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ROMAN WINDOW GLASS: AN APPROACH TO ITS STUDY THROUGH ICONOGRAPHY

VIDRIO ROMANO DE VENTANA: UNA APROXIMACIÓN A SU ESTUDIO A TRAVÉS DE LA ICONOGRAFÍA

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Abstract

Despite the fact that iconographic studies are recognized as an important tool for understanding antiquity, there are few references of Roman window glass among scholars in this field. This paper, which analyses images in reliefs, mosaics and wall paintings, shows how representations of window glass are more common than hitherto argued. The data from these analyses provides important information about the chronology, use and availability of this type of material, adding to the small body of knowledge regarding an object little understood in scholarly circles, even though windows are believed to be one of the most widespread applications of glass in the Roman era.

Key words. Roman window glass; Roman glass; Roman art; Roman architecture; iconography.

Resumen

A pesar de que los estudios iconográficos son considerados una herramienta importante para el conocimiento del pasado, existen escasas alusiones en relación con el vidrio romano de ventana en las publicaciones referentes a esta temática. En este artículo, en el cual se procede al análisis de imágenes en relieves, mosaicos y pinturas murales, se demuestra cómo las representaciones de vidrio de ventana de época romana son más frecuentes de lo expuesto hasta el momento. Los datos arrojados por este análisis han proporcionado una importante información sobre la cronología, el uso y la instalación de este tipo de material, permitiendo indagar más sobre un objeto poco conocido entre los investigadores y que ha sido considerado como una de las grandes aplicaciones de este material durante el periodo romano.

Palabras clave. Vidrio romano de ventana; vidrio romano; arte romano; arquitectura romana; iconografía.



1. INTRODUCTION¹

Beginning in the first century AD, the number of representations of glass objects in Roman art grew notably. This was not merely coincidental and was to a large extent due to the standardization of this material thanks to advances in manufacturing technology with the invention of glass blowing in the mid-first century BC (Vigil, 1969: 85; Stern, 1999). The precision of detail in many of the implements represented indicates that Roman society was quite knowledgeable about this material and, specifically, that artists were familiar with these objects (Ortiz Palomar, 2001b: 64). Indeed, there is archaeological documentation for many of these pieces, although for a small number of the glass objects represented there is no documentary corroboration, possibly because they sprang from the artists' imaginations or simply because no example of the objects has been found as of yet (Naumann-Steckner, 1991: 87-88). However, the main problem lies in identifying whether many of these depictions represent glass containers or, on the contrary, objects made of some different material. In those cases where the object does not emit a sense of transparency—a clear indicator of glass—it cannot be reliably identified by its form alone, since the same shapes can also be reproduced in pottery or metal (Naumann-Steckner, 1991; Stern, 2004: 37).

Between references to this subject in studies of Roman glass, there is a glass typology that there are no mentions: window glass (Naumann-Steckner, 1991; Sabrié & Sabrié, 1992). Foy and Fontaine, in their studies about this kind of glass, argue that the oldest representation of window glass is found in an image in a fourth-century AD wall painting that shows Samson being pursued by the Philistines in the catacombs of the Via Latina in Rome (Foy & Fontaine, 2008: 437). This indication was done due to they believe that 'only the presence of blue in paintings or mosaics truly reflects the representation of translucent or transparent glass' (Foy & Fontaine, 2008: 437). Certainly, the bluish-green colour is a characteristic common to this type of glass. These hues are known as natural glass colour and they are caused by the presence of iron oxides into the glass raw materials (vitrified sands) as impurities (Price & Cottam, 1998: 15).

This study focuses on the window glass due to the limited knowledge that, in general, there is about these materials. Nevertheless, we have to note that it was not the only one used to covering window openings during the Roman period. Organic materials, like parchment, antlers, animal bladders, etc., were used to cover little spaces as the classical sources mentioned (Martial,

Epigr. XIV, 61-62; Plauto, *Amphitruo* 1, 340). The plant fibers were also used for the production of mats (Forbes, 1966: 184). However, among organic materials, wood was the most used for the manufacture of shutters, which were fixed on one or more lateral axes (Chipiez, 1877-1919: 1038), as evidenced the numerous remains documented in the cities of the Vesuvian area.

Most of these elements were commonly used in houses and architectures due to their lower cost and their easy manufacture (Forbes, 1966: 184-185; Foy & Fontaine, 2008). Nevertheless, people needed to remove them to obtain a correct illumination of internal spaces and most of them were not appropriated to cover big openings (Foy & Fontaine, 2008: 444). On the other hand, there were other mineral constituents that, as well as glass, allowed the input light through them, such as marbles, alabaster, muscovites, etc. (Forbes, 1966: 184; Fuentes, 2001: 138; Foy & Fontaine, 2008: 444). Due to its physicochemical characteristics, specular gypsum or *lapis specularis* became one of the most important minerals with this utility and was a real alternative to glass (Bernárdez Gómez & Guisado di Monti, 2004). However, glass ended up relegating to the background to this class of materials possibly for economic and manufacturing reasons (Fuentes, 2001: 139).

These translucent materials were used for allowing natural lighting of internal spaces and avoiding the bad weather but, since they were more expensive, they also provided beauty and prestige to the architectures in which they were installed (Vipard, 2009: 9).

Finally, most of windows outside and at accessible heights were covered by bars or shutters (*clathri*) to prevent the theft. These elements were done with both geometric and plant designs and were carried out in several types of material: wood, bronze, iron, stone or terracotta (Adam, 1996: 333). Some findings would indicate that both systems, glass panes preceded by protection bars, were used in some buildings in the ancient city of Zeugma (Fontaine & Foy, 2005: note 40).

The analysis of the possible representations of window glass in different iconographic sources in this paper was done via an exhaustive review of those images that, because of their size and subject matter, may contain this type of object in their composition. Although no less important, images in which it is not possible—because of their size—to distinguish the characteristic elements needed to correctly identify panes of glass in openings are not included. These comprise numismatic objects and images, whether bas-reliefs or paintings, that decorate small artefacts. Moreover, because of the large number of iconographic examples, it is possible of course that this study does not cover every extant sample. In that case, it is hoped that the guidelines established here can be used to detect this type of material in representations that have not been consulted.

1. We would like to thank Dr Manuel García-Heras (Institute of History, CSIC, Madrid) and Prof. Margarita Orfila Pons (Department of Prehistory and Archaeology, University of Granada) for their amendments and suggestions.

Despite of the blue-green colour of these glasses have been the most important premise to identify window glass in this work, we can not discount that our references could be other minerals used like glass in windows.

The results of this study have allowed us to know more about the use, disposal and importance of this kind of material in the architecture of the Roman period, which, unfortunately, nowadays only few remains, most of them in the Vesubian area, are preserved to investigate these issues.

2. RELIEFS AND BAS-RELIEFS

In the iconographic study of Roman window glass sculptural reliefs and bas-reliefs offer fewer examples or expressions of interest. This is primarily due to one factor: the loss of the polychromic layer that provides the data needed to clearly distinguish one material from another (Bradley, 2009). The information may

be lost because of exposure to environmental agents during the operational lifetime of the object or to the conditions under which it was abandoned, buried and subsequently discovered.

