# 4

QUATRIÈME PARTIE / PART FOUR

# PRODUITS, COMMERCE ET ÉCHANGES / PRODUCTS, TRADE AND EXCHANGES

# MONUMENTAL DINANDERIE: ACHIEVEMENT AND TRADITION OF METAL SCULPTURE IN THE LOW COUNTRIES IN THE LATE GOTHIC AND RENAISSANCE PERIOD / *DINANDERIE MONUMENTALE : RÉALISATION ET TRADITION DE SCULPTURES EN MÉTAL AUX PAYS-BAS À LA FIN DE L'ÈRE GOTHIQUE ET À LA RENAISSANCE*

Lisa Wiersma[1]

## ABSTRACT

The Low Countries once contained many sculptures from the late Gothic and Renaissance period in a variety of materials, sizes, and qualities, and for both indoor and outdoor purposes. During outrages of iconoclasm and other phenomena, stone and wood sculptures were lost as were metal sculptures, possibly to a greater degree proportionally. Despite the current paucity of physical evidence, the Low Countries supported an extraordinary group of artisans specialised in the casting of metal sculpture.

Brass sculpture workshops acquired a prestigious position during the 1450's with Guillaume Lefèvre in Tournai and Jacques de Gérines in Brussels. On a level of elaboration equalling sculptural works by *orfèvres*, these specialised *dinandiers* produced monumental sculptures for courtyards and sepulchres as well as for liturgical purposes. This practice lasted until *c.* 1550, when bronze sculpture was introduced by Leone Leoni and continued by Jacques Jonghelinck in Brussels. This paper covers the most important artists, art works, and developments in monumental metal sculpture of the 15th and 16th centuries in the Low Countries.

Keywords: Art history, metal sculpture, bronze, brass, workshop traditions, technical development, art materials, northern renaissance art, Low Countries, Burgundian and Habsburg Netherlands

## RÉSUMÉ

Les anciens Pays-Bas comptent à la fin de l'époque gothique et à la Renaissance de nombreuses sculptures de différents matériaux, tailles et qualités, aussi bien destinées à un usage intérieur qu'extérieur. Des sculptures en pierre et en bois ont été perdues lors des troubles iconoclastes et autres événements, tout comme d'autres en métal, bien que probablement dans une moindre proportion. Malgré l'absence aujourd'hui de traces physiques, les anciens Pays-Bas ont soutenu un groupe extraordinaire d'artisans spécialisés dans la fonderie de sculptures en métal.

Les ateliers de sculpture en laiton acquièrent un prestige certain au cours des années 1450 avec Guillaume Lefèvre à Tournai et Jacques de Gérines à Bruxelles. Atteignant un degré technique équivalant au travail d'*orfèvres*, ces *dinandiers* spécialisés produisent des sculptures monumentales pour des jardins royaux et des tombeaux, mais aussi à des fins liturgiques. Cette pratique se poursuit jusqu'aux environs de 1550, lorsque la sculpture de bronze est introduite par Leone Leoni, puis perpétuée par Jacques Jonghelinck à Bruxelles. Cet article traite des principaux artistes, œuvres d'art et développements de la sculpture métallique monumentale aux 15e et 16e siècles aux Pays-Bas.

[1] Utrecht University, Utrecht, Netherlands.

Mots-clés : histoire de l'art, statuaire, bronze, laiton, traditions d'atelier, techniques, matériaux, Renaissance, anciens Pays-Bas, Pays-Bas bourguignons et habsbourgeois

Some twenty years ago, an estimate was given of the number of sculptures in the county of Holland around 1400. Dick De Boer deduced the amount as two thousand statues by assuming that works of sculpture adorned squares, buildings, and bridges; and that sculptures were to be found in the inventories of churches, cloisters, and houses. The author reckoned this quantity would have been doubled by the year 1450, during the reign of the Burgundian dukes (De Boer, 1994, p. 145-147). The percentage of monumental copper alloy statues is not specified but, certainly, many late medieval and renaissance metal sculptures in the Low Countries were lost due to altering taste, outrages of iconoclasm from the 16th century onwards, the cannonade of Brussels in 1695, sales by the French after the Revolution, and, above all, the ability to melt and reuse the material—all of these forces determine the remaining corpus. Additionally, events like the fire at the Brussels Coudenberg palace in 1731 destroyed documents that accounted for commissions.

The loss of both material and documentary evidence makes it difficult to see this art form emerging in the 15th century; however, municipal archives indicate that several cities within the Low Countries were inhabited by groups of artisans specialised in metal sculpture (Doesburgh, 2000), and, fortunately, some of the greatest monuments and statues were preserved. Further, in an effusive and fantasized manner, the achievement of the artisans is on display in contemporary paintings which predate the severe religious and political upheavals, and depict sculptural decoration on furniture and architectural structures across city squares and streets. However exaggerated these images may be, both in numbers and in the use of expensive materials, the presence of metal sculpture in paintings undoubtedly reflects the presence of real examples in outdoor space at the time (Wixom, 2003; Chevalier, 2005).

In 1966, in his book on 15th-century sculpture in the Netherlands, Germany, France, and Spain, Theodor Müller was the first and last art historian to give an overview of the history of metal sculpture in the Low Countries (Müller, 1966). Along with Müller's work, a foundational understanding of the history of the Low Countries' sculptures in metal was deepened by various scholars who researched both single sculptures and larger groupings (e.g. Pegues, 2017; Brine, 2015; Scholten, 2007; Mira & Delva, 2007; Wixom, 2003; Doménech & Frechina, 2001; Campbell, 1988). The aim here is to offer a more elaborate art historical context, to supplement the sculptures Müller mentions, and to expand the research to the 16th century when late Gothic brass sculpture made way for Renaissance bronzes, consequently ending the age of brass founders casting refined and monumental sculpture that began around 1450.

The flourishing of arts and crafts in the Low Countries from the 15th century onwards was grounded in political, economic, and social prosperity. The area had benefited for many centuries from trade in raw materials, increasingly urbanised areas, and a wealthy consumer base (Blockmans, 2010). As early as the beginning of the 15th century, the Low Countries had been renowned for their production of metal castings, especially for military equipment—it was the dawn of bronze ordnance. Netherlandish founders cast cannon for French, German, and English princes and rulers. For instance, King Henry V of England ordered guns from Gerrit van Vruethem from Utrecht in 1414, and his son, Henry VI, turned to Matheus van der Beke from Antwerp (Kuypers, 1869, p. 202; Doesburgh, 2000, p. 21). Cannon from the Southern Netherlands were regarded as some of the best available (Kuypers, 1869, p. 202; Doesburgh, 2000, p. 21; Cipolla, 1965, p. 30), and during the 15th and 16th centuries, gun founding techniques were kept up-to-date by patron-rulers who had great interest in their development (Kuypers, 1871, p. 86-89).

Given these stimuli, practical and metallurgic knowledge became omnipresent, and, overall, artisanal practices evolved as craftsmen became more sophisticated in their approach, cultivated exchange, and travelled frequently (Scholten *et al.*, 2013; Nieuwland, 1996; Kuypers, 1869; 1871). The patronage of the Burgundian dukes and an "inexhaustible" supply of excellent artists resulted in a burst of artistic activity (Blockmans & Prevenier, 1999, p. 132-134). Founders working in brass developed advanced techniques for the casting of statues. With the reign of Philip the Good, metal sculpture came into demand and flourished for decades thereafter. In stimulating the taste for monumental metal sculpture in the Low Countries, the Burgundian ducal family took advantage of the increasing skills of a diverse group of artists: goldsmiths capable of figure casting, *geelgieters* or *dinandiers* (brass founders) who cast richly decorated brass objects and figures, and wood and stone sculptors, like Claus Sluter.

Despite the innovative character of the bronze casting industry in the 15th century, it seems that two separate specialisations emerged in the foundries of the Low Countries in this period: workshops that cast bells, mortars and cannon in bronze, and foundries where liturgical objects and sculptures were cast in brass. Unlike the gun founders in the 15th century (Kuypers, 1869, p. 203; Nieuwland, 1996, p. 23, 28; Doesburgh, 2000, p. 65, 128; Weinryb, 2012, p. 72), the sculpture founders did not originate from bell founders' workshops. Around 1450, the casting of monumental metal sculpture developed from brass founders who had evolved from the practice of *dinandiers* casting aquamanilia in the Meuse Valley from the 12th century. These artisans had adopted the techniques described by Theophilus for the casting of silver and golden figurines using wax models (Hawthorne & Smith, 1979)—a corresponding and contemporaneous change occurred in English medieval practice (Badham & Oosterwijk, 2015; Pappot, 2017).

