Site and Prehistoric Rock Art in Spain

The Selva Pascuala mural is one of two pictographic panels found at the Selva Pascuala rock shelter, which was discovered in 1918 by archaeologist E. Hernández-Pacheco (1959). The shelter measures 1,220 cm in width by 315 cm in height, and the fungal pictographs are up to 8.8 cm in height. The site is located in the municipality of Villar del Humo, within the central Spanish province of Cuenca. Villar del Humo lies within the outskirts of the Sierra de las Cuerdas, a group of medium-sized mountains of 900 to 1,500 m altitude in the southernmost part of the Sistema Ibérico range. The local landscape is rugged, with dense pine forests growing amid cliffs and boulders of reddish Triassic sandstone.

Although little is known of the post-Paleolithic culture in this region, it is noted as an important record of prehistoric rock art. The first such site was discovered in 1917. Following several archaeological surveys over the last decade, the number of rock art sites documented has grown from 13 to 40 (Poyato *et al.* 2007; Ruiz 2006).

The rock art of Villar del Humo belongs to two major art styles: Levantine and Schematic. Levantine art is distributed over the eastern half of the Iberian Peninsula, a region referred to as the Spanish Levant. It represents a naturalistic style in which human and animal figures play major roles, with vivid scenes of hunting activities, dancing, and fighting. Schematic art is found throughout the Peninsula and features dots, lines, zigzags, and schematized figures, painted with broader brushes and a less careful technique. Both styles occur together at various sites, including Selva Pascuala, and were probably produced by the same culture undergoing a long-term process of change (Mateo 2001; Ruiz 2006). However, some researchers believe they may reflect two consecutive cultures that coexisted and competed with each other in this part of the Peninsula over a period of time (Hernández and B. Martí 2000; Martínez and Villaverde 2002). At Selva Pascuala, naturalistic and schematic figures appear together in the mural with no appearance of competition or erasure of one by the other, suggesting a meaningful relationship in the overall composition, even if both styles were produced in different chronological periods.

Levantine and Schematic art are distinguished from Paleolithic rock art, particularly the remarkable Franco-Cantabrian tradition of northern Spain and southwestern France, known from cave sites such as Lascaux and Altamira among others. Franco-Cantabrian art typically occurs in deep caves, but Levantine and Schematic art is mainly found at rock shelters, which tend to be more open and exposed to the elements. Large animals are the principal subjects of Paleolithic cave paintings, whereas humans and their activities figure more prominently in Levantine and Schematic art. The latter styles are also distinguished from Paleolithic art by their use of plain colors, mainly red but also black and white. Finally, Levantine and Schematic paintings are relatively small, 1 m or less, compared with the typically larger scale of Franco-Cantabrian art.

Although Paleolithic art differs in some respects from these post-Paleolithic styles, their meanings may be related based on a common hunting and gathering adaptation that typified the Upper Pleistocene and persisted in the Iberian Peninsula until the fourth millennium B.C.E. In the eastern part of the Peninsula,

Paleolithic and post-Paleolithic styles display some similarities, highlighted by new discoveries in the last decade. Both have a conspicuous, consistent emphasis on animals and hunting motifs, clearly reflected in the Levantine hunting scenes. Both traditions offer abundant evidence of magical or ritual functions, presumably based in symbolic meaning of the reduced number of animal species most often portrayed, apart from their relative economic importance. Anthropomorphism plays a role in these depictions, often assimilating the hunter to the hunted.

Such interpretations are based on similarities between the older and more recent styles of prehistoric art, plus ethnographic analogies with extant hunting and gathering cultures. There is an increasing consensus that painted rock shelters of the Spanish Levant and caves featuring Paleolithic art were long regarded as sacred sites or sanctuaries; that is, they were places of ritual importance. Based on the austerity of their location and consistent subject matter, these ancient rock art sites cannot be well understood in secular terms as mere creative decoration or artistic expression for its own sake (Díaz-Andreu 2001).

In recent decades, shamanistic interpretations involving altered states of consciousness or "archaic techniques of ecstasy" (Eliade 1964) have been proposed for rock art in Europe and elsewhere (Clottes and Lewis-Williams 1998; Lewis-Williams 2002; Lewis-Williams and Dowson 1988; Turpin 1994). Indigenous uses of neurotropic fungi typically involve a shamanistic context, and the identification proposed here is based in part on general explanations of rock art in shamanistic terms. It must be noted that such explanations remain theoretical thus far, and subject to disagreements as well as further study (for a recent critique see Bahn 2010).