The absence of pigmentation poses a challenge when identifying representations of glass objects in general. Given that, as noted above, most archaeologically documented types of glass are copies of models made from other materials, it is difficult to discern the material being portrayed in representations of objects. For these reasons, the analysis of reliefs and bas-reliefs in this study focuses on identifying installation systems of glass panels in openings of architectures that could indicate the representation in those of window glasses. Examples of this approach include the use of window and other frames in a Christian sarcophagus discussed by Charles Chipiez (1877-1919: 1039), and some frames identified in mosaic work, which will be analysed below in greater detail. Furthermore, most of the constructions represented in reliefs and bas-reliefs are found in the background of a scene or appear as



Figure 1: Trajan's column and details of some windows, which are represented on it (Photo: A. Velo-Gala).

secondary elements and, as a result, the detail lacks precision. The openings in these types of constructions usually appear as mere empty spaces, with the exception of some cases where they are divided into sections, possibly simulating frames holding panes of glass (Chipiez, 1877-1919: 1038) or other locking systems such as bars or latticework.

The primary examples of representations of openings and coverings in Roman art are found in historical and allegorical reliefs, where the representation of architectures plays an important role in scenes and backgrounds. One of the best examples of Roman relief work is Trajan's Column, a renowned monument built between AD 110 and 113 (Coarelli, 1999: 144). Representations of constructions appear frequently in the column's bas-reliefs and are more or less prominent in a scene according to their importance in the story (Fig. 1). Generally speaking, openings are represented by quadrangular or arched openings without any outstanding elements except for a projecting border or frame around the circumference. Some of the more elaborate examples depict a frame that divides the space into vertical lines that could hold sheets of glass, although because of the lack of colour, they could also simply be protective bars. The representation of one opening in a building, perhaps a temple of some sort, includes a complex network of slats that seems to correspond to a *clathrus* or lattice, another type of covering used with this kind of space.

In contrast to Trajan's Column, in the reliefs that decorate the Column of Marcus Aurelius –erected after the death of the emperor, possibly in AD 180 and modelled on Trajan's Column (Beckmann, 2011)– the images are more distant in the scenes and the carving is deeper. This makes it easier to study the figures, heightening their importance in the composition. In this case, the constructions are of secondary importance and are not visually significant in the story, with fewer representations than on Trajan's Column. However, the window openings found on both structures are similar.

The reliefs that decorate the honorific arches in Rome, e.g. the Arch of Titus, Arch of Septimius Severus and Arch of Constantine, and the Arch of Galerius in Thessaloniki (Kleiner, 1992) offer little information with regard to window representations, since scenes of people, especially emperors, take priority over other aspects. On some neutral occasions, the backgrounds include structures or some other architectural element, but representations of openings are limited or simple in design. Roman reliefs with a port theme also often contain the representation of structures as we can see in a relief from the Torlonia collection that depicts ships arriving at a port (Rostovtzeff, 1937) and an illustration of what has been identified as the north façade of the Lighthouse of Alexandria on a glass vessel from the famous Begram findings (Afghanistan) (Quet, 1984). However, as with the above examples, the openings in these constructions are simply represented as holes in the walls.

3. MOSAICS

With regard to the study of glass and its representation in mosaics, most research has focused on the presence –which increases beginning in the second century AD– of moveable objects like vessels, cups and other types of glass containers, usually as secondary details in banquets or domestic scenes (Ortiz Palomar, 2001b: 64-65). However, as with the reliefs, the correct interpretation of these objects as glass artefacts is problematic. Generally speaking, these types of objects appear in the background and are small, and the sense of transparency through the representation of their contents is more limited and less common than that found in wall paintings. The analysis of window glass in Roman mosaics in this study focuses on mosaics that contain some type of building, such as villas in rural landscapes, port facilities or domestic or mythological scenes with structures in the background. The problems here are similar to those of glass recipients and, except in a few cases, it is difficult to identify a translucent covering over the openings.

A large number of the Roman mosaics with representations of villas come from North Africa and were created during the Late Empire. These constructions usually form part of the composition and either play an important role in it or are integrated into the surrounding area, which also features people and objects involved in rural activities (Neira, 1999: 174). There are doubts about whether the villas in these mosaics reproduce real architectural models from the area (Neira, 1999: 175), and based on a visual examination of the works, it is only possible to affirm that the structures follow a similar pattern or design presented on a plane without perspective. The most prominent features of these buildings are their towers, which flank an enclosure, usually walled, in which some rooms stand out against the surrounding area (Neira, 1999: 175). All of these images represent a large number of openings, both entryways and windows, in the buildings.

However, it is difficult to establish whether the artist intended to reflect the existence of sheets of glass as a closing system for these openings, most of which are subdivided by frames. This is because, in many cases, the artist chose to use dark tiles for these spaces instead of bluish-green ones which, as noted above, predominate in the representation of window panes. For this reason, the existence of frames in the representations of openings is not always indicative of a closure using glass panes, since they could simply represent other types of security closures like grilles or latticework (Foy & Fontaine, 2008: 428, 437).

Ch. Chipiez mentioned, in one of his studies, that sheets of glass were represented in a North African mosaic because there was a semi-circular opening with a radiating frame in the upper part of the door (Chipiez, 1877-1919: 1039). A review of the mosaics in North Africa shows that the case described by Chipiez is that of the Mosaic of *Dominus Iulius*. This

