

Arts and sciences before science and art: facsimiles of ornamented caves

Arts et sciences d'avant la science et l'art : fac-similés de grottes ornées

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ABSTRACT. Art and science intersect in our distant past, that of the first artists of humanity. Even though it has traversed millennia to reach us, prehistoric art remains highly fragile. To ensure the preservation of decorated caves, they must be closed to the public and thus made invisible. How can this paradox be resolved? For about forty years, the success of replicas of decorated caves has proven that they are credible solutions. Through an iterative process between research and mediation, the replica feeds on scientific data and, in return, offers researchers food for thought about their practices.

RÉSUMÉ. Art et science se croisent dans notre plus lointain passé, celui des premiers artistes de l'humanité. Même s'il a traversé les millénaires pour parvenir jusqu'à nous, l'art préhistorique reste d'une grande fragilité. Pour assurer la conservation des grottes ornées, il faut les fermer au public et donc, les rendre invisibles. Comment résoudre ce paradoxe ? Depuis une quarantaine d'années, le succès des répliques de grottes ornées prouve qu'elles constituent des solutions crédibles. Grâce à un processus d'itération entre recherche et médiation, la réplique se nourrit des données scientifiques et en retour, offre au chercheur des éléments de réflexion sur ses pratiques.

KEYWORDS. Prehistory, origins, replica, prehistoric art, dissemination, myth.

MOTS-CLÉS. Préhistoire, origine, restitution, art premier, diffusion, mythe.

An old and fragile heritage

Prehistoric cave art was discovered at the end of the 19th century and officially recognized by the scientific community in 1902 [CAR 02]. Although they did not have dating techniques, the archaeologists of that time were aware of the extreme antiquity of this art, which spanned tens of millennia. One of the consequences was the deduction that these caves were "immortal" since they had survived such a vast expanse of time. It was only from the 1960s (following the problems at Lascaux due to excessive tourist visits) that researchers, and subsequently society as a whole, became aware of the fragility of this heritage, which is inherently unsuitable for mass tourism. Since then, it has been understood that to ensure the preservation of a cave, the stability of the underground climatic parameters must be maintained. The administration of the Ministry of Culture then took a radical measure : it was decided to close the majority of sites and to drastically reduce the number of visitors for the few caves that remained accessible. But then another question arises : how to respond to the legitimate frustration of citizens and to the prospects for local economic development?

Opened in 1983 (twenty years after the closure of Lascaux), Lascaux II was the first built replica. Its enormous success served as an example and others followed: Altamira (2003), Chauvet 2 (2015), Lascaux IV (2016), Cosquer Méditerranée (2022). The replica of parietal art has thus become the preferred medium for mediation in this field. For citizens, the replica has become a legitimate substitute for the original decorated cave.

The largest and most ambitious project that has been implemented today is Chauvet 2. This example in which we actively participated shows the crucial importance of a common base of scientific and artistic knowledge pre-existing the project: the replication could not have succeeded in its current form without the content provided by the research, nor could it have come to life without the mastery of gesture and materials brought by the hand of the artist, mastery acquired over years of practice and observation.

The Chauvet Cave, at the Mythological Origins of Art

Discovered in 1994 by three speleologists, Jean-Marie Chauvet, Eliette Brunel and Christian Hillaire, the Chauvet-Pont d'Arc cave is one of the major decorated caves of Prehistory. It offers multiple search fields. Its study by a multidisciplinary team began in 1998 and continues today. It is a slow process, due to the fact that access is very limited, both in terms of daily time and number of people present. The exceptional state of conservation of the site is explained by the sudden closure of the entrance, due to a partial collapse of the cliff in several stages which could be dated, the main one being around 29,000 years ago. The cavity then becomes inaccessible to large animals and humans; it is also protected from external climatic events and any other disruptive element.

The dating obtained on charcoal samples collected from the floors and walls show that the cavity experienced several human incursions between 38,000 and 30,000 years ago. Until now, the black drawings, made in charcoal, which have been dated, are placed at the beginning of these visits, making Chauvet one of the oldest decorated caves known in Europe and in the world [CLO 95].