## Antiquity and Dating of the Mural

Considerable uncertainty prevails over the exact age of the Selva Pascuala mural, as well as Levantine and Schematic art in general. Levantine art was formerly interpreted as Paleolithic, but archaeologists nowadays tend to place it in a post-Paleolithic context; i.e., after the Pleistocene. Many prehistorians now date it close to the rise of the first Neolithic farming and herding communities in the Iberian Peninsula. As noted, the role of animals in Levantine art recalls Paleolithic art, pointing toward a cultural adaptation resembling that of the Upper Pleistocene. However, in contrast to Franco-Cantabrian art, extinct Ice Age fauna are absent from this post-Paleolithic style, reflecting its more recent origins. Indeed, at Selva Pascuala the panel other than the one studied here contains a scene of horse domestication, a rarity for Levantine and Schematic art indicating a Bronze Age cultural stage.

Recent research (Ruiz *et al.* 2006) using  $^{14}\text{C}$  AMS analysis of calcium oxalate patinae has provided the first radiometric dates related to prehistoric art in the Sierra de las Cuerdas. Results indicate at least some Levantine art in the region could have been painted around 6000 B.C.E., prior to the Neolithic in the Iberian Peninsula (Ruiz *et al.* 2009). However, Levantine art was likely produced over a long period of time, up through the end of the Neolithic. On the other hand, Schematic art appears with the first Neolithic cultures, based on parallels between this style and decorated ceramics that have been well dated archaeologically (Torregrosa and Galiana 2001). The older Neolithic sites in the Peninsula are dated after circa 5600 B.C.E. (Zilhão 2001).

Conclusions about the age of the Selva Pascuala mural are tentative. Central portions, such as the bull, are clearly Levantine and may go back at least as far as 6000 B.C.E. The fungoid figures are interpreted as Schematic and likely Middle Neolithic, circa 4000 B.C.E. in this region. Unfortunately, the archaeological record for other cultural remains at the site is limited to some fragmentary evidence of fire usage and flint knapping; such is difficult to clearly associate with the mural. Selva Pascuala was not a habitation site but rather one of special purpose, consistent with a shamanistic interpretation.

## Interpretation of the Mural and Mycological Identification

Based on its combination of Levantine and Schematic elements, the Selva Pascuala mural is likely to have originated with more than one artist in successive episodes of painting activity. Its interpretation must be qualified by indications it underwent a process of re-elaboration over time. At the center of the scene, animals are dominant. There are two large bulls, one of which has almost disappeared, plus a deer and several human

figures. These are rendered in Levantine style and probably trace to an earlier stage, based on their central position. Several Schematic figures appear around the edge of the mural, apparently added later and without disturbing the previous composition. Some of them, including the mushroom-like pictographs studied here, play an apparent role more typical of Levantine human figures, being placed toward the margin, around the central portion in which animal figures predominate.

The fungoid figures in the mural display individual differences of form resembling the kind of morphological variation commonly observed in fruit bodies of a single species. Two of them, in the tenth and eleventh positions (counting left to right), also show a split or bifurcated base, which could lend to anthropomorphic interpretation as legs. Indeed, the figures in this row have been previously interpreted as schematized human beings (Alonso 1983).

Recently proposed explanations for rock art based on ritualized trance or altered states, together with ethnographic analogies for use of *Psilocybe* and *Amanita*, suggest that the pictographs, interpreted as mushrooms, would likely represent neurotropic fungi. In consultation with Dr. Gastón Guzmán, we noted features of the 13 fruit bodies and the variations among them in light of fungal morphology and taxonomic concepts. The pictographs appear to illustrate a fungus with a convex to conic-subumbonate pileus and a straight to sinuous stipe, lacking an annulus. Accordingly and using these criteria, mycological data were reviewed to determine whether any neurotropic species occurred in the region with features matching those indicated in the mural. *Amanita muscaria* was excluded because of its non-sinuous stipe and large, persistent annulus. Moreover its pileus is adorned with conspicuous veil remnants, typically emphasized in artistic treatments, and notably lacking in the mural figures. We also considered the mural's combination of bovine and fungal figures raised some question of a possible habitat association. Likewise, this posed no apparent connection with *A. muscaria*, a mycorrhizal species.