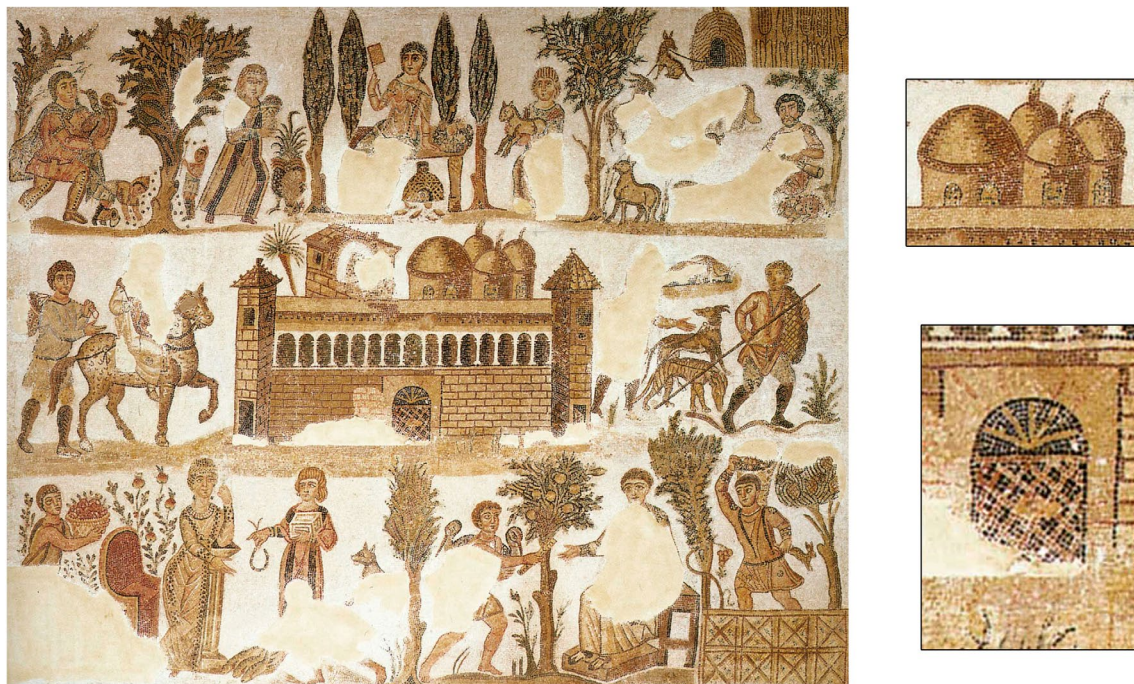


Figure 2: Mosaic of *Dominus Iulius*. Photo of the building and details (Photo: The National Bardo Museum).

mosaic, found in Carthage and dating from between AD 380 and 400 (Dunbabin, 1978: 62), is currently being held at the Bardo National Museum in Tunisia.

The villa represented in the work is in the middle of a scene that plays out on three planes where a series of figures, most prominently the *dominus*, engage in rural agricultural work and leisure activities. As the image shows (Fig. 2), the interior enclosure is reached through a double door topped by an arch, whose space is covered with a radiating arrangement of slats, a solution much like the one used today in many openings with similar characteristics. According to Ch. Chipiez It is possible that these openings were covered with sheets of glass, since the cut of glass sheets was possible for its adaptation to any type of space (Allen, 2002: 106), but no triangular panes that would fit the openings in this type of frame have been documented. The other windows in the mosaic use the system of a frame divided into sections, a type repeated in most of the openings represented in this category of mosaic.

There may be that these frames are the representation of other security systems that it could have been or not complemented with translucent material sheets because, in archaeological contexts, window glasses has been found specially in private architectures associated with openings in higher floors or willing to other open spaces of the house protected by walls or difficult access (Adam, 1996: 333).

Similar examples can be found in the buildings represented in three polychrome mosaics found in a villa in Tabarka, Tunisia, dating back to the fourth to fifth centuries AD (Dunbabin, 1978) (Fig. 3). All are apsidal in shape, following the arrangement of

the floors in the rooms they decorated, and the villa, the central element in the composition, is surrounded by images of plants, animals and crops. As with the other examples, most of the window openings in the three representations contain frames divided into four sections.

The solution used for window openings in other mosaics with a similar rural theme is more schematic, with the artist representing these elements with only dark quadrangular or arched shapes that have an exterior frame or profile in the most elaborate cases. Examples of this type of representation include the mosaic from the House of the Laberii in Uthina (Tunisia), created between AD 160 and 180 (Blázquez, 1996), which depicts a ploughing scene below a simplified image of a building or villa, and the Byzantine Madaba mosaic (6th c. AD), which represents a map of Palestine (Piccirillo, 1989). However, the most impressive example of a mosaic with a rural theme is the fragment from the first half of the second century AD from El Alia (Tunisia), which also depicts agricultural work (Charles-Picard, 1990). Alongside one of the figures sits a building with two windows on the second floor. The bluish-green colour of the tiles that fill the spaces in the compartmentalized frames in openings situated in a higher area less accessible are different from the models upper seen and clearly would allude to the presence of glass panes (Fig. 4).

We can find a similar sample of the mosaic of El Alia in a mosaic, which is decorating the dome of the room VII in the monument of Centcelles (Constantí-Tarragona, Spain). This building has been dated final four to beginning five century AD (Remolà & Pérez, 2013).

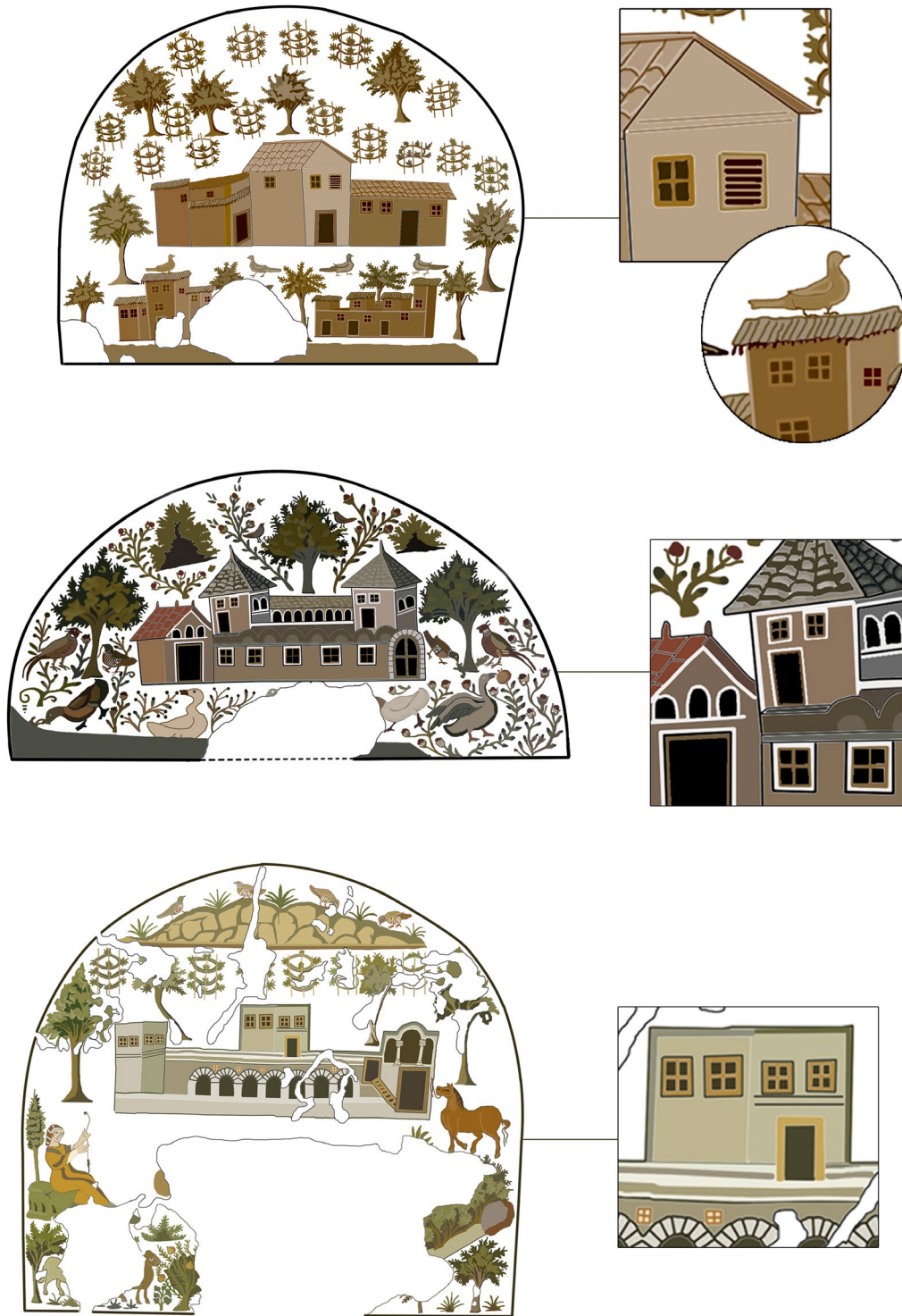


Figure 3: Mosaics of Tabarca. Illustration of the mosaics and windows details (Photo: A. Velo-Gala).