More than five hundred animal and human figures, black, red or engraved, as well as hundreds of geometric signs, handprints, torch burns and various traces are recorded on the site [CLO 01]. On the clay soils, footprints and traces of lit fireplaces are preserved directly against the walls. Animals have also left abundant traces, such as hundreds of footprints of wolves, ibexes and especially cave bears. The latter hibernated in the cavity for generations, leaving thousands of bones everywhere on the ground. During their underground stays, the bears rubbed against the walls and tore ornate panels with their claws. On several occasions, humans returned after the bears had passed, superimposing new drawings on the ursine tracks. This occupation of the underground space alternately by humans and large carnivores makes the Chauvet cave a unique site in the world for analyzing their complex interactions.

Another originality: three species, usually very rare in cave art, dominate the cave bestiary at Chauvet: the woolly rhinoceros, the mammoth and the cave lion, the latter seeming to play a central role. On at least three occasions, big cats are represented in troops, chasing rhinoceroses or horses. The most explicit scene shows nine felines chasing a herd of fleeing bison. On a rock facing the Lions fresco, an enigmatic hybrid creature is drawn: it has the pelvis, vulva and legs of a woman but its head is replaced by those of a bison and a lion (Fig. 1).

How to interpret these images? Aurignacian hunters had to kill to live and ensure the perpetuation of their species at the expense of others. It seems that the artists wanted to stage in a secret place, deep in the cave, the two fundamental principles of the human condition: the announced death, symbolized by the hunting of lions, and the life in gestation, evoked by the feminine image, centered on the sexual and reproductive function. This oppositional structure suggests a discourse in the form of mediation, like the episodes of a death/life cycle, eternally renewed [GOD 13]. Beyond the story in images, it is a fragment of myth, one of the oldest of humanity, which is told before our eyes [FRI 15].