Close similarities were noted, however, between the mural pictographs and the neurotropic fungus *Psilocybe hispanica* Guzmán (Fig. 2). Known so far only from Spain, this species was described from a locale near Huesca in the Pyrenees Mountains, approximately 275 km northeast of Selva Pascuala, in the Aragon region. It is reportedly used there recreationally for its neurotropic effects, especially by young people (Fernández-Sasia 2006; Guzmán 2000; Guzmán and Castro 2006). Its pileus is convex to subconical, closely matching the pictographs. The straight to sinuous stipes of the mural's mushrooms also agree well with those of *P. hispanica* (Guzmán 2000). Our knowledge of this species to date is based on only three collections, so additional comparative data would be valuable. Nonetheless if the mural relates to a shamanistic context and the pictographs represent mushrooms, we consider *P. hispanica* a uniquely apt candidate for the likely identity of the species depicted, as proposed by Guzmán.



**Fig. 2.** *Psilocybe hispanica* Guzmán (photograph, I. Seral).

Habitat data also correlate with the identification tentatively suggested here. *Psilocybe hispanica* is a coprophilic species, coinciding with the mural's association of bovine with fungal figures. This species has been collected so far only from horse dung, but coprophilic fungi present a wide range for kinds of dung they inhabit. This is well illustrated by *Psilocybe cubensis* (Earle) Singer, and *P. coprophila* (Bull.: Fr.) P. Kumm., which occur on dung of many kinds of herbivorous mammals including horse and cattle, among others.

There is another neurotropic fungus in the region that might be considered in light of the mural pictographs, *Psilocybe semilanceata* (Fr.: Secr.) P. Kumm. This species is closely related to *P. hispanica* but differs in its pileus, which is acutely papillate and more narrowly conical to subcampanulate. These features point away from any relationship with the fungi depicted at Selva Pascuala. It grows only on soil rather than dung, likewise offering no specific link with the apparent bovine association in the mural.

*Psilocybe hispanica* has been found so far only in the Pyrenees region, in alpine *Pinus* forests at 2,000 to 3,000 m altitude. The Selva Pascuala site lies at 1,070 m. However, it is likely that *P. hispanica* has a wider ecological distribution than is presently known, based on studies of other species such as *P. aztecorum* R. Heim emend. Guzmán. The latter was originally described from alpine *Pinus* forests at 3,500 m altitude (Heim 1957), but Guzmán (1978) later found it in a non-alpine *Pinus* forest at 2,500 m.

In view of the temporal separation between the Selva Pascuala mural and our records of *Psilocybe hispanica* in the present, a related question arises of climate change as a possible factor affecting distribution of this species over time. We have no mid-Holocene records for the Sierra de las Cuerdas, but several studies have been published addressing paleoclimate for medium altitude mountains in a radius of approximately 100 km around Villar del Humo (Carrión and van Geel 1999; Fernández-Miranda and Moure 1977; Stevenson 2000). Studies indicate mature forests of *Pinus* species with some deciduous trees were well established. The data present no indications contrary to the likely presence of *P. hispanica* in the region during the era of the Selva Pascuala mural.

Following shamanistic explanations of rock art, ethnographic analogies for use of *Psilocybe* and *Amanita* suggest to us that Selva Pascuala probably reflects a similar context of neurotropic fungi consumption. Our interpretation of the mural, if correct, would imply ritual usage of neurotropic fungi, especially *Psilocybe hispanica*, as part of the post-Paleolithic culture pattern in this region. Accordingly, Selva Pascuala presents the first direct evidence for possible utilization of *Psilocybe* in prehistoric Europe. Along with Pegtymel and Tassilli, the mural represents the third reported instance of rock art suggesting prehistoric usage of neurotropic fungi. Tassilli is the only site previously known that may likely represent *Psilocybe*. Selva Pascuala thus offers the second such example.

## Discussion

Examples of apparent Schematic style fungal depictions other than in Selva Pascuala have been recorded. These include Marmalo V at Villar del Humo (Alonso 1983-84), plus Monte Arabí and Cantos de la Visera, both at Yecla in the Murcia province (Acosta 1968). How such sites relate to Selva Pascuala is unclear, but their existence is interesting in view of our findings about the mural.

Selva Pascuala's apparent association of bovine imagery with *Psilocybe* is noteworthy in light of a mythic link between the bull and mushrooms, extending into classical Mediterranean history and seemingly related to intoxication. In Greek mythology, mushrooms bellow like bulls as they fruit from the ground; and Dionysus, the god of intoxication, manifests as a bull that his ecstatic devotees dismember barehanded (Ruck 2006). Fungi are similarly anthropomorphized as a variety of taurine monsters, which the mythic hero masters by decapitation, harvesting the head (Ruck *et al.* 2000). This mythic encounter of the hero with the bull and its harvesting as a magical plant is traceable to Mithraism and its revision as Zoroastrianism, arguably the earliest monotheistic religion. Deification of the bull in shamanistic contexts has been documented at shrines and sanctuaries excavated at Catal Höyük in Anatolia, a tradition dating back to the era of Selva Pascuala (Ruck *et al.* 2009). The Selva Pascuala mural also seems to express this widespread metaphoric zoomorphism.