Besides the discussion of the decorative programme of the dome, our interest is focused in building representations in it. One of them (Fig. 5) shows windows with similar colours as the previous example, which would indicate window panel representations.

One final mosaic with similar characteristics is in the form of a fragment held at the Toledo Museum of Art that may be from a floor mosaic from Ostia and dates back to the third to fourth centuries AD

(Pevnick, 2014). The piece depicts two figures making a sacrifice in the centre while three others engage in activities related to fishing. The image features a number of structures whose openings –particularly the bigger ones– contain large compartmentalized frames with bluish tiles in them. Here it is also possible to argue that the artist wanted to represent sheets of glass in these spaces (Fig. 6). These large windows covered with glass panels are well known



Figure 4: Illustration mosaic of El Alia (Photo: A. Velo-Gala).



Figure 5: Illustration of the detail of the mosaic of Centcelles (Photo: A. Velo-Gala).

in the Roman times at this period. One of the best examples is the Constantine's basilica in Treveris (Germany), in which we can see a modern reconstruction with large windows cover by glass panels simulating

how it was in Roman times (Fontaine & Foy, 2005: 18).

Representations of port facilities and the constructions in them, which can also be found in mosaics



Figure 6: Illustration mosaic from Ostia, Toledo Museum of Art (Photo: A. Velo-Gala).

containing marine landscapes, also provide interesting data for the study of Roman window glass. This type of mosaic, which had a strong Hellenistic and Alexandrine influence, emerged sometime around the third to second centuries BC and quickly spread around the Mediterranean (Noguera, 1995-1996: 220). These pieces depict buildings associated with large port facilities, nearby towns that connect to small anchorages, and maritime villas (Noguera, 1995-1996: 227-228). The possibility of identifying the ports in the mosaics has aroused the interest of many scholars, as the images could represent Carthage, Puteoli or Alexandria (Noguera, 1995-1996: 222). However, as with the villas, the use of iconographic models and standardized cardboards has complicated this task (Salido & Neira, 2014: 202).

In mosaics of this type, the structures appear on the different planes that comprise the composition, either alternating with other elements without any apparent order or occupying spaces that indicate some interest on the part of the artist in differentiating the maritime scenes from the terrestrial ones. Most of these representations are small, with poor definition and the window openings are only represented by quadrangular or

arched shapes without any distinctive element or are subdivided by the presence of some type of frame, as in some of the villa images. A prime example of this type is the Vega Baja de Toledo (Spain) mosaic from the third to fourth century AD, which shows several port facilities interspersed with scenes of fishing and marine animals within an octagonal design that corresponds to its role as a fountain base (Blázquez, 1982: 33-36).

The late third or early fourth century AD mosaic known as the Triumph of Venus from Cuicul, in Djemila (Algeria), specifically from room XI of the House of the Donkey (Blanchard-Lemée, 1975: 78, 79, Pl. X), contains a building with a series of compartmentalized window openings that differ from the previous examples (Fig. 7). The piece incorporates the image of an islet on the outer border encircling the main scene of Venus bathing in which a series of buildings stand out. These buildings have been identified as part of a private residence, a maritime villa in this case, thanks to the curtains that decorate the intercolumniations (Blanchard-Lemée, 1975: 78, 79, Pl. X). Next to these spaces are two large arched window openings where, as above, the space is compartmentalized by a series of



Figure 7: Illustration of the villa, which is represented in the mosaic Venus' triumph Cuicul (Djemila) (Photo: A. Velo-Gala).

frames. The main difference with respect to the earlier examples lies in the colour chosen for these sections, as the artist here opted to use clear tiles. This could be interpreted as a random taste-based choice made to balance the composition chromatically, since the bottom of the image contains a series of dark tiles. However, it is more likely that the intention was to represent sheets of glass or some other translucent material with similar characteristics.

Equally important, because of the diversity of structures and constructions reproduced, is a mosaic from the ancient city of Hippo Regius, today the modern city of Annaba (Algeria), built between AD 210 and 260. This example constitutes the floor of a room belonging to a maritime villa known as the House of Isguntus or the villa Facing the Sea. The mosaic is currently in three sections, of which only one is *in situ*; the other two are held by the Archaeological Museum in Annaba (Boulinguez & Napoli, 2008: 703). One of the sections in the museum, known as the View of Hippone, was studied in 2008 by Corinne Boulinguez and Joëlle Napoli, who wanted to corroborate that the port in the image represents the ancient city of Hippo Regius, whose existence has been confirmed by classical literary sources. Several of the elements indicate that the image depicts a port landscape: a triton – a mythological figure often used in antiquity to symbolize the Lighthouse of Alexandria – blowing into a shell; a triumphal monument dedicated to Neptune, found in many port representations; and a building in the lower corner interpreted as a dock because of the columns on the lower level (Boulinguez & Napoli, 2008: 707-709).

The two structures in the middle of the image contain several openings that differ from the other elements of this type in other buildings in the group (Fig. 8). The building in the upper middle has been

identified as a possible *horreum* according to its characteristics, a comparison with archaeological and iconographic evidence about this type of building, and descriptions found in classical literary sources. These buildings all have thick lateral buttresses and a critical ventilation system that insulates the grain or other stored product from subsoil and ambient humidity and temperatures (Boulinguez & Napoli, 2008: 719-720). The upper part of the construction seems to represent a dressed stone used to reinforce the wall, something common in warehouses on the coast, as evinced by the remains at Leptis Magna (Tripolitania) (Boulinguez & Napoli, 2008:722; Salido & Neira, 2014: 209). However, the image could also represent frames with sheets since, as with the Triumph of Venus mosaic, the clear tiles seem to allude to the existence of some type of covering or protection and colours are different of those that represented the rest of the wall. This type of covering may have been used in the windows of some Roman *horrea*, as it was in some thermal baths, where this type of material is commonly found due to its important function keeping a good temperature and illumination in hot rooms. Classical authors, like Varro (Varro, *De Re Rustica* 1, 57,3) or Pliny The Elder (Pliny, *Nat. Hist.*, 18, 73), mention that openings should be installed in external walls of granaries as well as the importance of avoiding the humidity in internal spaces (Varro, *De Re Rustica* 1, 57,1). Archaeologically, sheets of glass have been found in a *horreum* in Vada Volaterrana (Italy), and have been interpreted as either material to cover the structure's openings or merchandise stored for later sale (Foy & Fontaine, 2008: 436). Although the findings of this kind of material are unusual in archaeological buildings associated with *horrea*, it is possible that its use was justified in coastal areas to providing good lighting and preserving products to high humidity of these zones but more

