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Seriality in the Middle Ages

Lead as a material for medieval sculptures of the Virgin

Two materials are generally associated with medieval sculptures of the Virgin with metal surfaces: gold and silver. Prominent artefacts include the Golden Madonna of Essen (Essen, cathedral, ca. 980)[1], the Hildesheim Golden Madonna (Hildesheim, Dommuseum / Cathedral Museum, from the time of Bishop Bernward, r. 993–1022 AD)[2] or the silver Virgin of Walcourt (Walcourt, Saint-Materne, second quarter of the 11th century?).[3] What is less well known is that another group of metal sculptures of the Virgin, at least eight in number, was made from a lead alloy.[4] Two Virgins in this group have been musealized: the Virgen de Plandogau (Barcelona, Museu Frederic Marès, fig. 1)[5] and the Vierge de Baroilles (Paris, Musée du Louvre, fig. 2-3).[6] The Virgins in Saint-Pardoux d'Arnet (Creuse; Chapelle d'Arfeuille, fig. 4)[7], Châteauneuf-les-Bains (Puy-de-Dôme)[8], Poncin (Ain)[9] and Thuir (Pyrénées-Orientales; Notre-Dame de la Victoire, fig. 5)[10] are located in churches and chapels, i.e. in religious spaces.

Another Virgin is part of the private Ruhmann collection in Wildon, Austria (fig. 6).[11] The whereabouts of a Virgin described as formerly belonging to the Parisian antiquarian Alphonse Charnoz are unknown. In the collection of the Musée des Monuments français (Paris, Cité de l'architecture et du patrimoine), however, there is a cast donated by M. Charnoz, which allows it to be categorised in the same group as the other Virgins.[12] Whether the Virgin owned by Alphonse Charnoz is identical to the Madonna in the Dourif collection in Clermont-Ferrand, which belongs to the same group and was discovered to have been lost in 1904, remains to be seen.[13]

A piece more distantly related to the aforementioned Virgins is the Vierge d'Apcher (today: Le Malzieu-Ville, Église Collégiale), made of a tin-lead alloy and discovered in August 1960 in the Saint-Jean-Baptiste castle chapel in Apcher (Prunières). The Virgin is the only piece for which a scientific material analysis is available. The analysis carried out in 1960 at the Usine sidérurgique in Saint-Chély-d'Apcher revealed a ratio of 62.50% tin to 35.30% lead, with 2.20% unspecified residue. The exact method of analysis is not given in the source.[14]

Fig. 1: Mare de Déu de Plandogau, Museu Frederic Marès, Barcelona. ©Foto: ArtWorkPhoto.eu

The Virgins have been dated to the early 13th century.[15] They consist of several modules that have been joined together: the body of the Virgin including the child, the heads of the Virgin and child, the hands of the Virgin and the right hand of the child.[16] Iconographically, the sculptures correspond to the type of *Sedes sapientiae*, the Madonna as a 'throne of wisdom', a reference to the Old Testament throne of Solomon (I Kings, 10:18–20).[17] While the gold and silver pieces are usually metal-clad, fully crafted wooden sculptures (examples of this include the wooden cores of the Virgins in Paderborn[18] and Girona[19], which have lost their metal surfaces), the pieces fashioned from lead correspond much more closely to the concept of the container: a shell several millimetres thick on average[20], which is largely

Fig. 2: Vierge de Baroilles, Paris, Musée du Louvre (picture taken during examination outside the glass cabinet)

Fig. 3: Vierge de Baroilles, Paris, Musée du Louvre (picture taken during examination outside the glass cabinet)

self-supporting and does not have to be completely filled. Joseph Déchelette wrote in 1890 in the *Notes sur les objets d'orfèvrerie conservés dans les églises de l'arondissement de Roanne* with reference to the Vierge de Baroilles of an "ossature de bois dont la partie inférieure s'élargit en forme de siege".[21] The metal only covers the front of the Virgins; and the backs are flat and made of wood (fig. 7).