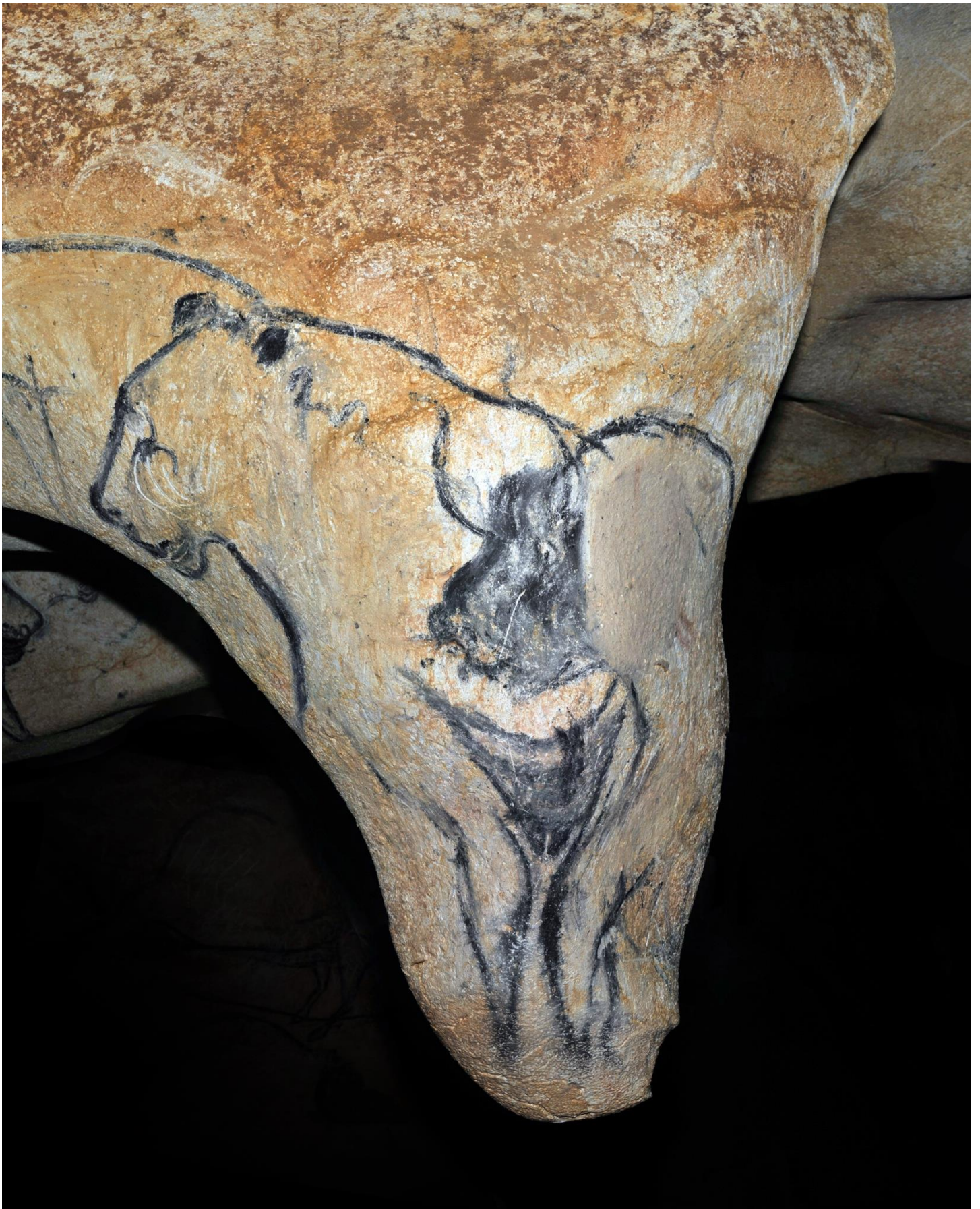


Figure 1. Chauvet-Pont d'Arc Cave (Ardèche)

The “Pendant of the Venus” bears a composite figure formed of two animal heads (bison and cave lion) on a female body showing legs, pelvis and vulva. (Photo C. Fritz/Chauvet team/CNRS/MC)

In 1995, barely a year after the discovery, the idea was born to build a replica located in Ardèche, as close as possible to the original cave. However, the final project could only see the light of day in 2008 after the launch of a call for tenders. The construction of a new complex comprising five buildings on fifteen hectares of the Razal plateau, in the municipality of Vallon Pont-d'Arc in Ardèche, began in 2011. The replica constitutes the heart of this system [GEN 17].

The initial concept was to present the cave art in its context, as it appears in the cave today. Faced with the impossibility of reproducing everything due to the size of the floor space (8,400 m2) and volumes (44,000 m3), choices had to be made. After numerous adjustments, both financial and technical, twenty-two decorated panels, or approximately 300 figures, distributed throughout the cavity, were selected to represent the richness and diversity of the parietal works and pictorial techniques.

Inventing new working methods

When work began at the end of 2011, no method for producing such facsimiles was defined within the project team. It was a real challenge: the team had to both invent new technical processes and implement them within a tight schedule. Coordination between the different actors was critical for a smooth progress and evolution of the project, because the inauguration date was already set to April 2015. The first stage was devoted to producing prototypes meant to test the materials and to define the different stages of the work [TOS 12].

Most of the volumes of the cavity were built on site: the walls, vaults and floors forming the geological envelope are modeled by teams of sculptors under the control of a scientific committee, the objective being to faithfully reproduce the very large diversity of appearance and texture of these different elements. A guidebook of geological features observable in the Chauvet cave was designed by researchers from the scientific team [DEL 13] to guide the work of the visual artists and craftsmen on the site (Fig. 2).