In casting metal effigies during the 15th century, the Low Countries nobility seems to have finally adopted a wider European tradition—from the 11th century onwards copper-alloy effigies had been cast, mostly in France, Great Britain, and Germany. Somehow, this practice declined during the 14th century and resurged in the beginning of the next century in Great Britain, Germany, and Italy (Badham & Oosterwijk, 2015). With the patronage of the dukes of Burgundy, the art form took root in the Low Countries around 1450. The first documented brass founder to cast monumental sculptures in the Low Countries is Jacques de Gérines from Brussels. Commissioned by Philip the Good, he cast the funerary effigies of Louis of Mâle, the Count of Flanders, his wife Margaret of Brabant and their daughter, Margaret of Flanders, in Lille, as well as possibly casting effigies in Brussels of Joanna of Brabant, Duchess of Brabant, and her great-nephew William of Brabant (Campbell, 1988 opposes the latter). Each of these tombs was adorned with two angels and twenty-four *pleurants* or weepers. The Gérines effigies and weepers were lost, but four small saints and apostles in the collections of The Metropolitan Museum of Art that were made in Tournai and attributed to its most important brass founder, Guillaume Lefèvre, serve as proof of the high level of Flemish brass casting at the time (Scholten, 2011, p. 20-22). And, like the aforementioned founders, the Reinier van Thienen workshop, responsible for the Mary of Burgundy effigy in Bruges (1488-1496), also cast its sculptures in brass or leaded brass (de Ruette *et al.*, 1993; van Doorslaer, 1921).

Before 1450 refined metal sculpture in the Low Countries was mainly a product of goldsmiths (Collon-Gevaert, 1951). Their work had always been appreciated for its refinement which, from the 12th century onwards, had developed to the highest level. Figurative decoration was introduced at an early stage, and subsequently, hollow wax casting was common practice. Some years ago, conservators of the Rijksmuseum in Amsterdam found indications for the use of the *cire perdue* technique inside the Saint Frederic reliquary bust—a work by the Utrecht goldsmith Elias Scerpswert of 1362 (personal com. A. Pappot, Rijksmuseum Amsterdam). This bust clearly shows the modelling and casting skills of these craftsmen. Since other, similar examples

Fig. 1

Baptismal font, Aert van Tricht, 1492, Saint John's cathedral, 's-Hertogenbosch.

Photo: L. Wiersma.

Fig. 2 ▸

Baptismal font, Aert van Tricht, 1492, Saint John's cathedral, 's-Hertogenbosch.

Photo: L. Wiersma.

are known, it can be believed that figurative goldsmith's work preceded or inspired the making of more elaborate decorations and sculptures in brass during the 15th century (Müller, 1966, p. 3, 17; Dubbe, 1999, p. 9). This is not surprising when one considers the popularity of artworks by goldsmiths at the Burgundian court with Gerard Loyet, a court artist to Charles the Bold, being the most striking example. *Orfèvrie* can be considered a principal focus for the patronage of the Burgundian courts (Velden, 1997, p. 14-15, 64; Taburet-Delahaye, 2004, p. 128) and an example for other artisans making three-dimensional figurative sculptures or sculptural decoration to endeavour to achieve. The figurines made by artists like Loyet and smaller sculptures cast by brass founders show obvious similarities in style and the level of their quality in proportion to the differences in their material properties. The astonishing votive gifts made by Loyet comprise delicate precious metal figurines approximately the same size, around 50 cm, as the ten remaining brass weepers from the tomb of Isabella of Bourbon in Antwerp, made in 1476, and now kept in the Rijksmuseum in Amsterdam. An even stronger visual comparison of the Loyet works can be made to the brass figures cast by Aert van Tricht—a prominent metal sculptor in the Low Countries around 1500 whose family workshop was operative at least several years before 1492 and up until 1520. He received commissions from Den Bosch, Xanten (Germany), and the abbey of Averbode. His most spectacular and refined work is the baptismal font he made for Saint John's church (later cathedral) in Den Bosch in 1492 (fig. 1) containing six figures on the base (fig. 2-4) and a presumed self-portrait on the lid (fig. 5) (Hoekx, 1983; Koldeweij, 1983).

Unfortunately, all tomb figures (effigies, angels and weepers) that were made in the period between Lefèvre's activity and the ten weepers from Isabella of Bourbon's tomb are lost. They included the mid 15th-century tomb sculptures by Jacques de Gérines and the effigies by an unknown maker from the funerary monument of Lodewijk van Gruuthuse and his wife, commissioned in 1474 for the Church of Our Lady in Bruges and explicitly referred to as brasses (Vermeersch, 1976, p. 265-271). Similarly, the only known metal *priants* are lost: the kneeling figures of the grandson of John the Fearless, Adolf of Cleves, and his wife Anna of Burgundy, an illegitimate daughter of Philip the Good, were placed on a tomb in the Dominican church of Brussels in 1492 (fig. 6).

Many more equally rich monuments were to be found in the churches of the Low Countries; however, the materials are not always explicitly described (Vale, 1996, p. 938; Le Roy, 1734, p. 259-260).

The little known but monumental work of the Iglesia Parroquial de San Martín Obispo in Valencia serves as another exemplar of the tradition represented by the tomb figures of Isabella van Bourbon and Mary of Burgundy. It is an equestrian group showing Saint Martin and the beggar and was cast in Flanders in 1494 (fig. 7). It is, most likely, a work by Renier van Thienen; although, recent exhibition catalogues continue to support Elías Tormo's attribution from 1923 to Pieter de Backere on stylistic grounds (Doménech & Frechina, 2001, p. 328ff.; Mira & Delva, 2007, p. 408ff.). In 2008, Susie Nash added Renier van Thienen to this attribution (Nash, 2008, p. 98-99), and, since De Backere's job concerning other sculptures was to gild, not to cast them, to see Van Thienen as the founder is a reasonable assumption. The group was assembled from about forty components cast using the lost-wax technique (Doménech & Frechina, 2001, p. 328; Mira & Delva, 2007, p. 408). Given the fact that a casting tradition of monumental equestrian groups did not exist in the Netherlands in the 15th century, it is quite an achievement and contemporaneous to the casting of Andrea del Verrocchio's *Bartolommeo Colleoni* by Alessandro Leopardi. Apart from the Saint George in the Prague Castle of 1373 and the lost Ladislaus I of Hungary by the Von Klausenburg brothers, no other metal monumental equestrian group that was made in the northern parts of Europe is known until the 17th century (Otto, 1985, from p. 112; Otto, 1986; Hunecke, 2008, p. 126-147; Beuing, 2010, p. 35-36). The Van Thienen workshop was also responsible for casting the unfinished and lost series of statues of the dukes and duchesses of Brabant, after designs by Jan van Brussel (also called "van Roome") and models carved by Jan Borman the Younger. From the early 16th century, four of the thirty planned sculptures of dukes on slender columns had decorated the Baliën court, the public square in front of the now burnt-down ducal Coudenberg Palace in Brussels; however, these broke or were melted in 1790 and 1793 respectively (Pegues 2017, p. 181-204).

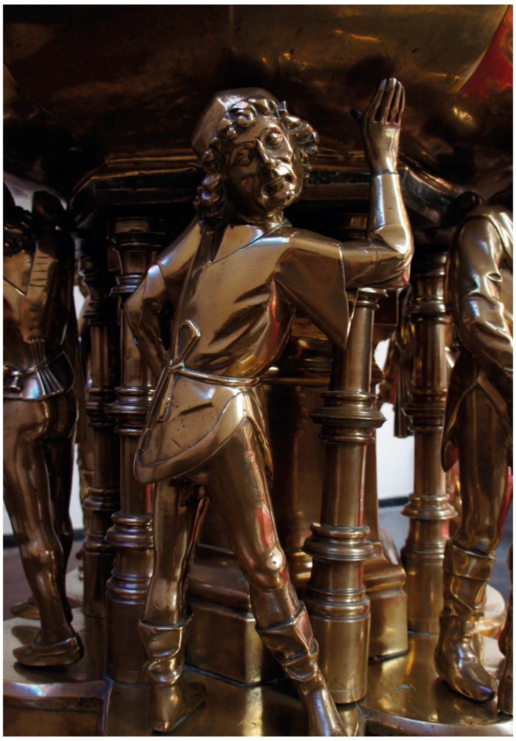


Fig. 3 ◄

Baptismal font, Aert van Tricht, 1492, Saint John's cathedral, 's-Hertogenbosch.

Photo: L. Wiersma.

Fig. 4

Baptismal font, Aert van Tricht, 1492, Saint John's cathedral, 's-Hertogenbosch.

Photo: L. Wiersma.

Fig. 5

Baptismal font, Aert van Tricht, 1492, Saint John's cathedral, 's-Hertogenbosch.

Photos: L. Wiersma.