Does the extraordinary formal similarity between the Virgins mean that they are part of a series? The aim of the study described here is to test and enlarge upon this hypothesis, which has already been formulated by Jean-René Gaborit and others, on the basis of specific assessment methods (3D scans). At the same time, the material properties of lead and the history and semantics of the material will be used to develop an initial idea as to which object and material topographies the Virgins were part of, and what it may have meant to produce a medieval sculpture of the Virgin and Child from a lead alloy against that contextual backdrop. (KCS)

Lead: material properties

Lead can be found in the fourth main group of the periodic table. It is abbreviated as "Pb" and has an atomic number of 82. It is a metal, has a pale grey lustrous colour, is relatively soft, easily malleable, has a high density and can be scratched with a fingernail. The melting point of pure lead is 327.5°C.[22]

Metallic lead is toxic, endangers the environment and can cause nerve and reproductive damage in humans. On account of its toxicity, the European Chemicals Agency (ECHA) is planning to further reinforce the ban on the metal by adding it to the list in Annex XIV of REACH, the so-called "Authorisation List".[23] This kind of listing would have dramatic consequences, particularly for the protection of cultural heritage, as any use of lead, be it the restoration of organ pipes or the display of medieval stained glass in museums, would of course be subject to authorisation.[24]

Lead is rarely found in its pure form in nature and has therefore usually been extracted from lead-bearing ores. Lead can be used as a pure metal, but it is also

Fig. 4: Virgin and Child enthroned, Saint-Pardoux d'Arnet, Chapelle d'Arfeuille © Conseil départemental de la Creuse - G. Thévenot 2009

Fig. 5: Virgin and Child enthroned, Thuir, Notre-Dame-de-la-Victoire, Dinh-Image Maker/CCRP66 pour le Département des Pyrénées-Orientales

often used as an alloy, especially with tin, antimony and copper.[25] Lead is also a component of many pigments, such as lead white $[2PbCO_3)_2 \cdot Pb(OH)_2]$[26] or lead-tin yellow (which is available in two compositions, namely Type I: Pb_2SnO_4, and Type II $Pb(Sn,Si)O_3$).[27] Red lead (in German Mennige) (Pb_3O_4) was used for a long time as a rust inhibitor[28] but has been banned as an anti-rust paint in Germany since 1 January 1993. However, certain exceptions do still apply in the restoration sector.[29]

Lead forms layers of lead dioxide (PbO_2) on its surface that are difficult to dissolve – and this makes it a relatively inert material. In the presence of organic acids, this protective mechanism can be disrupted, resulting in the formation (for example) of lead carbonates or lead acetates. The resulting corrosion processes can lead to massive material losses.[30] As a result, lead objects should not be stored or displayed in containers such as cabinets or showcases made of materials that emit acetic acid, such as wood or chipboard.[31] (PB)

Lead in the Middle Ages: material histories and material semantics

Assignments of meaning to materials are neither universally valid nor static, but rather fluid and conditioned by cultural contexts that are themselves in a constant state of change.[32] This applies in particular to lead, which today carries primarily negative associations due to the environmental pollution that it causes. As an anthropogenic marker, it features in the project "Earth Indices. Die Verarbeitung des Anthropozäns" (2022) in the Haus der Kulturen der Welt in Berlin.[33]

Things were different in the Middle Ages. Objects made of lead and its alloys – lead seals, lead roofs, lead weights, lead inscriptions, lead ampullae to name but a few[34] – had an enclosing and authenticating function. Lead was endowed with protective, healing and even magical qualities.[35] The topography of mariologically encoded artefacts includes lead seals and lead insignia, of which prominent examples include the seal of Leo Semnos, Metropolitan of Naupaktos (12th century, Dumbarton Oaks Collection)[36] or the famous insignia

Fig. 6: Virgin and Child enthroned, Ruhmann collection, Wildon

from the Marian shrine in Rocamadour, showing the enthroned Virgin and Child.[37]