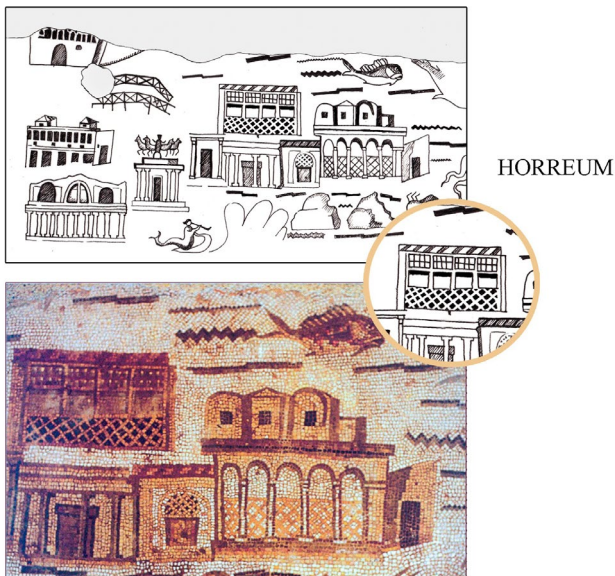


Figure 8: Illustration of the mosaic View of Hippone (Photo: Ferdi, 1998).

archaeological findings would be necessary to confirm this hypothesis.

The lower openings also have a closing system that differs from the examples studied to this point in that the frames create a type of mesh or lattice. This same model fills an upper semicircular opening in the door of a building below the *horreum*. Both cases may represent a *clathrus* or *cancellus* that allows air and light to enter the interior space and, in turn, protect it

(Salido & Neira, 2014: 209). Today, some remains of these pieces have been preserved, e.g. a fragment of stone latticework held at the Archaeological Museum in Tipasa (Boulinguez & Napoli, 2008) and the terracotta lattice piece from the House of the Labyrinth in Pompeii (Chipiez, 1877-1919; Adam, 1996).

Although the most semicircular openings represented in Roman mosaics and divided into sections seem to indicate that they would be representations of protected elements, we can also ensure that these areas were covered with translucent sheets as it reflects a fourth-century AD great mosaic found in Spain in the villa at La Olmeda (Pedrosa de la Vega, Palencia) (Fig. 9). This mosaic represents a mythological theme: the scene of Achilles on Skyros.

The semicircular space that crowns the door of the supposed gynoeceum contains a series of small quadrangular shapes inside a black frame divided into compartments of diagonal blue and white tiles. By interspersing two tile colours in each of the quadrangles, the mosaic artist is able to depict the presence of a bluish-green colour and, at the same time, the brightness or transparency that results when light hits the glass or other translucent material panes (specular gypsum, alabaster, etc.). This is achieved by the use of the white tiles, i.e. the same colour as the background. However, unlike the previous examples and, for instance, the openings in the representation of Theodoros's Palace in a sixth-century AD mosaic in the Basilica of Sant'Apollinare Nuovo (Ravenna) (Fontaine & Foy, 2005: fig.5), the distribution of the panes in the

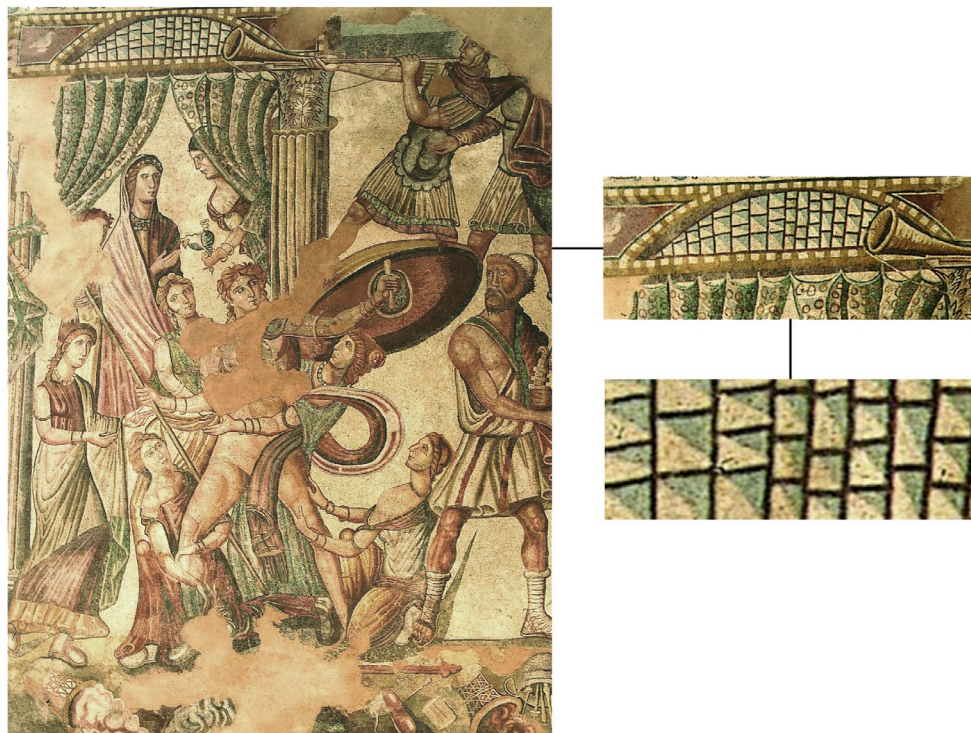


Figure 9: Mosaic Aquilles on Skyros, Villa de La Olmeda, Pedrosa de la Vega (Palencia) (Photo: 'Villa romana La Olmeda' Museum).



Figure 10: Detail of the mosaic of Bad Kreuznach (Germany). Retrieved from: <http://www.kreuznachernachrichten.de/2015/04/20>

opening is unique in that the subdivision of the interior space is not orthogonal. This can be interpreted in two ways: either the image is an artistic abstraction of more regular real models or it is a clear example of the existence of the use of irregularly shaped sheets of glass or translucent minerals that would have been cut using reamers. The second interpretation is supported by the fact that, in addition to lighting the rooms, this distribution would have created a play of light when the sun shone. In that case, the system would be like a less developed version of the stained glass panes of the medieval period. In fact the first stained glass remains was dated during the third-century AD and were made reusing windowpanes broken (Foy & Fontaine, 2008: 442). It is possible that this example was elaborated following real models, perhaps installed in the villa itself, although unfortunately we do not have evidence that these kinds of materials have been documented during the excavations. However this mosaic reflects a reality that is observed in much private architectures, where window glasses have been found associated to openings of the most relevant rooms, like *triclinia*. This feature shows that window glass was a functional and aesthetic element due to reflected the power and luxury of the owner (Vipard, 2009). Similar examples in Hispania are documented in a villa in Ronda del Marrubial (Córdoba), where an important set of

fragments of window glass were recovered associated with a *triclinium* (Velo-Gala, 2016) or in the villa of Els Arters (Énova, Valencia) (Sánchez de Prado, 2006: 86).