From the decades just after the Habsburg family came to power, hardly any monumental metal sculptures remain, nor do archival documents accounting for their production—the Baliën court records being an important exception. Of the *Aeolus and Mercury* that might have been cast for Binche under the supervision of Jacques Dubroeucq, the sources are vague or ambiguous regarding their execution (Boogert, 1998, p. 138-143, 200-202; Smolderen, 1984). Similarly, many of the funeral monuments with sculptures that were made for the elite of the Low Countries during this period were demolished and their features cannot be determined from descriptions—when the depiction of the deceased is described as *koperen afbeeldsel* (representation in copper), as is the case with Count Jan van Egmond's tomb in the court chapel at Egmond from 1516 (Wap & Cannabich, 1834, p. 97), one is obliged to think it describes an engraved brass tomb slab since that was the customary form. Some objects and sources do clearly account for a continuous casting tradition on the highest level, including the sumptuous gilded brass wall-mounted memorial for Jacques de Croÿ, bishop of Cambrai, at Cologne cathedral, that was probably made in Brussels around 1516 (Brine, 2015, p. 212ff.). Churches and municipalities kept turning to brass founders; however, most of the known commissions were liturgical and comprise no elaborate sculptural work.

The workshops of the brass founders acquired their prestigious position in the 1450s with the advent of Jacques de Gérines in Brussels and maintained their significance until *c.* 1550. In summary, the most significant founders of sculptures were Guillaume Lefèvre in Tournai, Jacques de Gérines in Brussels, his fellow-townsman Renier van Thienen, and Aert van Tricht in Maastricht. But brass founders continued to be productive up to the beginning of the 17th century. The majority sprouted from bell and cannon founding families and practised the profession of both brass and bronze founder—Jan Fierens, who worked in Mechelen around 1500, Johannes van den Eynde, active in the second and third quarter of the 16th century, and the 16th-century Cauthals family. There are two interesting examples of post-1550 sculptural works, both monumental outdoor sculptures of Christ. The first was cast by brass founder Jan II Cauthals for the Mechelen bridge in 1594 after the model of Jan van Doorne (Smolderen, 1996, p. 153-155; Doesburgh, 2000, p. 114), and the second was a commission to renew a crucifix


Fig. 6

Tomb of Adolf van Kleef and Anna of Burgundy, 1492, Dominican's church, Brussels (destroyed) (Le Roy, 1734, p. opposite 260).

on the Antwerp Pont the Meir that was, after the unexpected death of Jacques Jonghelinck, completed by Jan III Cauthals in 1635—the remaining sculpture from the Pont the Meir has not been analysed, but it is quite possible that the Cauthals founders had adapted, by then, the practice of bronze sculpture casting. In 1634, the future sculpture was referred to as *eenen Cristus van bronse*, a Christ of bronze (Stock & Nieuwdorp, 1986, p. 78).

The first Netherlandish sculptor and founder to work in bronze was Jacques Jonghelinck (1530-1606), the crown prince of Netherlandish metal sculpture from Antwerp. Around 1550, he followed Leone Leoni to Italy and became acquainted with the making of Italian bronze sculpture. His practice back in the Low Countries some years later was a complete departure from the brass founding practices (Pappot & Wiersma, 2017); however, metal sculpture maintained its close association with goldsmithing. Like Leone Leoni and Benvenuto Cellini, some of the famous metal sculptors from the Low Countries working from the 1550s were possibly trained by goldsmiths before they became bronze sculptors, and included Jacques Jonghelinck, Willem van Tetrode, and Adriaen de Vries (Pappot & Wiersma, 2017; Scholten, 2003; Koomen, 2003; Scholten, 1998; Smolderen, 1996). During the Habsburg reign, goldsmiths maintained their significant position. Antwerp and Utrecht were the most important goldsmithing centres, and in Mechelen alone, thirty goldsmiths were recorded, mostly working for Margaret of Austria (Fritz, 1982; Bergh-Hoogterp, 1990; Rommes & Spek, 2004). Around 1550, the demand was prompted by the vogue for collectibles, such as delicate statuettes and silver and gold life castings of animals and flowers. Goldsmiths' apprentices must have felt encouraged to develop the skills necessary to become sculptors given the demand around Europe in the Renaissance for monumental bronze, statues, and statuettes. In the 15th and 16th centuries, being from a goldsmith's family or becoming a goldsmith's apprentice might have been an advantage in pursuing an artistic career as a sculptor or painter (Eser, 2005).

Fig. 7

Saint Martin and the Beggar, 1494, Iglesia Parroquial de San Martín Obispo, Valencia.

Photo: S. Nash, January 2005.

This does not explain why specialised brass founders were unable to excel in bronze sculpture casting. The brass founding tradition had lost much of its glamour in the 16th century. The arrival of Leone Leoni in the Low Countries can be considered a breaking point. He was a goldsmith, sculptor, and founder known for his expertise, his Italian style and his knowledge of making monumental bronze sculpture who was summoned to northern Europe to serve the prestigious Habsburg. In the 15th century, the brass founders of the Low Countries could stand up to the Italian bronze sculptors but they did not equal them. However, while the history of pan-European metal casting traditions is often told from the perspective of the Italian Renaissance, the tradition of northern sculpture warrants a more distinguished role. As Theodor Müller stated in 1966, the Netherlandish art of metal sculpture in the 15th century …*represent*[s] *an achievement which no country other than Italy could rival at this time* (Müller, 1966, p. 92). And, once introduced to the Italian ways, the Low Countries' bronze sculptors of the late 16th century, like the Netherlandish mannerist sculptors Willem van Tetrode, Giambologna, Jacques Jonghelinck, and Adriaen de Vries would help take bronze sculpture to its highest levels throughout Europe, Italy included.

## ACKNOWLEDGEMENTS

I am very grateful to Pete Dandridge. His suggestions were very helpful. Further I would like to thank Nicolas Thomas, Sophie Oosterwijk, Douglas Brine, Monique de Ruette and Françoise Urban for their support, comments and advice. For moral support I am indebted to Tonny Beentjes and Arie Pappot, my travel companions to the 2014 conference—my first as a speaker. Arie requires a second mention, as shortly thereafter, we would join forces to research Netherlandish metal sculpture from the 16th century, especially the works of Jacques Jonghelinck. Our research affected this paper—to its benefit. But, most of all, I wish to express my gratitude to Arjan de Koomen and Frits Scholten, who supervised my master's thesis. Though abbreviated and altered, it formed the basis of this paper.

## BIBLIOGRAPHY

Badham S. & Oosterwijk S., 2015. "Monumentum aere perennius"? Precious-metal effigial tomb monuments in Europe 1080-1430, *Church Monuments*, 30, p. 7-105.

Beuing R., 2010. *Reiterbilder der Frührenaissance, Monument und memoria*, Münster.

Blockmans W., 2010. *Metropolen aan de Noordzee, De geschiedenis van Nederland 1100-1560*, Amsterdam.

Blockmans W. & Prevenier W., 1999. *The Promised Lands, The Low Countries Under Burgundian Rule, 1369-1530*, Philadelphia.

Brine D., 2015. *Pious memories. The wall-mounted memorial in the Burgundian Netherlands,* Leiden (Studies in Netherlandish art and cultural history, 13).

Campbell L., 1988. The tomb of Joanna, Duchess of Brabant, *Renaissance Studies*, II, 2, p. 163-172.

Chevalier A., 2005. Les dinanderies représentées dans les tableaux des peintres "Belges" du xv$^{e}$ siècle. *In*: Toussaint J. (ed.), *Art du laiton. Dinanderie*, Namur, p. 105-130.

Cipolla C., 1965. *Guns, Sails and Empires: Technological Innovation and the Early Phases of European Expansion, 1400-1700*, New York.

Collon-Gevaert S., 1951. *Histoire des arts du métal en Belgique*, Bruxelles (Académie royale de Belgique, Classe des Beaux-Arts, Mémoires, 2$^{e}$ série, t. 7).

De Boer D., 1994. Tussen Jacob van Minniken en Jorijs de beeldsnijder. *In*: Falkenburg R. (ed.), *Late gothic and renaissance sculpture in The Netherlands*, Zwolle (Netherlands yearbook for history of art, 45), p. 141-159.

de Ruette M., Dewanckel G., Dupas M., Duverger E., Maes L., Monfort X., Urban F. & Wouters H., 1993. Étude technologique des dinanderies coulées. L'œuvre de Renier van Thienen et la restauration du chandelier pascal de Léau (1483), *Bulletin de l'Institut royal du patrimoine artistique*, 25, p. 171-209.

Doménech F.B. & Frechina J.G, 2001. *La clave Flamenca en los primitivos Valencianos*, Valencia.

Dubbe B., 1999. *Zwols zilver, Het Zwolse goud- en zilversmidsambacht en zijn meesters*, Zwolle.

Eser T., 2005. Holbeins Söhne, Zur berufsstrategischen Alternative "Goldschmied oder Maler" im 16. Jahrhundert. *In*: Brinkmann B. & Schmid W., *Hans Holbein und der Wandel der Kunst des frühen 16. Jahrhunderts*, Turnhout, p. 113-146.