If the identification proposed herein is correct, the dung habitat of *Psilocybe hispanica* is sufficient by itself to explain the mural's combination of fungus and bovine. But there may be more than habitat involved in this association, as well as other elements of the mural, possibly relating to the effects of *Psilocybe* upon humans or animals as observed by humans. The bifurcated bases of two of the fungal pictographs are suggestive of human legs. This might represent a transformation process relating to perceived effects on humans, in a sense reconciling previous interpretation of these pictographs as anthropomorphs. Observed effects of neurotropic fungi or plants upon animals that ingest them may also underlie fungal zoomorphism and anthropomorphism at Selva Pascuala and elsewhere. In any case, the mural's depiction of mushrooms carefully arranged in a row

with correct detail and features, seems to suggest they held special significance for the artist and cultural context.

## Conclusion

We suggest that Viñas' hypothesis is sound, and the Selva Pascuala mural likely depicts mushrooms, especially neurotropic fungi. Although *Psilocybe hispanica* presents a probable candidate for the species depicted, as indicated by Guzmán, we emphasize that this identification is tentative, and contingent upon a shamanistic interpretation of the mural. Understanding of Selva Pascuala and related sites will no doubt benefit from further research on rock art and post-Paleolithic culture in Spain.

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## Literature Cited

1. Acosta, P. 1968. La pintura rupestre esquemática en España. Salamanca: Universidad de Salamanca.
2. Alonso, A. 1983-84. Los conjuntos rupestres de Marmalo y Castellón de los Machos (Villar del Humo, Cuenca). *Empúries* 45-46:8-29.
3. Bahn, P. G. 2010. Prehistoric rock art: Polemics and progress. Cambridge University Press, Boston.
4. Borhegyi, S. 1961. Miniature mushroom stones from Guatemala. *American Antiquity* 26:498-504.
5. Carrión, J. S. and B. van Geel. 1999. Fineresolution Upper Weichselian and Holocene palynological record from Navarre's (Valencia, Spain) and a discussion about factors of Mediterranean forest succession. *Review of Palaeobotany and Palynology* 106:209-236.
6. Clottes, J. and D. Lewis-Williams. 1998. *The Shamans of Prehistory: Trance and magic in the Painted Caves*. Harry N. Abrams, Inc., New York.
7. Díaz-Andreu. 2001. Marking the landscape: Iberian post-paleolithic art, identities and the sacred. Pages 158-175 in G. H. Nash and C. Chippindale, eds., *European landscapes of Rock-Art*. Routledge, London.
8. Dikov, N. N. 1971. Naskal'nyie zagadki drevnei Chukotki: Petroglify Pegtymelia (Rock art puzzles of Ancient Chukotka: Pegtymel petroglyphs). Nauka, Moscow.
9. Eliade, M. 1964. *Shamanism: Archaic techniques of ecstasy*. Pantheon Books, New York.
10. Fernández-Miranda, M. and J. A. Moure. 1977. El abrigo de Verdelpino (Cuenca): Noticia de los trabajos de 1976. *Trabajos de Prehistoria* 34:31-84.
11. Fernández-Sasia, R. 2006. *Psilocybe hispanica* Guzmán, un taxón novedoso en nuestro entorno. *Errotari* 3:73-76.
12. Furst, P. T. 1974. Hallucinogens in Precolumbian art. Pages 55-102 in M. E. King and R. Traylor Jr., eds., *Art and environment in Native America*. Texas Tech University Press, Lubbock, Texas.
13. Guzmán, G. 1978. Variation, distribution, ethnomycolological data and relationships of *Psilocybe aztecorum*, a Mexican hallucinogenic mushroom. *Mycologia* 70:385-396.
14. Guzmán, G. 2000. New species and new records of *Psilocybe* from Spain, the U.S.A. and Mexico, and a new case of poisoning by *P. barrerae*. *Documents Mycologiques* 29:41-52.
15. Guzmán, G. 2008. Hallucinogenic mushrooms in Mexico: An overview. *Economic Botany* 62:404-412.
16. Guzmán, G. and M. L. Castro. 2006. Observations on some known species of *Psilocybe* from Spain and description of a new species. *Boletín Sociedad Micológica de Madrid* 27:181-187.
17. Heim, R. 1957. Sur les *Psilocybes* hallucinatoires des Aztèques et sur le microendémisme des *Agarics* utilisés par les Indes du Mexique à des fins divinatoires. *Comptes Rendus des Séances de l'Académie de Sciences* 245:1761-1765.
18. Hernández, M. S. and B. Martí. 2000. El arte rupestre de la fachada mediterránea: Entre la tradición epipaleolítica y la expansión neolítica. *Zephyrus* 53-54:241-265.
19. Hernández-Pacheco, E. 1959. *Prehistoria del solar hispano*. Madrid. Real Academia de Ciencias Exactas, Físicas y Naturales, XX.
20. Letcher, A. 2006. *Shroom: A cultural history of the magic mushroom*. Faber and Faber, London.
21. Lewis-Williams, D. J. 2002. *The mind in the cave: Consciousness and the origins of art*. Thames & Hudson, London.
22. Lewis-Williams, D. J. and T. A. Dowson. 1988. Signs of the times: Entoptic phenomena in Upper Paleolithic art. *Current Anthropology* 29:201-245.
23. Martínez, R. and V. Villaverde. 2002. *La Cova dels Cavalls en el Barranc de la Valltorta: Monografías del Instituto de Arte Rupestre, 1*. Tírig, Spain: Museu de Valltorta.
24. Mateo, M. A. 2001. Arte Levantino adversus pintura esquemática: Puntos de encuentro y divergencias entre dos horizontes culturales de la prehistoria peninsular. *Quaderns de prehistoria i arqueologia de Castelló* 22:183-211.