In his capacity as an encyclopaedic writer, Isidore of Seville (d. 636 AD) distinguishes between 'black' and 'white lead' (tin), as did Pliny in the *Naturalis historia*. He emphasises the heaviness of the lead, which was used to test the depth of the sea. He names Hispania, Gaul and Britain as deposits (Etym. 16.23).[38] An important source for the medieval use of lead is the *Schedula diversarum artium* by Theophilus Presbyter (1122/23). It describes, for example, the soldering of the two halves of a cup made of a tin-lead alloy (Book 3, LXXXVIII). Book 3, XXIII, "On the purification of silver", describes lead and tin in a complementary way: tin makes the silver, which has not yet been purified, bubble. The addition of glass and lead purifies the silver and makes it possible to skim off residues of other materials.[39]

Fig. 7: Vierge de Baroilles, Paris, Musée du Louvre (picture taken during examination outside the glass cabinet)

The attitude of the Bible and the Church Fathers towards lead is ambivalent, but it tends to be negative (Ex 15, 10; Isa 1, 25; Isa 6, 29). In Gregory the Great's commentary on Ezekiel 22:18, heavy lead symbolises sin.[40] In *Dialogue* 4, 41, Gregory associates lead, together with iron and bronze, with deadly sins that cannot be purged by fire.[41] In contrast, in Augustine, *De civitate dei* (22.11), the leaden vessel that the artist moulds, and which can float on water – despite the weight of the material – becomes a symbol of physical resurrection.[42]

The central French Virgins in the group analysed here are located in or near regions where there is evidence of high mining activity in the Middle Ages. Numerous lead furnaces have been documented for the 12th century, particularly at Mont Lozère.[43] Tin as an alloying metal – as in the case of the Vierge d'Apcher, which is more distantly related to the Vierge de Baroilles group – was also available in medieval France. New insights have emerged through recent archaeological research – including individual studies such as the investigation of the Le Repaire mine (in the municipality of Vaulry, Haute-Vienne) since 2007, where tin was extracted alongside other metals. There is evidence of two phases of activity: firstly, from the second half of

Fig. 8a: Vierge de Baroilles, Paris, Musée du Louvre, photograph taken next to the orthogonal image of the 3D model

the 7th to the 10th centuries, and then from the 13th to the 15th centuries, with a possible hiatus between the two in the 11th and 12th centuries. The mine is located in the Limousin, a region famous for its medieval enamel production. In this region, as the excavation director Mélanie Mairecolas points out, tin – as a material – may have held a specific significance as an opacifier for the production of white enamels, in addition to its various other functions (production of utensils, etc.).[44] (KCS)

Object scans

To what extent do the examined Virgins, some of which exist in multiple colour versions, truly resemble each other? In preparation for their analysis and comparison, they were scanned in their entirety using a Structured-Light 3D scanner[45]. Originally designed for industrial quality assurance, this scanner has in recent years enjoyed increasing use among researchers working in cultural heritage studies.[46]

During the data acquisition phase, a predetermined structured light pattern is projected onto a three-dimensional surface and becomes distorted, an effect which is captured by one or more cameras at fixed angles and distances from the projector. Through a process of triangulation, these distorted patterns can be converted to 3D coordinates for individual points on the surface, resulting in a point cloud for each scan. Multiple scans overlap, with the aim of creating an extensive point cloud of the object, which is then triangulated and meshed in a post-processing phase.[47]

These high-resolution 3D measurements provide a precise basis for examining the objects. Using the resulting model[48], the figurines can be analysed *without* texture information, a process which makes their surface structures more apparent (fig. 8a). Indeed, by also using light from artificial sources, it becomes possible to investigate surface structure in greater detail. The detailed documentation of surface topography enables a precise detection of surface features in the sub-millimeter range. The hand-held Structured-Light Scanner