Fritz J., 1982. *Goldschmiedekunst der Gotik in Mitteleuropa*, München.

Hawthorne J. & Smith C.S. (ed.), 1963. *On Divers Arts. The Treatise of Theophilus*, Chicago.

Hoekx J.A.M., 1983. Enige bijzonderheden uit de geschreven bronnen. *In*: Hoekx J.A.M., Koldeweij A., Adriaanse W. & Mackelnbergh E.V., *De doopvont van Aert van Tricht, St. Janskathedraal*, 's-Hertogenbosch, p. 4-7.

Hunecke V., 2008. *Europaïsche Reitermonumente, Ein Ritt durch die Geschichte Europas von Dante bis Napoleon*, Paderborn.

Koldeweij A.M., 1983. Kunsthistorische en iconografische notities. *In*: Hoekx J.A.M., Koldeweij A., Adriaanse W. & Mackelnbergh E.V., *De doopvont van Aert van Tricht*, *St. Janskathedraal*, 's-Hertogenbosch, p. 8-16.

Koomen A. de, 2003. Guglielmo Fiammingo at Cellini's studio (Appendix). *In*: Scholten F. (ed.), *Willem van Tetrode, Sculptor (c. 1525-1580)*, Zwolle, p. 131-139.

Kuypers F., 1869. *Geschiedenis der Nederlandsche artillerie van de vroegste tijd tot op heden*, I, Nijmegen.

Kuypers F., 1871. *Geschiedenis der Nederlandsche artillerie van de vroegste tijd tot op heden*, II, Nijmegen.

Le Roy J., 1734. *Grand Théâtre Sacré du duché de Brabant : Contenant la description générale & historique de l'église métropolitaine de Malines & de toutes les autres églises cathédrales, collégiales, & paroissiales, des abayes, prévôtez, prierez & couvents tant d'hommes que de femmes, & autres fondations religieuses, qui se trouvens dans l'Archevêché de Malines, les Evêchez d'Anvers & Bois-le-Duc; comme aussi de ceux qui sont au Wallon-Brabant...*, II, Den Haag.

Mira E. & Delva A., 2007. *A la búsqueda del Toisón de Oro, La Europa de los príncipes, la Europa de las ciudades*, Valencia.

Müller T., 1966. *Sculpture in the Netherlands, Germany, France and Spain: 1400 to 1500*, Middlesex.

Nash S., 2008. *Northern Renaissance Art*, Oxford.

Nieuwland H. (ed.), 1996. *Van Archimedes tot Nobel : Een chronologische studieverzameling van de oudste metaalkundige boeken, bronsgieten, buskruit en wapenfeiten uit die tijd : Voor artilleristen, wapenverzamelaars, kunstenaars en technici*, Maarn.

Otto R., 1985. *Europäische Reiterdenkmäler, Zeugen der Menschheitsgeschichte*, Raunheim.

Otto R., 1986. *Europäische Reiterdenkmäler, Zeugen der Menschheitsgeschichte, Besonderheiten als Ergänzung zum Hauptband*, Raunheim.

Pappot A., 2017. Westminster Abbey effigies XRF metal analysis, 2016. [Internal report]

Pappot A. & Wiersma L., 2017. Jacques Jonghelinck (1530-1606), Bronze sculptor of the Low Countries in the 16th century, *Sculpture Journal*, 26, 1, p. 69-82.

Pegues E., 2017. Jan Borreman's wooden models for bronze sculpture: A documentary reconstruction, *Artibus et historiae,* 76, 38, p. 181-204.

Rommes R. & van der Spek J. , 2004. *Met hand en hart, Zeven eeuwen smedengilde en St. Eloyengasthuis in Utrecht, 1304-2004*, Utrecht.

Scholten F., 1998. *Adriaen de Vries 1556-1626, Imperial sculptor*, Amsterdam.

Scholten F., 2003. Willem van Tetrode, alter Praxiteles. *In*: Scholten F. (ed.), *Willem van Tetrode, Sculptor (c. 1525-1580)*, Zwolle, p. 10-77.

Scholten F., 2007. *Isabella's weepers, Ten statues from a Burgundian tomb*, Amsterdam.

Scholten F., 2011. *European sculpture and metalwork in the Robert Lehman Collection*, New York.

Scholten F., Woodall J., & Meijers D. (ed.), 2013. *Art and migration, Netherlandish artists on the move, 1400-1750*, Leiden (Netherlands yearbook for history of art, 63).

Smolderen L., 1984. Jacques Jonghelinck en Italie, *Revue Belge de numismatique et de sigillographie*, 130, p. 119-139.

Smolderen L., 1996. *Jacques Jonghelinck, Sculpteur, médailleur et graveur de sceaux (1530-1606)*, Leuven.

Taburet-Delahaye É., 2004. Gold and silver. *In*: Antoine É., *Art from the court of Burgundy, The patronage of Philip the Bold and John the Fearless 1364-1419*, Paris, p. 128-131.

Vale M., 1996. A Burgundian funeral ceremony, Olivier de la Marche and the obsequies of Adolf of Cleves, Lord of Ravenstein, *The English historical review*, 111, 443, p. 920-938.

van den Bergh-Hoogterp L., 1990. *Goud- en zilversmeden te Utrecht in de late middeleeuwen*, Den Haag.

van den Boogert B. , 1998. *Habsburgs hofmecenaat en de introductie van de Italiaanse hoogrenaissance in de Lage Landen*, Amsterdam.

van der Stock J. & Nieuwdorp H., 1986. Het Christusbeeld van de Meir te Antwerpen, Een meesterwerk van de gebroeders De Nole uit de vergeethoek, *Belgisch tijdschrift voor oudheidkunde en kunstgeschiedenis*, 55, p. 69-95.

van der Velden H., 1997. *Gerard Loyet & Karel de Stoute, Het votiefportret in de Bourgondische Nederlanden*, Utrecht. [published as *The donor's image, Gerard Loyet and the votive portraits of Charles the Bold*, Turnhout, (Burgundica, 2), 2000]

van Doesburgh H., 2000. *Letters in Brons* [self-published].

van Doorslaer G., 1921. L'ancienne industrie du cuivre à Malines. IV. La fonderie du laiton et du bronze, *Bulletin du cercle archéologique littéraire et artistique de Malines*, 26, p. 117-184.

Vermeersch V., 1976. *Grafmonumenten te Brugge voor 1578*, Brugge.

Wap J. & Cannabich J., 1834. *Aardrijkskundige beschrijving van de Nederlanden, na 1830*, Oukoop.

Weinryb I., 2012. The Bronze Object in the Middle Ages, *In*: Ekserdjian D. (ed.), *Bronze*, London.

Wixom W., 2003. A glimpse at the fountains of the Middle Ages, *Cleveland studies in the history of art*, 8, p. 6-23.