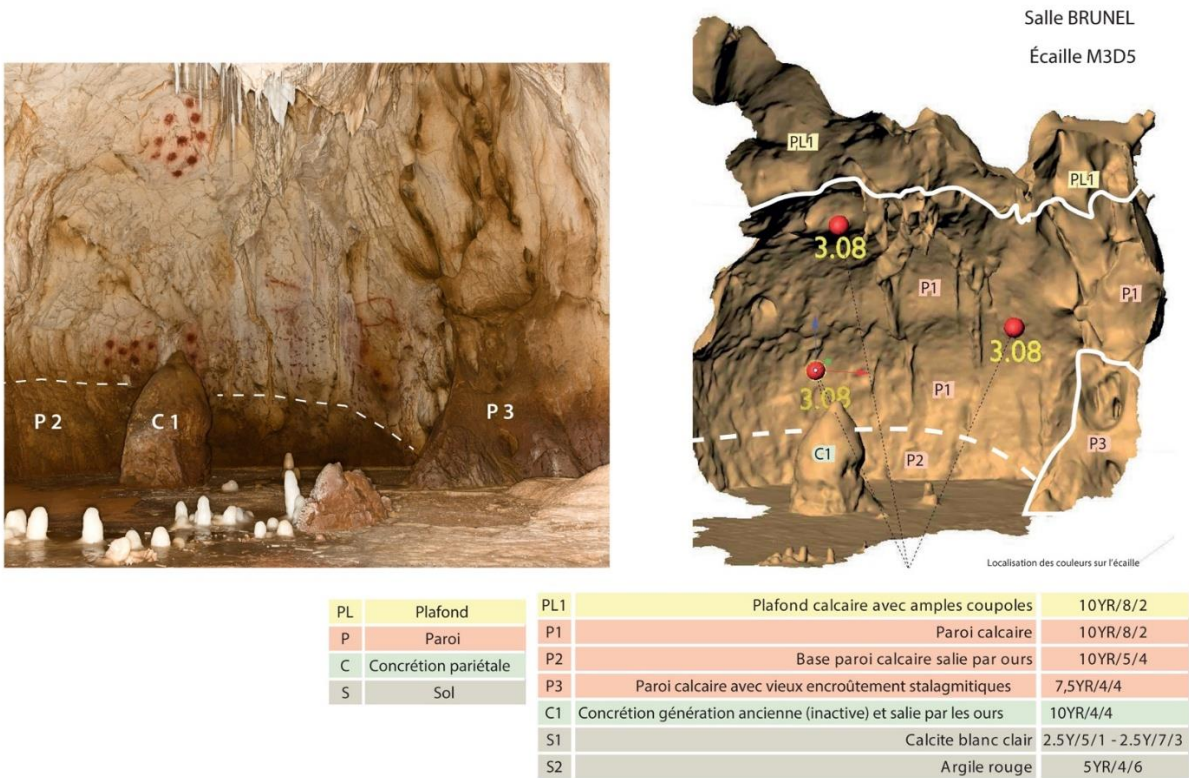


Figure 2. Chauvet-Pont d'Arc Cave (Ardèche), Guidebook of geological features specially developed for the creation of Chauvet 2 (photo JJ Delannoy/EDYTEM).

Far from the construction site, the cave art panels are made in the Gilles Tosello and Déco-Diffusion workshops in Toulouse, and Arc et Os in Montignac. Once completed, they are transported to the replica site for installation. Their precise insertion into the walls being built was anticipated by “reservations” calculated using the 3D model of the cave (Fig. 3).



Figure 3. *Insertion of the decorated panels on the Chauvet 2 replica construction site (photo C. Fritz)*

In the range of techniques used for both research and replication, 3D technology occupies a central place. Indeed, only a three-dimensional recording of underground spaces can account for the complexity of the natural volumes of the cave. Carried out under the aegis of the Ministry of Culture, a 3D survey by laser scanner was coupled with global photographic coverage allowing the correlation of high-resolution images on the 3D model. In recent years, even more efficient 3D techniques, such as photogrammetry and photometry, have provided images for analysis by researchers from the different disciplines composing the scientific team (cave art, paleontology, ichnology, geoarchaeology, etc.).

In the replica, 3D data allowed the scenographers to recompose the natural spaces to place them as accurately as possible in the new structure. In the original Chauvet cave, the visitor follows a linear path from the entrance to the bottom and must then return by the same path; in Chauvet 2, it was necessary to create a continuous route to lead the visitor towards the exit, without making them retrace their steps. On the 3,000 m², or a third of the original surface, the spaces are therefore compacted: the distances between the decorated panels are reduced. They nevertheless respect the general topology: the panels follow the order and orientation of their original location in the cave (Fig. 4).