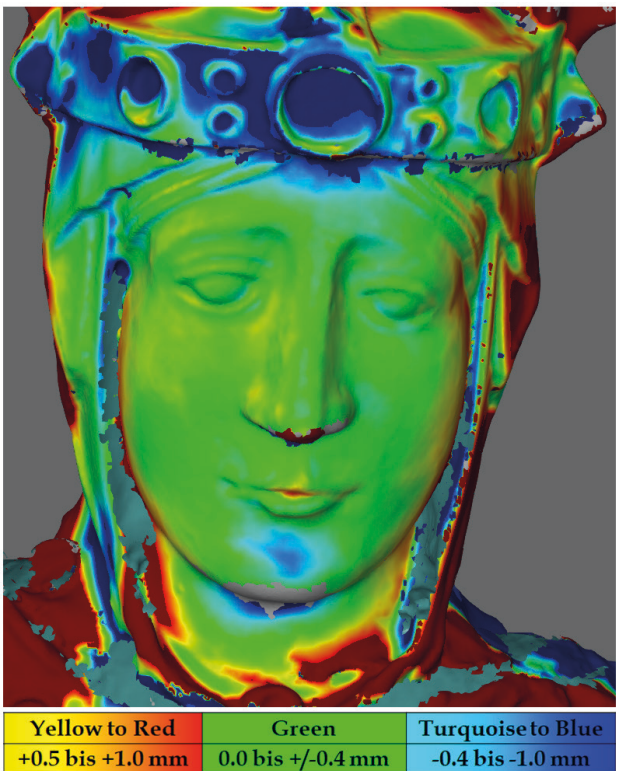

Fig. 8b: 3D surface comparison between the Vierge de Baroilles, Paris, Musée du Louvre, as the target model, and the Mare de Déu de Plandogau, Museu Frederic Marès, Barcelona, as the actual model

is contactless and projects only blue LED light onto the surface, which in turn makes it well suited to on-site use.

The 3D models of the surface areas are also used for mathematical comparisons. This methodology, long used in industry to conduct prototype quality assu rance[49], has more recently been used in cultural heritage research, restoration, as well as in conservation efforts to gain a better understanding of the relationships between objects of similar appearance. In short, it becomes possible to highlight subtle differences that are not otherwise visible to the naked eye, or else difficult to see and easy to miss.[50]

Conservation measures and signs of wear can also be monitored through 3D surface comparisons.[51] By comparing two datasets using 3D inspection software, deviations of the surface topography all the way down to the submillimeter range can be easily uncovered and visualised: among many different examples, precisely this method was used to conduct a comparison between the Virgen de Plandogau in Barcelona and the Vierge de Baroilles in Paris.[52]

In order to enable a comparison, the two datasets were roughly aligned and then, subsequently, surface areas were selected on one 3D model to serve as references for a best-fit algorithm. The use of smaller reference areas was necessary to ensure an accurate interpretation of results, as large-scale deviations caused by deformations and modularity of individual components (different hands, for example) would otherwise overpower small-scale differences.

After aligning the models mathematically, differences were displayed in a false-colour image (fig. 8b). Green areas indicated minimal changes, while yellow to red colouring indicated areas with more substance or convex deformations on the actual model compared to the target model. Turquoise to dark blue represented deviations between the models ranging from -0.5 to -1.0 mm, indicating material loss or concave deformations. On initial examination, the 3D comparison between the two faces of the Virgins highlights considerable similarity, showing deviations of only 0.5 mm. (LP)

Series and variation

Concepts of seriality are primarily associated with modern and contemporary artefacts, not with medieval cult images. If these Virgins turn out to be serial, that contradicts fundamental expectations of the object categories of medieval art[53], including the singularity and uniqueness of the religious artefact in particular. However, it is part of the ‚Eigensinn' of pre-modern sculptures of the Virgin that they can appear in series. Two examples from different periods, regions and contexts include a series of Auvergne wooden sculptures from the 12th century and the statuettes produced in Malines/Mechelen, Belgium, in the early 16th century. The series from Auvergne includes the Morgan Madonna (New York, Metropolitan Museum of Art), the Virgin from Montvianeix (New York, The Cloisters), the Virgin from Notre-Dame d'Usson (Clermont-Ferrand, Musée d'art Roger-Quilliot), the Virgin in Notre-Dame de Claviers in Moussages (Cantal), Notre-Dame d'Aubusson in Aubusson d'Auvergne (Puy-de-Dôme) or the Virgin in Heume-l'Eglise (Puy-de-Dôme). This is a non-identical series with many similarities (iconographic type, physiognomy, partial vestment style, but above all construction and polychromy technique), but also numerous differences, including the size of the Virgins.[54] The Virgins from Malines/Mechelen (approx. 30–40 cm in height) were produced in large numbers together with other figures of saints between 1500 and around 1525/30. They responded to a growing demand for images for individual devotion, were affordable for a wide audience due to their serial production, and