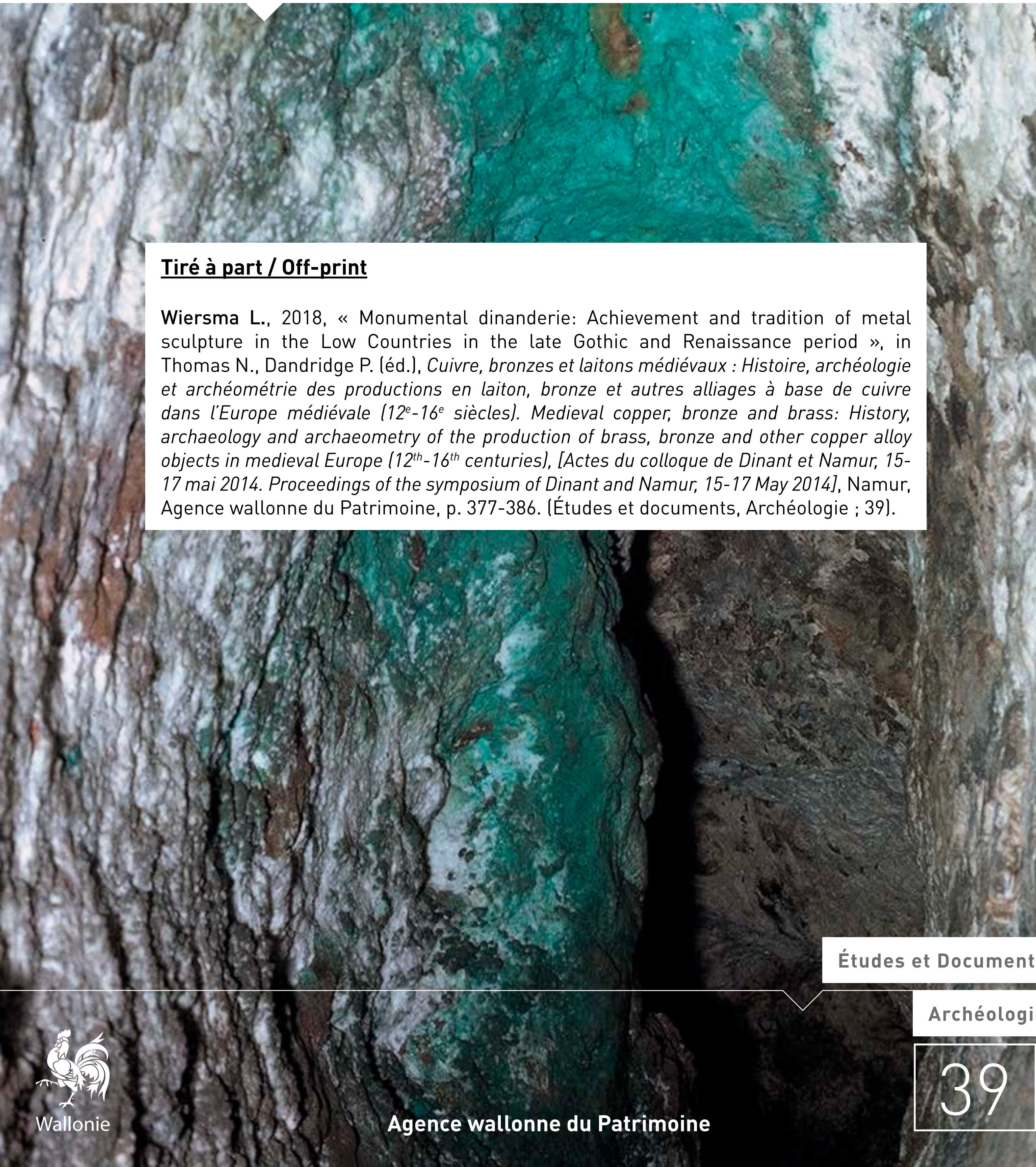
# CUIVRES, BRONZES ET LAITONS MÉDIÉVAUX / MEDIEVAL COPPER, BRONZE AND BRASS

Histoire, archéologie et archéométrie des productions en laiton, bronze et autres alliages à base de cuivre dans l'Europe médiévale (12e-16e siècles)

History, archaeology and archaeometry of the production of brass, bronze and other copper alloy objects in medieval Europe (12th-16th centuries)

*Sous la direction de Nicolas Thomas & Pete Dandridge*

SPW | *Éditions*



**Tiré à part / Off-print**

**Wiersma L.**, 2018, « Monumental dinanderie: Achievement and tradition of metal sculpture in the Low Countries in the late Gothic and Renaissance period », in Thomas N., Dandridge P. (éd.), *Cuivre, bronzes et laitons médiévaux : Histoire, archéologie et archéométrie des productions en laiton, bronze et autres alliages à base de cuivre dans l'Europe médiévale (12e-16e siècles). Medieval copper, bronze and brass: History, archaeology and archaeometry of the production of brass, bronze and other copper alloy objects in medieval Europe (12th-16th centuries), [Actes du colloque de Dinant et Namur, 15-17 mai 2014. Proceedings of the symposium of Dinant and Namur, 15-17 May 2014]*, Namur, Agence wallonne du Patrimoine, p. 377-386. (Études et documents, Archéologie ; 39).

Études et Documents

Archéologie

39

Wallonie

Agence wallonne du Patrimoine

Études et Documents

Archéologie

39

La série ARCHÉOLOGIE de la collection
ÉTUDES ET DOCUMENTS est une publication
de l'AWaP

Service public de Wallonie
Direction générale opérationnelle de l'aménagement du territoire, du logement, du patrimoine et de l'énergie
Agence wallonne du Patrimoine (AWaP)
Rue des Brigades d'Irlande, 1
B-5100 Jambes

IMPRESSION, DIFFUSION ET VENTE
Service publications
Résidence du Grand Cortil
Place des Célestines, 21 (derrière l'hôtel Ibis)
B-5000 Namur
Tél. : +32 (0)81.230.703 ou +(0)81.654.154
Fax : +32 (0)81.231.890
publication@awap.be
www.awap.be
www.patrimoine-publications.be

n° vert de la Wallonie : 1718
www.wallonie.be

En cas de litige, Médiateur de Wallonie :
Marc Bertrand
Tél. : 0800.191.99 – le-mediateur.be



ÉDITEUR RESPONSABLE
Jean Plumier,
Inspecteur général-expert

COORDINATION ÉDITORIALE
Liliane Henderickx

CONCEPTION GRAPHIQUE
DE LA COLLECTION
Ken Dethier

MISE EN PAGE
Fabien Cornélusse

IMPRIMERIE
Snel, Vottem

COUVERTURE
Filon de minerai de cuivre au toit d'une galerie de la mine médiévale de Bouco-Payrol (Aveyron). Photographie : B. Léchelon.

**Avertissement**
Depuis le 1er janvier 2018, le Département du patrimoine de la Direction générale opérationnelle de l'aménagement du territoire, du logement, du patrimoine et de l'énergie du Service public de Wallonie, et l'Institut du Patrimoine wallon sont réunis au sein de la nouvelle Agence wallonne du Patrimoine (AWaP).


Dépôt légal : D/2018/14.407/19
ISBN : 978-2-39038-016-0

# CUIVRES, BRONZES ET LAITONS MÉDIÉVAUX / MEDIEVAL COPPER, BRONZE AND BRASS

## Histoire, archéologie et archéométrie des productions en laiton, bronze et autres alliages à base de cuivre dans l'Europe médiévale (12e-16e siècles)

## History, archaeology and archaeometry of the production of brass, bronze and other copper alloy objects in medieval Europe (12th-16th centuries)

**Sous la direction de**
**Nicolas Thomas & Pete Dandridge**

Actes du colloque de Dinant et Namur, 15-17 mai 2014 /
Proceedings of the symposium of Dinant and Namur, 15-17 May 2014

Colloque organisé par le Service public de Wallonie et l'Institut national de recherches archéologiques préventives (Inrap)

Avec l'aide et le soutien :
de la Maison du patrimoine médiéval mosan, du Centre culturel régional de Dinant, de la ville de Dinant, et de l'Institut européen du cuivre (Copper alliance)

ÉTUDES ET DOCUMENTS
Archéologie 39
Namur, 2018

Service public de Wallonie
Direction générale opérationnelle de l'aménagement du territoire, du logement, du patrimoine et de l'énergie
Agence wallonne du Patrimoine

Institut national de recherches archéologiques préventives (Inrap)

Wallonie patrimoine AWaP

Inrap
Institut national de recherches archéologiques préventives

# TABLE DES MATIÈRES / TABLE OF CONTENTS

## PRÉFACE

Du 15 au 17 mai 2014, s'est tenu à Dinant et à Namur le colloque international *Histoire, archéologie et archéométrie des productions en laiton, bronze et autres alliages à base de cuivre dans l'Europe médiévale (12$^{e}$-16$^{e}$ siècles)*. Ces journées font partie d'un programme de recherches autour des productions en alliage à base de cuivre de la vallée de la Meuse mené conjointement par le Service Public de Wallonie, (Belgique) et l'Institut national de recherches archéologiques préventives (Inrap, France).

Ce partenariat réunissant les deux principaux acteurs de la recherche archéologique des deux côtés de la frontière a également abouti à la présentation au grand public d'une exposition *L'or des dinandiers : Fondeurs et batteurs mosans au Moyen Âge*, à la Maison du patrimoine médiéval mosan, entre les mois de mars et novembre de la même année. Cette année 2014 fut également l'Année de l'archéologie en Wallonie « Archéo 2014 », célébrant les 25 ans de régionalisation de la compétence archéologique en Belgique. C'est dans ce programme de festivités que le colloque et l'exposition ont pris naturellement place, offrant à un large public les résultats des recherches entreprises. On ne peut que se réjouir aujourd'hui que les Actes de ce colloque paraissent dans la foulée de la restructuration de l'Administration wallonne en charge du Patrimoine. En effet, dans les missions de la nouvelle Agence wallonne du Patrimoine sont maintenus les volets « études, recherches et publications » aux côtés des missions régaliennes et opérationnelles menées antérieurement par le Département du Patrimoine du SPW et l'Institut du Patrimoine wallon.

Le travail du cuivre et de ses alliages pourrait paraître un sujet extrêmement pointu, d'autant plus pour la période restreinte entre les 12$^{e}$ et 16$^{e}$ siècles, limites chronologiques données par le colloque. Et pourtant, cette manifestation a réuni pendant trois jours plus d'une centaine

## FOREWORD

During 15-17 May, 2014, the international symposium *History, Archeology and Archeometry of Brass, Bronze and Other Copper-Based Alloys in Medieval Europe (12$^{th}$-16$^{th}$ centuries)* was held in Dinant and Namur. The meeting was part of a research program focused on the copper-based alloy productions of the Meuse Valley jointly conducted by the Public Service of Wallonia (Belgium) and the National Institute for Preventive Archaeological Research (Inrap, France).