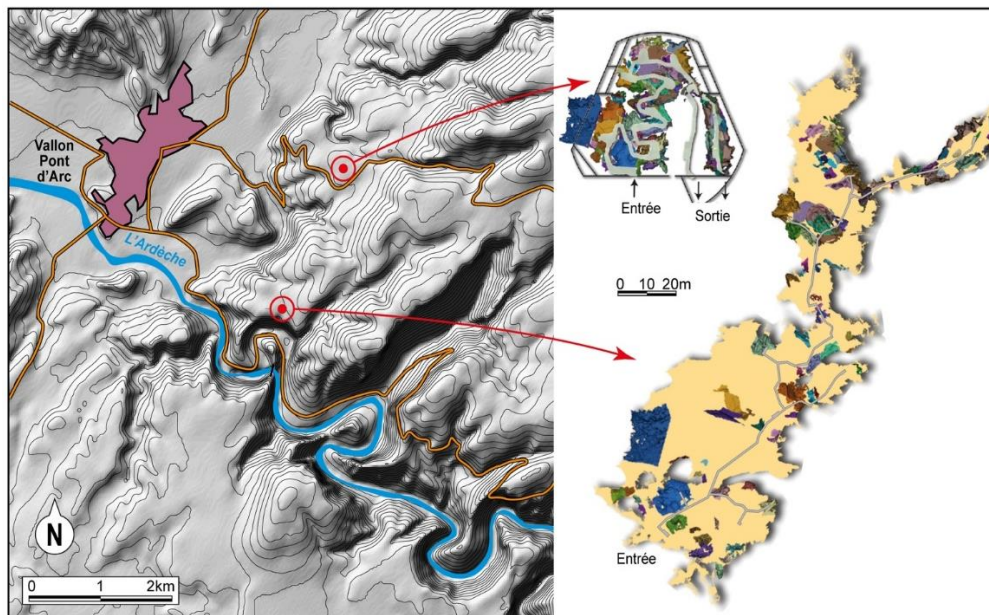


Figure 4. A (left). location of the Chauvet cave and the Chauvet 2 replica. B (top). plan of the replica C (right). plan of the Chauvet cave (doc. JJ Delannoy/EDYTEM)

To better understand in order to better interpret

Thanks to the 3D file of the panel, the first step of the work in the workshop consists of generating a rough outline of the reliefs in natural size using a digital milling machine which will model a block of high density foam with a pre-determined precision of two to four millimeters.

From this modeled block, a mold is made, followed by a drawing which makes it possible to construct a resin shell a few centimeters thick. When the panel exceeds a surface area of two to three square meters, it must be cut into several “scales” which are then connected before being split again at the end of the work. All these technical phases have one essential goal: to limit the total weight of the of each panel of the the facsimile at the end of the process in order to be able to handle the “scales” and to bring them to the replica site in Vallon-Pont d'Arc (Fig. 5).

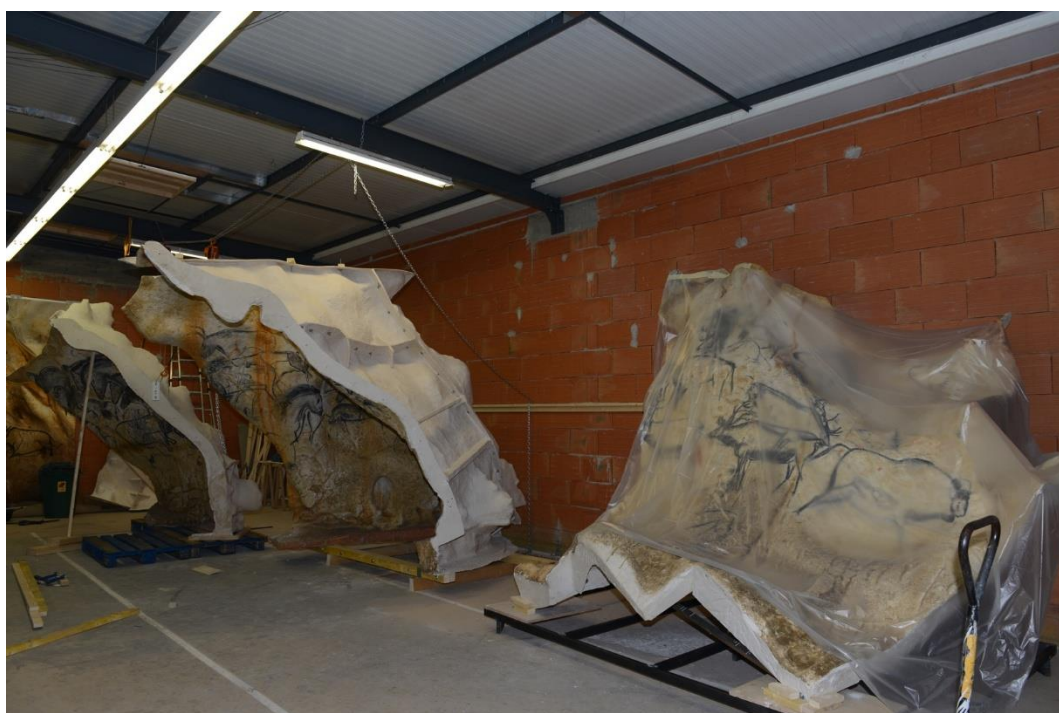


Figure 5. Dismantling of the decorated panels at the Toulouse studio before their transport to the Chauvet 2 replica construction site (photo C. Fritz)