25. Poyato, C., J. F. Ruiz, and R. Guillén. 2007. Investigación y puesta en valor del conjunto de arte rupestre de Villar del Humo, Cuenca. Pages 399-429 in J. M. Millán and C. Rodríguez, eds., *Arqueología de Castilla - La Mancha: I Jornadas*, Cuenca, 13-17 de diciembre de 2005. Cuenca, Spain: Ediciones de la Universidad de Castilla-La Mancha.
26. Ruck, C. A. P. 2006. *Sacred mushrooms of the goddess: The secrets of Eleusis*. Ronin Publishing, Inc., Oakland, California.
27. Ruck, C. A. P., B. D. Staples, and C. Heinrich. 2000. *Apples of Apollo: Pagan and Christian mysteries of the Eucharist*. Carolina Academic Press, Durham, North Carolina.
28. Ruck, C. A. P., M. A. Hoffman, and J. A. González Celdrán. 2009. *Mushrooms, myths and mithras*. City Lights Publisher, San Francisco.
29. Ruiz, J. F. 2006. *Las pinturas rupestres en la Serranía de Cuenca: Análisis, revisión y crítica del concepto de estilo en las manifestaciones plásticas postpaleolíticas*. Unpublished Ph.D. Thesis, UNED (Universidad Nacional de Educación a Distancia), Madrid.
30. Ruiz, J. F., M. Mas, A. Hernanz, M. W. Rowe, K. Steelman, and J. M. Gavira. 2006. First radiocarbon dating of oxalate crusts over Spanish prehistoric rock art. *INORA Newsletter* 46:1-5.
31. Ruiz, J. F., M. W. Rowe, A. Hernanz, J. M. Gavira, R. Viñas, A. Rubio, and C. Matamoros. 2009. Cronología del arte rupestre postpaleolítico y datación absoluta de pátinas de oxalato cálcico: Primeras experiencias en Castilla - La Mancha (2004-2007). Pages 303-316 in J. A. López and R. Martínez, eds., *El arte rupestre del arco mediterráneo de la Península Ibérica*. Museo de Bellas Artes San Pío, Valencia, Spain.
32. Samorini, G. 1992. The oldest representations of hallucinogenic mushrooms in the world (Sahara Desert, 9000-7000 B.P.). *Integration* 2(3):69-78.
33. Stevenson, A. C. 2000. The Holocene forest history of the Montes Universales, Tereul, Spain. *The Holocene* 10:603-610.
34. Torregrosa, P. and M. F. Galiana. 2001. El arte esquemático del Levante peninsular: Una aproximación a su dimensión temporal. *Millars* 24:183-198.
35. Turpin, S. A., ed. 1994. *Shamanism and rock art in North America*. Rock Art Foundation, San Antonio, Texas.
36. Wasson, R. G. and V. P. Wasson. 1957. *Mushrooms, Russia and history*. Pantheon Books, New York.
37. Zilhão, J. 2001. Radiocarbon evidence for maritime pioneer colonization at the origins of farming in west Mediterranean Europe. *Proceedings of the National Academy of Sciences* 98:14180-14185.