The partnership, which brings together the two main archaeological research communities on either side of the border, was responsible as well for the exhibition, *L'or des dinandiers: Fondeurs et batteurs mosans au Moyen Âge*, which was intended for the general public and installed at the Mosan Medieval Heritage Centre between March and November of 2014. 2014 was also the "Year of Archaeology" in Wallonia (Archéo 2014), celebrating the 25$^{th}$ anniversary of the regionalization of archaeology in Belgium. It was within this program of festivities that the symposium and the exhibition naturally took place serving to present the results of their research to a wider audience. We are now delighted that the proceedings of this symposium are being published following the restructuring of Wallonia's heritage authorities. Indeed, it is the mission of the new Wallonia Heritage Agency (AWaP) to sustain a program of study, research and publications, while continuing to be responsible for the governance and operational duties previously performed by the Heritage Department of the SPW and the Wallonia Heritage Institute.

An investigation of copper and its alloys might seem a highly specific subject, especially when restricted to the period between the 12$^{th}$ and 16$^{th}$ centuries, the chronological limit set for the symposium. And yet, this event gathered together for three days over a hundred participants from across Europe, de participants venus des quatre coins de l'Europe, et même d'autres continents, invités à partager leurs travaux les plus récents à travers une soixantaine de communications dont trente-quatre sont réunies dans le présent ouvrage.

Les contributions rassemblées autour du cuivre, sous la forme de matière première ou d'objets constituant une part importante de la culture matérielle de la période, mettent en évidence de nombreux angles d'approche, variés et complémentaires. La diversité des chercheurs concernés (archéologues, historiens, historiens de l'art, métallurgistes, restaurateurs et chimistes) ont permis de confronter les nombreuses sources et les multiples méthodes dans un objectif partagé, démontrant une fois encore l'intérêt d'une approche interdisciplinaire et la nécessité d'un dialogue permanent entre experts d'horizons différents.

Dans la préface de ce recueil, nous tenons à remercier tous les chercheurs qui ont accepté de partager leurs recherches, la « Cellule Events » de la DGO4 qui a pris en charge l'organisation opérationnelle et logistique de la manifestation, mais aussi Nicolas Thomas et Pete Dandridge pour avoir réuni ces travaux jusqu'à la publication de ce livre. La Maison du patrimoine médiéval mosan, en particulier Claire-Marie Vandermensbrugghe, sa directrice, et le Centre culturel régional de Dinant, la ville de Dinant et l'Institut européen du cuivre ont apporté leur aide logistique et financière dans le cadre de l'organisation du colloque.

Enfin, puisse cette publication augurer d'un développement des liens de coopération entre nos deux institutions, l'AWaP et l'Inrap, qui, outre le fait qu'elles relèvent toutes deux du Service public, ont des intérêts communs évidents à partager leurs compétences et savoir-faire, tant dans l'acquisition des données que dans leur exploitation et leur restitution.

Nous n'oublions pas que ces perspectives organisées au plus haut niveau de nos institutions passent par des liens humains forts de respect, de confiance, voire d'amitié parfois,

and even other continents, to share their most recent work in sixty presentations of which thirty-four are in this book.

The contributions in this compilation all address the subject of copper, as a raw material or in the form of objects representing an important part of the material culture of the period, and highlight the many varied and complementary approaches taken to its study. The diversity of the researchers involved (archaeologists, historians, art historians, metallurgists, conservators, and chemists) enabled them to exchange their varied sources and methodologies toward a common goal, demonstrating once again the value of an interdisciplinary approach and the need for ongoing dialogue between experts from different backgrounds.

In the preface to this collection of papers, we would like to thank all the researchers who have been kind enough to share their research, the Events Department of DG04 which was responsible for the organization and logistics associated with the event, and also Nicolas Thomas and Pete Dandridge for compiling these works and preparing them for publication in this book. The Mosan Medieval Heritage Centre, particularly its manager Claire-Marie Vandermensbrugghe, and the Regional Cultural Centre in Dinant, the Dinant City Council and the European Copper Institute provided logistical and financial assistance during the organisation of the symposium.

Finally, we hope this publication augers well for the development of a close collaborative relationship between our two institutions, the AWaP and INRAP, which, in addition to both being public services, have an obvious common interest in sharing their skills and expertise both in the acquisition of data and in its exploitation and dissemination.

We are well aware that these possibilities, organised at the highest levels of our institutions, create strong relationships based on respect, trust, and sometimes friendship, entre des femmes et des hommes qui unissent leur passion pour la recherche et s'épanouissent dans leur travail dans l'intérêt général.

Jean Plumier
Inspecteur général-expert de l' AWaP
General inspector Wallonia Heritage Agency
Namur, Belgique

between men and women, who share their passion for research and thrive in the work they undertake in the publics' interest.

Dominique Garcia
Président exécutif de l'Inrap
Executive president of Inrap
Paris, France

# INTRODUCTION AUX PRODUCTIONS EN LAITON, BRONZE ET AUTRES ALLIAGES À BASE DE CUIVRE DANS L'EUROPE MÉDIÉVALE (12E-16E SIÈCLES)

# INTRODUCTION TO BRASS, BRONZE AND OTHER COPPER-BASED ALLOYS IN MEDIEVAL EUROPE (12TH-16TH CENTURIES)

NICOLAS THOMAS & PETE DANDRIDGE

Aujourd'hui, il est bien difficile de poser un regard sur notre monde sans y déceler la présence, cachée ou non, du cuivre ou d'un de ses alliages. Ce métal est littéralement partout : dans tous les circuits électriques, les canalisations de nos maisons, dans nos voitures, trains, avions… Ce ne sont là que quelques exemples. Au Moyen Âge, le cuivre et ses alliages semblent afficher une présence plus discrète. Le métal le plus répandu est le fer qui constitue l'essentiel des métaux transformés, produits et consommés dans les villes comme dans les campagnes. Toutefois, entre les 12e et 16e siècles, la place du cuivre dans l'Europe médiévale n'en est pas moins remarquable : de Salerne à Londres, de Novgorod à Paris, il est présent sur tous les costumes sous forme de paillettes, de clous décoratifs, de boucles de ceinture et autres accessoires du costume. Il s'introduit progressivement dans toutes les cuisines comme pots à cuire, chaudrons ou poêles, dans les maisons plus ou moins cossues, même dans celles de la classe laborieuse. On le trouve sur la table quand il est chandelier, aiguière ou encore bassin pour se laver les mains. Les inventaires après décès et les testaments en témoignent.

Nombre de petits objets comme ceux de moyennes dimensions, de quelques grammes à quelques kilogrammes, sont des productions de masse réalisées en série, exportées sur de longues distances et participant à l'économie globale de l'Occident tout en formant un horizon culturel commun. Difficile de trouver une fouille archéologique sans plusieurs boucles de ceinture trouvées dans les niveaux du Bas Moyen Âge, un péage où les articles de batterie ne font pas l'objet de taxation, une foire où l'on ne voit un étal de vaisselle de cuivre. À Paris même, aux Champeaux, les chaudronniers disposent

Today, it is very difficult to look at our world without discovering the presence, hidden or not, of copper or one of its alloys. Copper is literally everywhere. For example, it can be found in all electrical circuits, in the pipes of our houses, and in our cars, trains, and planes. In the Middle Ages, copper and its alloys seem to have had a more discreet presence. The most widespread metal was iron, which constituted the bulk of the metals processed, produced and consumed in medieval cities as well as in the countryside. However, between the 12th and 16th centuries in medieval Europe, the status of copper and its alloys was no less remarkable: from Salerno to London, from Novgorod to Paris, it was present on all clothing as pins, mounts, belt buckles and other dress accessories. It was gradually introduced into every kitchen, in the houses of the wealthier classes as well as in those of the working class, in the form of cooking pots, cauldrons and pans, and it found its way onto dining tables as candlesticks, ewers, or basins for washing hands. Wills and probate inventories bear witness to these multiple object types.

Many small to medium sized objects, from a few grams to a few kilograms, were mass produced in series and exported over long distances as part of the global economy of the West contributing to the formation of a common cultural perspective. For the late Middle Ages, it is difficult to find an archaeological excavation that does not contain several belt buckles, a tax roll in which *dinanderie* is not listed, or a record of a fair without a stall of copperware. In Paris, in the Champeaux area, boilermakers had a covered market along the Rue de la Ferronnerie from the end of the 13th century on. For their trade in England, d'une halle le long de la rue de la Ferronnerie dès la fin du 13e siècle. Pour leur commerce en Angleterre, les Dinantais, considérés comme marchands de la Hanse teutonique, possèdent là leur entrepôt au bord de la Tamise, sur les quais de Londres.