The last phase of the work in the workshop is the longest and most complex. The artists must project the image of the 3D file of the panel decorated with high resolution textured photos in high resolution onto the blank shell by using a video projector. A first visual examination will allow a very fine manual modeling of the reliefs, cracks, hollows, and surface conditions (smooth or rough) before moving on to coloring these geological elements. In theory, the cave works come at the end; in practice, the modeling, the coloring of the wall and the drawings are carried out during the same phase because the paintings and engravings of Chauvet are linked to their rocky support in a very intimate way. In fact, the artists drew with charcoal or engraved on soft limestone surfaces covered with clay, rubbing or mixing with their fingertips. For the artists working on the replica, this involves working in the studio with materials that are still fresh, in order to reproduce the spontaneity of the gestures, their fluidity, the marks they left. The unique features of each wall stimulated the creativity of several cave artists, leading them to develop gestures and techniques that contribute to the expression of the “Chauvet style” (Fig. 6). The analysis of this style, as well as the very possibility of reproducing it while respecting as much as possible the ways of doing of the original artists, involve a wide body of knowledge located at the intersection of sciences and the arts.

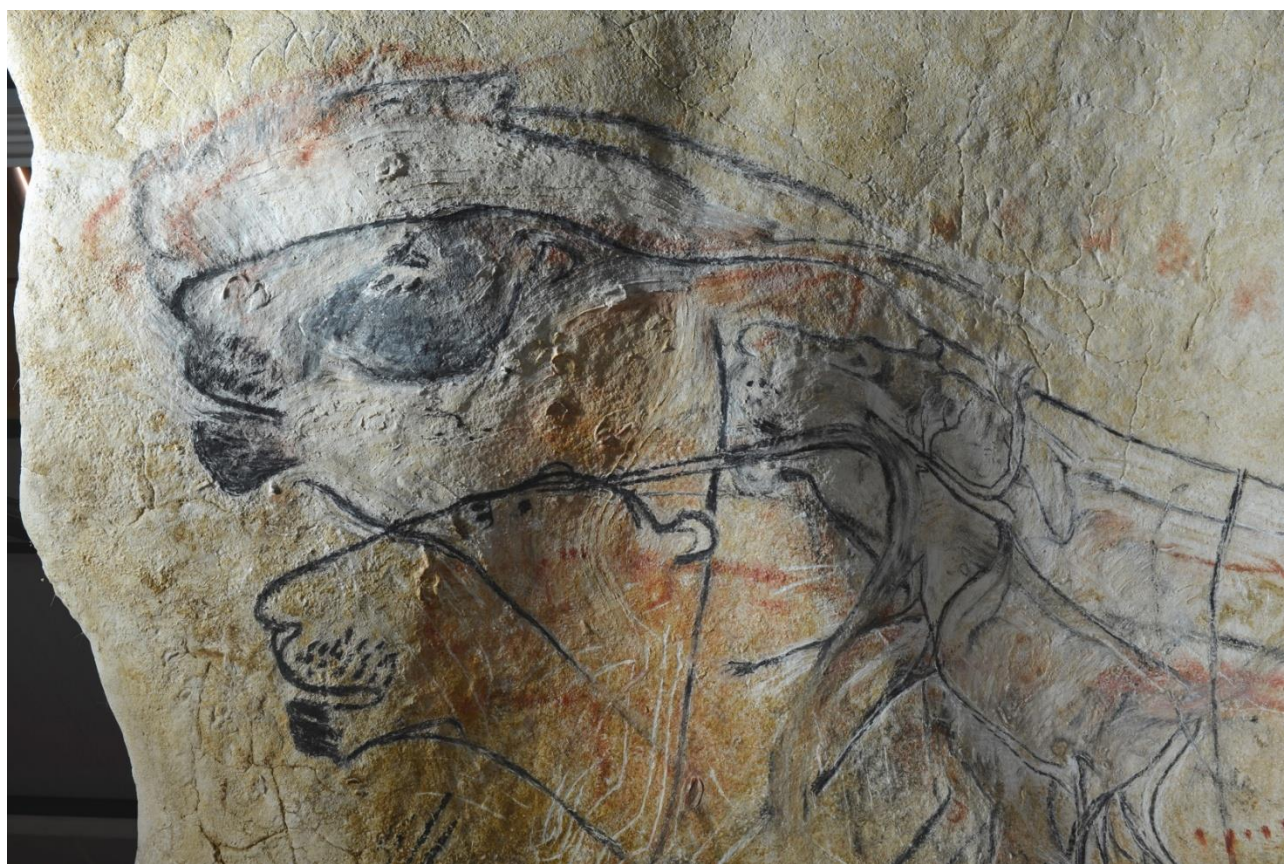


Figure 6. The Chauvet artists smoothed the loose wall and mixed their pigments with their fingertips as shown by the grazing lighting on this panel of the replica, currently being produced in the Toulouse workshop (photo C. Fritz).

The knowledge gained over years of research and experimentation helped us choose the materials for the facsimiles. The basic material used for the walls is an acrylic resin, a two-component synthetic “plaster”. Very flexible, liquid or pasty, it lends itself both to modeling and to the application of colors, obtained by diluting natural mineral powder pigments: red ochre, yellow ochre, Sienna, burnt umber... The red pigment is made up of hematite powder, an iron oxide with the same composition as the prehistoric dye.

Burned branches of Scots pine (*pinus sylvestris*) were used to reproduce the black drawings; it is the same kind of tree as the one that was used for the coals found in Chauvet. Once carbonized, the carbonized fragments are directly used as charcoal sticks. (Fig. 7).



Figure 7. Two states of the Panel of Lions being produced in the Toulouse workshop (photo C. Fritz).