they could be individualised by creating a specific environment, for example by inserting them into a small retable.[55] The two examples are only comparable to a limited extent: more significantly, they illustrate the context-specific diversity of serial production in the Middle Ages.

The lead-alloy Virgins from Baroilles, Plandogau, Thuir, Saint-Pardoux d'Arnet, Châteauneuf-les-Bains and Poncin are the result of a serial production method in which the same (for example) wooden model was in all probability moulded over and over again: for example, through a casting process well known from the production of pewter objects in particular, in which two half-moulds (of a jug, for instance) are cast and soldered together. After casting, the outer mould is smashed, while the model inside remains intact and can be used again.[56] Indeed, the Virgins in the group around the Vierge de Baroilles are half-moulds with an open back. At the current stage of our research, however, it is also conceivable that an impression was made over a model using lead plates several millimetres thick as the starting material. The Virgins are not completely identical, something which becomes clear in the design of Mary's right hand. The Vierge de Baroilles and the Virgins in Poncin and Châteauneuf-les-Bains hold a bird as an attribute in their right hand. The Virgins in Thuir, from Plandogau and in the Ruhmann Collection have a sphere (the right hand in Thuir has been restored, however), while in Saint-Pardoux-d'Arnet the right hand remains empty.

This variation within the series[57] is made possible by the modular production of the Virgins. The hands were made separately from the body and could be individualised through the choice of a specific attribute. Whether this was done by the artist and his workshop or at the request of an individual or institutional patron must remain an open question at this stage of our investigations.

Finally, we must address the question of a possible model for the Virgins. For technical reasons, serial production requires a reusable model. The formal similarity between the Virgins is based on the use of this model. The question of this model as a recognisable replica of a famous cult image has been raised repeatedly in research. The Virgin of Le Puy Cathedral (and possible predecessor statues), which was destroyed in 1794, has been cited as a possible model.[58] If the Virgins were indeed originally conceived as being visibly metallic, the Golden Madonna of the cathedral in medieval Clermont (10th century, lost in the French Revolution)[59], then the silver Virgin of the cathedral in Mende (12th century)[60] or the silver Virgin in Rocamadour[61] must of course also be taken into consideration as possible models.

A prerequisite for the reference to a golden or silver Virgin would be the originally intended visibly metallic appearance of the Virgins made of a lead alloy – possibly with the idea of imitating a more precious material. However, on the basis of the current state of the art in restoration-technology research, it cannot (yet) be clearly decided whether – and if so, for how long – the metal surfaces remained visible; or, indeed, if they were covered with layers of paint right from the beginning. (KCS)

Summary and outlook

Many of the questions outlined here about the Virgins of the group around the Virgen de Plandogau and the Vierge de Baroilles – including the central question of seriality – can only be answered on the basis of a very detailed study of the objects. The cooperation between art history and conservation science that began in 2021 seems promising in this regard. At the same time, new questions arise from the precise analysis of the object in its materiality.

These include the significance of the Virgin's face and precious jewellery (such as the jewelled collar) for her meaning as a religious object. Initial results indicate that the Virgins analysed so far not only share the same overall proportions and size. They reveal particular similarities in the area of the face. In addition, the decorative elements in the chest area and the pleats at the hem are almost identical, while variations exist and were used in the area of the hands (to take one example).

Seriality and variation in relation to the modular design of the Virgins thus prove to be the key to understanding these extraordinary artefacts. An important priority will be to extend these scientific analyses and, at the same time, to supplement them with an object-historical dimension, with a view to linking the concepts of seriality and variation back to specific historical contexts.