À ces productions s'opposent d'autres aux caractéristiques non moins spectaculaires : le métal devient ostentatoire. Dans les églises, les bénitiers, crosses, croix, chandeliers, lutrins, fonts baptismaux, encensoirs, ciboires mais aussi portes, colonnes, lames funéraires ou encore cloches donnent à voir ou à entendre. Au sommet des beffrois, cloches et carillons participent aussi à renforcer le prestige des villes les plus opulentes. Le cuivre brille sur les toits, comme couverture ou, plus modestement, comme girouette des édifices civils ou aristocratiques. À Goslar, à Pérouse ou encore à Huy, le cuivre se métamorphose en fontaines, à Rome ou ailleurs en statues… Ces utilisations, qu'elles soient plus ou moins répandues ou exceptionnelles, ont un point commun : ce sont des productions sur commande. Même si l'on peut percevoir ici et là des indices de série, le plus souvent, ces œuvres sont l'aboutissement d'un lien direct entre un commanditaire, ecclésiastique, aristocratique, ou la ville elle-même, et un fabricant.

On trouve aussi le cuivre et ses alliages dans nombre d'artisanats et d'activités particulières : chaudières pour les brasseurs, les teinturiers et les étuves, mesures et balances pour le commerce des denrées vendues au poids ou en volume, mortiers et alambics chez l'apothicaire, sous forme de fil pour les formes à papier ou dans les instruments de musique… Moins pacifique, et requérant des quantités de métal toujours croissantes entre le milieu du 14e et le 15e siècle, le cuivre allié à l'étain se fait canon, bombarde, couleuvrine, fauconneau…

Les emplois très diversifiés du cuivre, allié à l'étain, au zinc et au plomb, dans des proportions variables, sont d'abord dus aux propriétés physiques et mécaniques de ces multiples alliages. Ils possèdent une excellente conductibilité thermique, appréciée pour les chaudrons, poêles et chaudières, mais aussi une résistance à la

the Dinant merchants, treated as part of the Hanseatic League, possessed their own warehouse on a London quay on the banks of the Thames.

Apart from these utilitarian products, there were others that were no less spectacular; indeed, the metal came to serve ostentatious purposes. Copper alloy stoups, croziers, crosses, candlesticks, lecterns, baptismal fonts, censers, and ciboria were introduced into churches along with doors, columns, funerary effigies and bells. These objects were intended to be seen as well as heard. From the top of the belfries, bells and carillons also helped to announce the prestige of the most opulent cities. Copper shone on the roofs, as a covering layer or, more modestly, as a weather vane for civic or aristocratic buildings. In Goslar, Perugia and Huy, copper was transformed into fountains or, in Rome and elsewhere, into statues. All of these forms of copper had one thing in common, whether or not they were generic or unique: they were all made to order. Even if one can find evidence for occasional series production, most often, these works resulted from a direct link between a sponsor—ecclesiastical, aristocratic, or the city itself—and a manufacturer.

Copper and its alloys were also utilized in many craft and specialist activities: boilers for brewers, dyers and public baths; measures and scales for the sale of food sold by weight or volume; mortars and alembics for the apothecary; wires for deckles used in paper making or for musical instruments. Serving less peaceful purposes was the ever increasing amount of copper alloyed with tin that was used between the middle of the 14th and the 15th century for the manufacture of cannons, mortars, culverins, and falconets.

The very diverse uses of copper, often alloyed with tin, zinc and lead in varying proportions, are due to the physical and mechanical properties of its multiple alloys. Their excellent thermal conductivity is advantageous for use in pots, pans and boilers while also being highly resistant to corrosion. The colour range is extensive: red to pink and yellow for brasses with the variation corrosion. La gamme de couleur de ces alliages est étendue : du rouge au rose et jusqu'au jaune plus ou moins soutenu en fonction de la teneur en zinc pour les laitons. Cet éclat proche de l'or a rendu ces laitons très attractifs pour la parure, pour le mobilier de la maison, celui dont on fait étalage, ou encore pour de plus grandes œuvres décoratives. Le cuivre peut aussi être doré pour afficher une surface plus opulente. L'attrait est également à chercher dans les propriétés mécaniques comme la résistance au choc : un chaudron de bronze est autrement plus robuste que son homologue en terre cuite. Les techniques de mise en forme sont variées, notamment par déformation plastique. Le cuivre est malléable et ductile, certains de ses alliages également. La plupart de ces matériaux peuvent être travaillés à froid, par martelage ou étirage pour les mettre en feuille ou en fil. Ils possèdent la faculté d'être mis en œuvre par fonderie, par coulage dans des moules. En plus du polissage donnant de la brillance, ces alliages sont usinables : ils peuvent subir des enlèvements de matière par ciselage, ou encore par alésage, par exemple pour les canons, les pièces d'horlogerie ou les instruments scientifiques. Le bronze, avec une concentration en étain autour de 20 %, sonne de façon remarquable, ce qui en fait le matériau incontournable pour les cloches ou les cymbales. Enfin, le cuivre et ses alliages sont facilement recyclables par fonderie. Toutes ces propriétés ont été exploitées au Moyen Âge.

Du fait de ses propriétés physico-chimiques, le cuivre est un métal demi noble, intermédiaire entre le fer et les métaux précieux. Il bénéficie d'une position similaire du point de vue de sa disponibilité et de sa valeur intrinsèque. La matière première est accessible, mais pas partout. L'Europe possède quelques grands gisements et de maints autres plus modestes, mais rien de comparable avec le fer tant du point de vue du nombre que de celui des conditions d'accès au minerai nettement plus aisées pour ce métal plus commun. Pour la période, les mines les plus importantes se trouvent en Allemagne, en Suède et en Italie. De fait, une fois les minerais transformés en métal, le cuivre voyage beaucoup en Europe, parfois sur de longues distances. Même si le recyclage très organisé dans les

principally based upon the zinc content. This gold-like luster makes brasses very attractive for finery, furniture that has pride of place in the home, and large decorative works. Copper can also be gilded to create an even more opulent surface. The alloys' attractions are also attributable to their mechanical properties, such as impact resistance—a bronze cauldron is more robust than its terracotta counterpart. Copper and some of its alloys are both malleable and ductile. Their ability to be plastically deformed allows their shaping by varied techniques. Most can be cold worked by hammering, formed in sheet or wire, or cast by pouring into molds. In addition, these alloys can be polished to a high shine, chiseled to remove material, and in the instance of guns, timepieces or scientific instruments, machined or bored. Bronze with a concentration of around 20% tin resounds remarkably, making it the essential material for bells and cymbals. Finally, copper and its alloys are easily recyclable by the foundry. All these properties were exploited in the Middle Ages.

Because of its physicochemical properties, copper is a semi-noble metal, intermediate between iron and precious metals. It enjoys a similar position relative to its availability and intrinsic value. The raw material is accessible but is not found everywhere. Europe has some large deposits and many more modest ones, but nothing comparable with iron ore in terms of supply and accessibility. During the medieval period, the largest mines were in Germany, Sweden and Italy. Therefore, once the minerals were turned into metal, copper was traded throughout Europe, sometimes over long distances. Even if recycling was well organized in the cities to ensure a part of their required supply, the increasing trade in goods and ever increasing needs of the market meant there was always a demand for fresh metal. From the 12th century, the search for new mines intensified throughout Europe. The metal was sought for itself, but its ores were also valued for more than just their copper content. At times copper ore was argentiferous, so copper became a byproduct of the extraction of silver, a coveted metal required to meet the monetary needs accompanying economic growth and trade.

villes assure une partie des approvisionnements, la diffusion croissante des productions et les besoins toujours plus importants créent une demande en métal neuf. À partir du 12e siècle, les recherches minières s'intensifient partout en Europe. Le métal est recherché pour lui-même, mais pas seulement. Parfois argentifère, le cuivre devient alors un sous-produit de l'argent, ce dernier métal étant convoité pour satisfaire les besoins en création monétaire accompagnant la croissance économique et les échanges.

Du matériau au produit, les conditions sont réunies pour qu'un véritable marché se développe à une échelle globale. Néanmoins, il manque à ce tableau brossé à grands traits les capacités techniques des moyens de production pour satisfaire la demande. Accompagnant le développement des villes où se concentrent à la fois la consommation et la production, les métiers s'organisent lentement au 12e et surtout au 13e siècle. Pour le travail du métal, partout en Europe, la tendance est à la spécialisation des métiers. Si l'archéologie vient parfois nuancer cette image donnée par les sources écrites, les fouilles d'ateliers métallurgiques permettent aussi de mieux appréhender les techniques et les savoir-faire, notamment au moyen de l'étude des chaînes opératoires et de l'analyse des objets et des déchets. On constate une standardisation des alliages, du moins pour la fonderie, une concentration des savoir-faire dans les mains de quelques-uns en même temps qu'une hiérarchisation au sein des ateliers et enfin une rationalisation permettant des productions à bas coût. À l'extrême, ces transformations de l'activité de mise en forme des objets favorisent la naissance d'un salariat et la mainmise du capitalisme marchand sur certains ateliers tournés vers les grands marchés d'exportation. L'adaptation des techniques au marché se fait par une algorithmisation toujours plus intense des savoir-faire et une segmentation

[1] Nous faisons ici la distinction entre les savoir-faire algorithmisés et ceux incorporés. Un savoir-faire algorithmisé est fondé sur la maîtrise d'algorithmes facilement décomposables et transmissibles notamment par un texte. Un savoir-faire incorporé résulte de l'expérience personnelle et peut difficilement être décomposé en séquences. La transmission se fait par l'apprentissage et le mimétisme.