3D technology is essential at each stage of the work but it cannot answer all the questions that arise as the facsimile takes shape. Before being able to reproduce the gestures of prehistoric artists, it is necessary to have understood them. Replicating an decorated panel consists in a certain way of studying it, the objective being not to produce a scientific publication, but a life-size restitution whose accuracy relies as much on the precision of the data required for the creation of the supports than on the understanding of the gestures of the paleolithic artist and of the way in which it informs the painted or sculpted material.

Before starting a new panel, our first task consists in identifying the main subjects and the traces and scratches left by various animals, to locate them in the photos and on the 3D projection. This phase also makes it possible to establish a chronology thanks to superpositions: if one line intersects with another and cut it, then it is more recent. It is essential at this stage to note the unique details linked to manual production: direction of execution, tool slippage, trace rework, etc.

An artwork emerging from an Art – Science collaboration

Each decorated panel presents its artistic or geological particularities. Replica work requires a keen sense of observation, supported by an advanced artistic culture, and by the dose of imagination required to create the illusion of reality. It is based on a combination of different artistic disciplines (painting, sculpture, modeling) and scientific expertise. This dual professional skill acquired over the years is essential to control both the documentary sources and the progressive progress of the work, which must be done in a meticulous manner: the facsimile of prehistoric art is a long-term task. It took more than two years for the Toulouse and Montignac teams to produce the 220 m² of wall art surfaces, divided into 22 panels whose area varies from one to fifteen m², with large disparities in time and number of people : depending on the panels, two to eight plastic artists were simultaneously needed.

An fruitful an unexpected encounter between the most advanced computer technologies and artistic practices from the depths of time, the result of a dialogue between abstract digital information and the physical constraints imposed by matter and substances, Chauvet 2 emerges at the end of the process as a work of art in the true sense of the term. A work which owes its final appearance to multiple authors, who can broadly be grouped into three categories: researchers, Paleolithic artists and contemporary artists, whose know-how and dedication to the work constitute a true tribute to their predecessors. Its status goes well beyond that of a simple replica: at the crossroads of arts, sciences and prehistory, it multiplies its layers of meaning and reading to open to us, through more than thirty millennia, a window into the imagination and the vision of the world of our very distant ancestors.

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