One key finding from our investigations thus far is that lead was available and accepted as a material for medieval sculptures of the Virgin around the year 1200. On a semantic level, such a use is corroborated by the protective and authenticating function of lead objects; and it is borne out by the connotations of lead with regard to the resurrection. We might find here an

expression of the medieval tolerance of ambiguity in the thinking and design of materials. At the same time, we cannot rule out that within specific contexts, material imitation as a reference to traditional models – to highly revered silver or golden cult images – may also have played a role. And that, in turn, would lead us to consider the significance of 'real' and imitated materials in the field of medieval constructs of similarity and recognisability. (KCS)

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2 H 56.6 cm. Forsyth 1972 (as in n. 1), pp. 121–124; Michael Brandt, "und gezieret mit Edelgesteinen". Zur großen Madonna im Hildesheimer Domschatz, in: Bernwardinische Kunst, edited by Martin Gosebruch/Frank N. Steigerwald, Göttingen 1988, pp. 195–210; Kirchenkunst des Mittelalters. Erhalten und erforschen, exhibition catalogue Hildesheim, Diözesan-Museum 1989, edited by Michael Brandt, Hildesheim 1989, cat. 4, pp. 37–84; Michael Peters, cat. VII-32, in: Bernward von Hildesheim und das Zeitalter der Ottonen, exhibition catalogue Hildesheim, Dom- und Diözesanmuseum 1993, edited by Matthias Brandt/Arne Eggebrecht, Bd. 2, Hildesheim/Mainz 1993, pp. 500–502; Pawlik 2013 (as in n. 1), cat. 17, pp. 234–244; Claudia Höhl, Das Kultbild als Fragment. Die Große Goldene Madonna Bischof Bernwards, in: Das Fragment im digitalen Zeitalter. Möglichkeiten und Grenzen neuer Techniken in der Restaurierung, edited by Ursula Schädler-Saub/Angela Weyer, Berlin 2023, pp. 288–299.

3 H 72 cm. Forsyth 1972 (as in n. 1), pp. 129–130; Robert Didier, Notre-Dame de Walcourt – Onze-Lieve-Vrouw van Walcourt. Une vierge ottonienne et son revers du XIII^{e} siècle, in: Bulletin Institut Royal du Patrimoine Artistique 25 (1993), pp. 9–33; Pawlik 2013 (as in n. 1), cat. 44, pp. 318–320; Katharina Christa Schüppel, Madonnenskulpturen mit silbernen Oberflächen. Zur Medialität weiblicher

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4 Jean-René Gaborit, La Vierge de Thuir et ses ‚sœurs'. Un cas de production sérielle à la fin de l'époque romane, in: Le plaisir de l'art du Moyen Âge. Commande, production et réception de l'œuvre d'art. Mélanges en hommage à Xavier Barral i Altet, edited by Rosa Alcoy, Paris 2012, pp. 522–529. On the alloy: p. 525.

5 51.5 x 20.5 x 16 cm. MFM 655. From the church Santa Maria de Plandogau d'Oliola (Lérida). The Virgin is first mentioned in the Museu Marès collection catalogue from 1955. It was acquired by Frederic Marès from the Junyent collection. Representative pieces include, for example: Walter William Spencer Cook/José Gudiol Ricart, Pintura e imaginería románicas, second, updated edition, Madrid 1980, p. 310; Mathias Delcor, Les vierges romanes tardives du Roussillon dans l'histoire et dans l'art, in: Les Cahiers de Saint-Michel de Cuxa 15 (1984), pp. 107–108; Juan Vivancos Pérez, Maredédéu de Plandogau, in: Catalunya Romanica 23 (1988), pp. 373–375; Jordi Camps i Sòria, cat. 74, Mare de Déu amb el Nen, in: Catàleg d'escultura i pintura medievals. Fons del Museu Frederic Marès 1, edited by Francesca Español/Joaquín Yarza, Barcelona 1991, pp. 143–144; Pierre Ponsich, La Vierge de Thuir et les relations artistiques entre la region auvergnate et les pays catalans à l'époque préromane et romane, in: Les Cahiers de Saint–Michel de Cuxa 25 (1994), pp. 51–52; Francesca Español, cat. 60, Virgen de Plandogau, in: De Limoges a Silos, exhibition catalogue Madrid/Brussels/Silos, Biblioteca Nacional, Espace Culturel BBL, Monasterio de Santo Domingo de Silos 2001/2002, edited by Joaquín Yarza Luaces, Madrid 2001, pp. 207–208; Gaborit 2012 (as in n. 4); Ernest Ortoll Martín/Montse Torras Virgili, Oleguer Junyent i Frederic Marès. Dos artistes i dues col·leccions, in: Oleguer Junyent, col·leccionista i fotògraf. Roda el món i torna al Born, exhibition catalogue Barcelona, Museu Frederic Marès 2017/2018, Barcelona 2017 (Quaderns del Museu Frederic Marés 21), pp. 37–40, and cat. 7, p. 98.