In other mosaic discovered in the villa of Bad Kreuznach (Germany) we can see a similar effect to the previous mosaic (Fig. 10). The building identified with a maritime villa (Ehmig, 2005) shows some apsidal spaces in the peristyle and windows of the upper floor closed by frames. The colour of tiles, pale blue, of these spaces would indicate that they were locked by a kind of translucent material. This is other clear example of the aesthetical function of this kind of materials, because in these open spaces, where they occupy only the upper place, they did not have a functional purpose.

4. WALL PAINTINGS

Wall paintings provide the best information for the iconographic study of Roman glass, since the number of representations of glass objects in this medium is very high. When containers are represented as empty, the simplest technique merely outlines their shape with a whitish or bluish-green line depending on the desired glass colour. Occasionally, brightness or reflected light



Figure 11: (Left) Media and Pelias' scene, triclinium of the house Gruppo dei Vasi di Vetro, Pompeya (Photo: Bragantini, Sampaolo, 2009: 267). (Right) Window with a wood frame in a wall of the College of the Augustales in Herculano (Photo: A. Velo-Gala).

is depicted in the same colour to create the impression of volume in the painting. Representing full containers was even easier, as inserting some type of filler material increases the sense of transparency.

One of the foremost studies into the pictorial representation of glass was done by Friederike Naumann-Steckner, who divided glass images into three groups: architectural fantasies, still lifes and domestic scenes (Naumann-Steckner, 1991: 87). Following his lead, the study of window glass in wall paintings requires the analysis of architectural fantasies and domestic scenes, as well as landscape scenes or images that contain some type of building. These pictorial groups present two highly interesting perspectives. The first is associated with openings in architectural fantasies, through which the viewer sees an imaginary background or landscape beyond the room, giving the space a sense of perspective and openness. These types of representations are found, above all, in Second Pompeian Style wall paintings, such as those decorating the main rooms in the villa Oplontis in modern-day Torre Annunziata, the villa of the Mysteries in Pompeii and the villa of P. Fannius Synistor at Boscoreale. However, these open spaces also appear in wall paintings from the Imperial era, also known as the Third and Fourth Pompeian Styles. Examples of Third Style works include some of the paintings that decorated the house of Marcus Lucretius Fronto in Pompeii, where mythological scenes alternate with architectural fantasies, and the theatrical scene from the Palaestra in Herculaneum (Bragantini & Sampaolo, 2009: 137).

The second perspective is seen in the external view of openings in buildings represented in domestic and landscape scenes. These structures are found in the

Second, Third and Fourth Style, especially in Third and Fourth Style decorative panels. The Second Style representations of buildings in wall paintings in a *cubiculum* in the P. Fannius Synistor villa are particularly noteworthy in this respect. Some examples of domestic and landscape scenes in the Third and Fourth styles that contain openings include Pan and the Nymphs in the House of Giasone in Pompeii (Bragantini & Sampaolo, 2009); Iphigenia in Tauris in the house of L. Caecilius Iucundus (Bragantini & Sampaolo, 2009); Media and Pelias, a scene from the house Gruppo dei Vasi di vetro (Bragantini & Sampaolo, 2009); numerous small architectural scenes found in Herculaneum and Pompeii (Bragantini & Sampaolo, 2009); and similar fragments discovered in other provinces in the Empire, like the findings in villas in Gallia Narbonensis (Barbet, 2008).

However, in both groups a problem arises with regard to detecting the presence of frames holding sheets of glass. Firstly, it is important to consider what the artist truly wanted to reflect with his work. His main interest may have been to use openings or windows to show the existence of an exterior space without any type of intermediate material interfering with the view, which would explain the absence of any type of closure. Despite the existence of transparent glass at the time, most window panes had a bluish-green colour that corresponded to the «natural» colour of this material (Price & Cottam, 1998: 15) and that, to some extent, hampered the view of the outdoors. Secondly, since many of the buildings in landscape scenes are in the background, they are usually small or poorly defined, which makes it impossible to detect whether they contain these kinds of closings.



Figure 12: Illustration of the Roman architectural landscape depicted in a mural painting (Photo: Anderson, 1994: 250).

In view of the above, pictorial images that can be interpreted as representing window glass are rare. François Mazois referenced a wall painting that represented the Bath of Faustina (illustrated and published by Johann Winckelmann, who in turn took it from the work by Pietro Bellori), which represents glass closing all of the window openings in a portico (Mazois, 1824: 24). Additionally, some Third Pompeian Style wall paintings have been interpreted as possibly containing large panes of glass filling the window openings in some architectural fantasies, such as those identified by Pascal Vipard in a wall painting from the house of the Labyrinth in Pompeii (Vipard, 2009: fig. 10).

Beyond the evidence presented by Mazois and Vipard –and bearing in mind what Danièle Foy and Souen Fontaine have established regarding the colour of the glass panes in the Via Latina catacombs in Rome (Foy & Fontaine, 2008: 437)– two examples from the wall paintings discussed in this study merit special attention. The first comes from the scene of Medea and

Pelias in the House Gruppo dei Vasi di vetro (Pompeii), which contains a small but significant detail. The scene takes place in a landscape dominated by tall structures, in which a small opening can be seen in one of the walls on the left divided into three vertical sections by some type of a frame. The internal spaces are bluish-green, which could represent the colour of panes of glass covering the vertical spaces. This type of opening is also seen in some of the bas-reliefs that decorate Trajan's Column and in the remains of a wall that divided one of the rooms in the collegial shrine of the Augustales in Herculaneum. In the case of the shrine, it is possible that these open spaces were covered by some type of material, although the literature does not contain any data in this regard (Fig. 11).

The second example is even more interesting with regard to Roman window glass. It is a fragment of a wall painting that forms part of the Barbara and Lawrence Fleischman collection (Fig. 12). The fragment is associated with two other pieces, one from the same

collection and the other from the Shelby White and Leon Levy collection. The painting belongs to the Second Pompeian Style and therefore dates from the third quarter of the first century BC (Anderson, 1994: 250-251). Due to its similarity to other pieces from a workshop in this area, such as the villa Oplontis paintings, it must have been created in Pompeii or the surrounding area (Godart & De Caro, 2007: 210).