6 53 x 21.5 x 16.5 cm. RF 4288. Acquired in 1990. Delcor 1984 (as in n. 5), pp. 108–109; Ponsich 1994 (as in n. 5), p. 53; Jean-René Gaborit, Vierge en majesté, dite ‚Notre-Dame de Baroilles', in: Musée du Louvre. Nouvelles acquisitions du département des sculptures 1988–1991 (1992), pp. 20–22; Gaborit 2012 (as in n. 4).

7 50 x 19 x 16 cm. Gaborit 2012 (as in n. 4). Dimensions according to the object file/Base Palissy (Géraldine Thévenot).

8 Forsyth 1972, cat. 58, p. 180 (56.5 cm; as 'wood covered with copper'); Delcor 1984, p. 108 (as polychrome wooden sculpture); Ponsich 1994 (as in n. 5), p. 53 (names wood as material, like Delcor); Gaborit 2012 (as in n. 4).

9 54 x 22 x 16 cm. Gaborit 2012 (as in n. 4). Dimensions according to the object file/Base Palissy.

10 57 x 20 x 16 cm. Marcel Durliat, La Chasuble et la Vierge de Thuir, in: Les monuments historiques de la France (1955), pp. 176–181; Forsyth 1972 (as in n. 1), cat. 57, pp. 179–180; Delcor 1984 (as in n. 5), pp. 104–109; Ponsich 1994 (as in n. 5), p. 52; Gaborit 2012 (as in n. 4); Marie-Pasquine Subes/Jean-Bernard Mathon, Vierges à l'Enfant médiévales de Catalogne. Mises en perspectives. Suivie du Corpus des Vierges à l'Enfant (XIIe–XVe s.) des Pyrénées-Orientales, Perpignan 2013 (Collection Histoire de l'Art 5), cat. 137, pp. 452–453; Jordi Camps i Sòria, Wooden Sculpture in Romanesque Iberian Peninsula. A wide and attractive panorama. Lines of Research, in: Medievalista 26 (2019), p. 23 (https://doi.org/10.4000/medievalista.2295, 18.02.2024); Katharina Christa Schüppel, Fragmentierung als Prozess. Der Mantel der Thuir-Madonna, in: L'arredo liturgico fra Oriente e Occidente (V–XV secolo). Frammenti, opere e contesti / Liturgical Furnishings between East and West (5th–15th Centuries). Fragments, Objects, and Contexts, edited by Fabio Coden, Cinisello Balsamo 2021, pp. 498–503.

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15 Gaborit 2012 (as in n. 4), p. 527. This dating is essentially based on the analysis of the inscription on the Vierge de Thuir.

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21 Ponsich 1994 (as in n. 5), p. 53.

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48 The scans were further processed at the Centre for Heritage Conservation Studies and Technologies in Bamberg using the Artec Studio v.15 software. The mesh resulting from the triangulation process was imported into Geomagic Wrap v.2021 to remove small components and align the model orthogonally along planes to simplify the export of views. Holes in the model were not closed and the surface was not smoothed to preserve the original surface accurately.

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