The fragment shows an urban landscape in bluish-green monochromatic tones, seen through an opening located between two columns, with a richly decorated frame that divides the image into two sections. Could this be an exception to what has been seen regarding the openings represented in the Second, Third and Fourth Pompeian Style paintings discussed above? Was the artist trying to be faithful to reality and represent the landscape as truly seen through the framed bluish-green glass that covered the opening? Given the approximate size of the fragment, 91 cm long by 80.5 wide (Anderson, 1994: 251), each window pane represented in it would measure approximately 56 cm long by 22 cm wide (the opening is wider because the columns overlap it by several centimetres in the image). These dimensions are within the values corresponding to other examples archaeologically documented, which show quadrangular measures or whose length doubles the width of the panel (Foy & Fontaine, 2008: 410). This last would be the example represented in this painting, which is similar to some windowpanes recovered in Vesuvian towns. Nowadays one of them can be seen in the British Museum (London) and its measures are 60 cm long by 30 cm wide (Kisa, 1908: 363).

David Gill has proposed an arrangement for the three wall painting fragments (Gill, 2009: fig. 3) that may also be important in the context of this particular study. Although the other fragments from the group are missing and its original location is unknown –which makes it impossible to establish the exact height of the opening– the restoration of the three parts suggest that this particular fragment was below the other two, due to the arrangement of the architectural elements in the space. Despite the fact that it is possible to see the column bases in the image, this does not mean that the columns stood on the floor, since there is a small ledge below them in the image that could indicate that they were based on a cornice or support step. Indeed, the painting may well have continued below this image, as seen in a painting from *cubiculum* 17 on the Western IV Insula of Pompeii, which contains a *tholos* in one of its scenes (Bragantini & Sampaolo, 2009). If this idea were accepted, the opening or window would have been at or about the same height as a real opening and thus be simulating a window that illuminates the room and provides a view of the outdoors.

If the image in this fragment is to be interpreted as a representation of window glass, the question of the colour of glass must be resolved, as it is one of the two most important elements, along with the presence of

the frame. Although some monochromatic blue-green paintings –such as those decorating the late Second Style wall paintings in the villa discovered under the Royal villa of Portici (Barbet, 1985; Bragantini & Sampaolo, 2009)– do exist, what differentiates this Pompeian painting from the others is, doubtless, its frame decorated with floral motifs, which divides the scene in two parts. The dark green band on the right of the right scene supports the idea that this is a window frame; since it would represent that the opening is deeper than the outside wall. Moreover, the presence of this frame, along with the colour of the landscape, indicates that the scene's bluish-green colour is produced by the visual effect resulting from looking through an opening covered by a translucent material of this colour.

Roman window glasses were generally bright blue or green although there were yellow or brown glasses, depending of the iron oxidation state presented in their composition. This feature was not important to decide its use and windowpanes with different colours have been discovered in the same archaeological site and associated to the same building (Foy & Fontaine, 2008: 413; Gliozzo *et al.*, 2013). However, although the colour of windowpanes is not a feature to determine the chronology, it seems that in the first centuries since the development of window glass there are more examples in 'blue aqua' colour. In this painting, the blue-green colour may have been the result of the deterioration process of the blue pigments (azurite), which in presence of humidity change chemically to green hues (malachite) (De la Vega, 2001: 730) so the original colour may be bluer according to the windowpanes of this period. It is true that glassworkers tried to obtain window glasses more transparent in later periods and this is appreciated in the higher amount of decolourants (manganese) detected in the composition of these glasses (Foy & Fontaine, 2008: 413).

Another decidedly interesting question related to this painting regards the glass dating. Several scholars have argued that window glass was a first-century AD Roman invention (Forbes, 1966; Vigil, 1969: 107; Isings, 1971: 44; Dell'Acqua, 2004: 110). If the chronology attributed to the fragment from Pompeii –the third quarter of the first century BC– is correct, this means that glass appeared as a material to cover openings a few years earlier than has often been argued, as suggested by David Grose, who said that this event occurred in the late first century BC (Grose, 1989: 357-358). Interestingly, in his study on the pictorial representations of glass in Roman wall paintings, Naumann-Steckner came up against a similar problem when identifying the types of containers found in Second Pompeian Style paintings such as those in the villa Oplontis and villa of P. Fannius Synistor. The fruit drawn inside the containers seems to indicate that they are of a size that does not correspond to any excavated container from that era, but does correspond

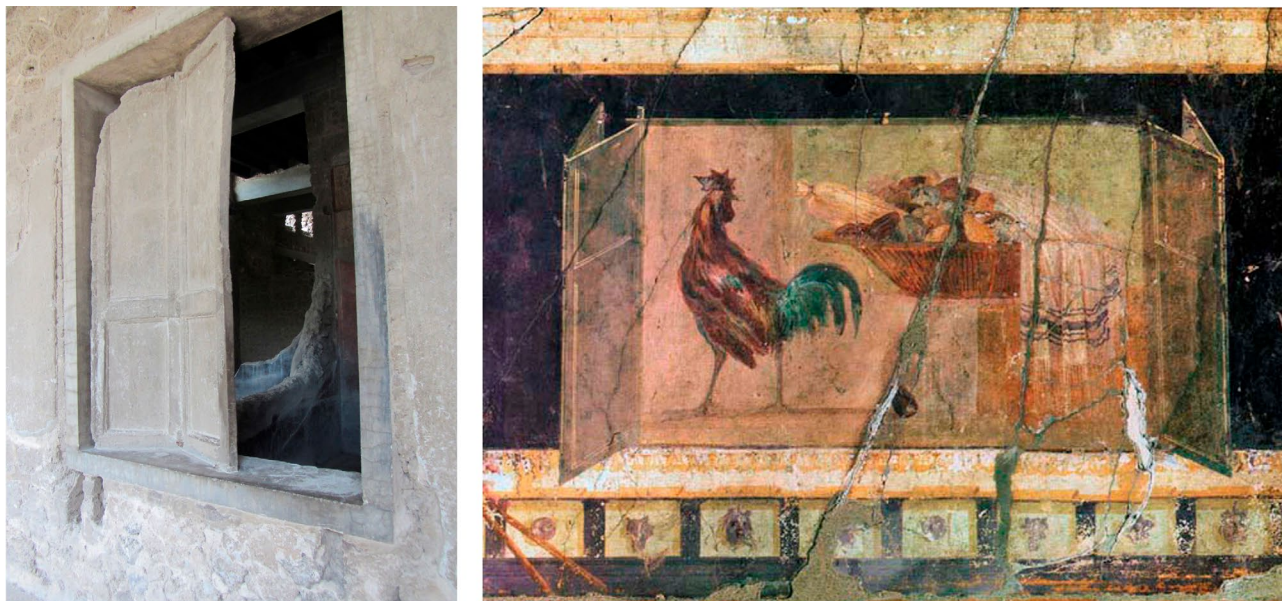


Figure 13: (Left) Mould of wooden shutter in the House of Mysteries (Pompeii) (Photo: A. Velo-Gala). (Right) Representation of a wooden shutter in a wall painting in the House of Cryptoporticus (Pompeii) (Photo: D. Peluso, Retrieved from: <http://www.pompeiiinpictures.com/pompeiiinpictures/r1/1%2006%2002%20p5.htm>)

to later samples. Given this situation, the author asks a number of questions that also apply to window glass: Is it possible that these paintings were dated incorrectly? Did the containers (or window panes in this case) come from the artist's imagination? Did objects of these types appear in an earlier era, for which there is no archaeological evidence? (Naumann-Steckner, 1991: 88).

It seems rather improbable *a priori* that these wall paintings –which have been determined to belong to the Second Pompeian Style– were incorrectly dated, since most scholars in the field of Roman wall painting agree, more or less, about the dating of the pictorial styles. Therefore, it seems more likely that Roman window glass appeared early than is believed and that, probably, this occurred in Italy according to archaeological evidence (Grose, 1989: 357-358).

Looking at the information provided by archaeological documentation, most of the glass windowpanes found in the excavations at Pompeii and Herculaneum date back to the first century AD, although this dating is somewhat complicated by the informality surrounding many of the excavations where they were found (Dell'Acqua, 2004: 112). Moreover, this type of material has been subject to and conditioned by the many reforms done to the buildings and has been especially affected by the punishing seismic activity in the area. The AD 62 earthquake that occurred in the Vesuvius region caused severe damage to the buildings there, some of which were abandoned, and might have led to a large part of the damaged glass being replaced with new pieces. Additionally, ancient glass was in high demand for a very common and extremely important practice in antiquity and later eras related to the manufacture of glass: recycling (Freestone, 2015).

Finally, one more piece of evidence can be added to the above examples: the fragments from a wall painting found after the reform of the Archaeological Museum of Bavay in France which may have come from a villa or *domus* and date back to the late second century AD (Eristov & Groetembriel, 2005). After attempting to put the fragments together, it was determined that they corresponded to the representation of a circular windowpane inside a square frame with an interior space orthogonally subdivided by a light blue frame. The interpretation of this artefact raised two interesting questions. Firstly, if the image is identified as a representation of a frame with strips of glass inside, it would be the first example of compartmentalization found in circular openings of this type, since glass is usually discovered in a single piece. Moreover, the presence of an L-shaped line or brushstroke on the right part of each of the empty spaces suggests an artistic recourse to simulate the effect of glowing when sunshine hits the glass. This effect here may be similar to the villa at La Olmeda mosaic (Spain), where the different coloured tiles clearly represent panes of glass or translucent minerals.

6. OTHER CLOSURE SYSTEMS REPRESENTED IN THE ROMAN ART

Throughout this work we have made reference to the difficult distinction between the representations of window glass and other translucent materials used for the same purpose in the different artistic Roman manifestations. The same happens when we refer to the representations of installation mechanisms of windowpanes as indicators of the presence of this kind of

closures, since they can be a reproduction of other security systems used in the openings of the architecture of this period.

Thus, in some mentioned reliefs, like Trajan's column, we can distinguish the image of a *clathrus* covering a big window in a religious building. However, the greatest numbers of representations of these elements are in the mosaic pavements, as we saw in the apsidal spaces in windows and doors of the mosaics of the *Dominus Iulius* (Fig. 2), the view of Hippone (Fig. 8) and Aquiles on Skyros (Fig. 9). Although some of these representations seem only closures, they may be susceptible to include some sort of material. Other examples that clearly allude to this type of closures are the victorious charioteer of Dougga, preserved in the Museum of Bardo and other scene from the aforementioned the mosaic Venus' triumph from Cuicul (Djemila) (Blanchard-Lemée, 1975: Pl. VI).

The use of materials less noble but more used frequently as the wooden shutters, is also reflected in some representations of this period. One of the most important examples is a wall painting of the House of Cryptoporticus in Pompeii (Fig. 13). There are some windows represented in these pictures, all of them with wooden shutters of double blade represented in both sides that allowed the viewer to observe different scenes.

The same wooden shutters represented in these paintings are preserved in some openings in architectures of Pompeii, like the plaster cast of the villa of the Mysteries and were also mentioned by classical authors like Vitruvius who said that *fenestrarum valvata* should be opened in walls of *triclinia* in Greek halls that allow the enjoyment of the gardens (Vitruvius, *De Architecture* 6, 6, 3).

7. CONCLUSIONS

Thanks to this study, it is clear that the number of representations of window glass from the Roman era is greater than previously believed. In this context, mosaics offer the largest number of examples for analysis, while paintings contain the highest number of examples of other uses of this material.

Although the most interesting characteristic of glass for artists of this period was its transparency (Naumann-Steckner, 1991: 98) –as indicated by the representations of containers made of this material– some of the images analysed in this article seem to indicate that window glass was appreciated for more than this feature. In some cases, its presence evokes transparency, while in others it is a functional element that allows light to illuminate interior spaces while protecting them from adverse weather. However, it is possible that artists of this period depicted this material for another reason: window glass was seen as an object of social distinction. This hypothesis is supported by the archaeological documentation of this material

in the private sphere, where its use was restricted to openings in the most prestigious rooms in the house (Vipard, 2009: 9).

As argued by Foy and Fontaine, a bluish-green colour in a window space is the key feature that determines that a representation depicts a covering made of glass. When this is not the case, other elements like compartmentalized frames of some type help to hypothesize that glass might be present; in these cases the artist would be emphasizing the material's transparency. Although most representations of window glass coincide chronologically more or less with the example cited by these scholars as the first representation of window glass, there are several representations that meet the same conditions as this wall painting and predate the fourth century AD. It may be that the increase in these representations around the third and fourth centuries reflects greater use of this material, as the written references seem to confirm (Ortiz Palomar, 2001a). However, this new analysis makes it possible to argue that the first documented representation of window glass –specifically the wall painting fragment from the Barbara and Lawrence Fleishman collection– may date back to the first century BC. Although most archaeological evidence postdates this painting, its source and characteristics corroborate the theory put forth by Grose regarding the appearance of these materials at some point during the first century BC and that this occurred on the Italian Peninsula specifically, since significant amounts of evidence from the eastern regions do not appear before the fourth century AD (Grose, 1989: 357-358).

The iconographic study of Roman window glass not only demonstrates the importance of the material in the society of the time, but also helps to explain its morphology and use in certain structures. Unlike the sheets of glass documented *in situ* in archaeological sites in the Vesuvian area, these materials are usually found in abandoned strata and associated with structures that were not preserved at a height sufficient to reconstruct the openings. This study has also shown that the use of glass was not restricted to covering window openings, but also appears in access openings, usually arched in shape, like interior and exterior doors. All of this is exemplified by the mosaic in the villa at La Olmeda (Palencia, Spain), which contains the clearest representation of window glass of all of the examples analysed in this article, although other representations that include compartmentalized frames, such as those found in the mosaic of the Roman villa at Bad Kreuznach (Germany) or later the mosaic of Theodiscus' palace in *Saint Apollinaire Nuovo* in Ravenna (Foy & Fontaine, 2005: fig. 5).

Although this study is focused on window glass, we have to reflect that these representations could be of other translucent minerals used for the same purpose. Furthermore we have consider a little space for representations of materials used for covering openings in Roman times.

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