From raw material to finished product, the conditions were right to develop a significant market on a global scale. However, what was missing from this broadly painted picture, was the technical capability of production to satisfy demand. Accompanying the development of cities where both consumption and production were concentrated, trades were gradually organized into guilds during the 12th and especially the 13th centuries. For metalworking, the trend throughout Europe was towards the specialization of trades. Archaeology sometimes provides a more nuanced view than the written records, while the excavations of metallurgical workshops, the study of their production processes and the analysis of their associated objects and wastes also help us better to understand the underlying techniques and knowledge. There was a standardization of alloys, at least for the foundry, a concentration of knowledge in a few hands, a workshop hierarchy, as well as a rational production process that minimized costs. In the extreme, these transformations in the activity of shaping objects promoted the emergence of a wage earning society, and the domination of certain workshops governed by mercantile capitalism and geared toward major export markets. The transformation of production techniques suited to this market was marked by an increase in algorithmic know-how and a segmentation in production processes especially noticeable in the manufacture of objects of little value and in the foundry.[1] In contrast, the creation of custom-made products and the maintenance and repair of objects offered opportunities for local markets to grow in cities. And finally, workshops were not always permanent but could move according to changing demands and needs.

At the end of the Middle Ages, several important innovations gradually spread through Europe

[1] We do distinguish here between the algorithmic know-how and embodied know-how. Algorithmic know-how is guided by algorithms that are easily segmented and transmitted, e.g. through texts. Embodied know-how depends on personal experience and is difficult to divide into sequences: it is instead acquired by learning through practice and imitation.

des chaînes opératoires que l'on remarque surtout dans la production d'objets de peu de valeur ou dans la fonderie[1]. À l'opposé, les productions sur commande, mais aussi l'entretien et la réparation de la vaisselle, offrent l'opportunité à un marché de proximité de s'accroître dans les villes. En outre, l'atelier n'est pas toujours un lieu fixe, il peut se déplacer au gré des commandes et des besoins.

À la fin du Moyen Âge, plusieurs innovations importantes vont progressivement se diffuser en Europe et modifier peu à peu les structures de l'industrie du cuivre. Le four à réverbère, dont le lieu comme la date d'apparition demeurent flous, se généralise au cours du 16e siècle. Ce type de structure fonctionne par convection, et donc sans soufflet, et le bain de métal placé dans un large bassin est séparé du foyer. Il permet de fondre des quantités de métal en une seule fois toujours plus importantes, jusqu'à plusieurs tonnes, tout en contrôlant plus efficacement toutes les étapes de la fusion du métal jusqu'à la coulée. Sans doute l'essor et les besoins de l'artillerie de bronze sont-ils à l'origine de ce progrès dans la fonderie. La mécanisation ensuite, alors que l'énergie hydraulique est largement utilisée durant les 14e et 15e siècles dans la métallurgie du fer, et plus marginalement pour le cuivre, le martinet à cuivre se propage dans toute l'Europe seulement à la fin de la période. Ce recours à cette énergie conduit à délocaliser le battage du cuivre, les affineries, voire la fabrication de produits finis ou de semi-produits, loin des villes, dans des vallées. Enfin, du côté des mines, la mécanisation s'étend aux opérations minéralurgiques avec le bocard concassant le minerai. L'appareil s'améliore significativement entre la deuxième moitié du 15e siècle et au cours du 16e siècle. Autre innovation, le *Saigerprocess*, procédé de traitement du cuivre argentifère par liquation et ressuage, est mis au point et perfectionné en Allemagne au milieu du 15e siècle. Le procédé permettant d'extraire encore plus efficacement l'argent du cuivre, et donc l'exploitation de gisements jugés avant peu rentables, nécessite de nombreuses opérations métallurgiques successives, et des investissements très lourds largement documentés par le livre XI du *De re*

and, little by little, changed the organization of the copper industry. The reverberatory furnace, whose place of origin and date of appearance remain unclear, came in general use during the 16th century. It works by convection, therefore without bellows, and the metal is melted in a large bowl separate from the hearth. It can melt larger quantities of metal in one go, up to several tons, while controlling more effectively all stages from the metal's melting to its casting. No doubt the increasing demand for bronze artillery was the impetus behind this advance in the founding process. While hydropower was widely used during the 14th and 15th centuries in iron metallurgy, and more marginally for copper, its mechanization of power hammers for copper tended to become more extensive throughout Europe only at the end of the period. The introduction of this form of energy production led to the relocation of copper hammering, refining, and even, to the manufacturing of finished products or semi-products to valleys far from the cities. Finally, on the mining side, mechanization extended to mineralogical operations with the ore being crushed by the *bocard* or stamping mill, a machine that improved significantly in the second half of the 15th century and during the 16th century. Another innovation was the *Saigerprozess* for the treatment of silvered copper by liquation and drying, which was developed and perfected in Germany in the mid 15th century. The process provided a more efficient method of extracting silver from copper deposits previously judged to be unprofitable, but it required successive metallurgical operations and a significant investment of funds. The process is largely documented in book XI of *De re metallica* (1556) by Georgius Agricola where a real factory is described with specific furnaces, very specialized machines, and distinct knowledge. The quantities treated are considerable and had no equivalent in the previous centuries. The process undoubtedly contributed to the colossal fortune of the Augsburg banker and businessman Jacob Fugger.

At the end of this short introduction to the proceedings of this conference, a vast subject emerges, albeit chronologically limited to a few centuries. It was not the objective of the *metallica* (1556) de Georgius Agricola. C'est une véritable usine qui est décrite, avec des fours spécifiques, des machines très spécialisées et des savoir-faire particuliers. Les quantités traitées deviennent considérables et n'ont pas d'équivalent durant les siècles antérieurs. Le procédé contribua sans nul doute à la fortune, colossale pour l'époque, du banquier et homme d'affaires Jacob Fugger d'Augsbourg.

Au terme de cette courte introduction aux actes de ce colloque, émerge un sujet très vaste, même limité chronologiquement à quelques siècles. L'objectif de ces journées n'était d'ailleurs pas d'épuiser la question, tant les angles d'approche sont à la fois variés et nombreux. Aux sources écrites abondantes, comme les comptes, les inventaires, les testaments ou encore les traités techniques, s'ajoutent les données fournies par différentes disciplines, en particulier par l'archéologie préventive et par l'archéométrie. Les données et les travaux se sont multipliés partout en Europe, il semblait donc utile de réunir les chercheurs et spécialistes de cette métallurgie du cuivre afin de dresser un bilan, même partiel de ces recherches.

Dans la vallée de la Meuse, Dinant et sa sœur Bouvignes sont des centres de production d'objets en cuivre, en bronze et en laiton, qui inondent de chaudrons, bassins et chandeliers, une bonne partie de l'Europe durant tout le Bas Moyen Âge, et même au-delà. À partir de 1466 et de la destruction de Dinant par Charles le Téméraire, duc de Bourgogne, de nombreux fondeurs et batteurs se réfugient et s'installent alors à Namur. Entre les 16e et 18e siècles, de cette dernière ville mosane, ce sont des milliers de chaudrons qui partent vers le Nouveau Monde comme objets de traite, via les ports d'Anvers puis de La Rochelle. Les villes de Dinant et de Namur étaient donc tout à fait appropriées pour accueillir un tel rassemblement autour des productions en cuivre au Moyen Âge.

symposium to exhaust the question, as the approaches to the subject are both varied and numerous. To the abundant written sources, such as accounts, inventories, wills, and technical treaties, are added the data provided by different disciplines, in particular preventive archaeology and archaeometry. As data and investigations have accumulated throughout Europe, it seemed useful to bring together specialists in copper metallurgy to draw up an assessment, even if only partial, of the current state of research.

Throughout the late Middle Ages and even beyond, Dinant and its sister city Bouvignes, both in the valley of the Meuse, were centres of production of objects in copper, bronze and brass which flooded the markets of a good part of Europe with cauldrons, basins and candlesticks. With the destruction of Dinant in 1466 by Charles the Bold, Duke of Burgundy, many founders and coppersmiths took refuge and then settled in Namur. Between the 16th and 18th centuries, thousands of cauldrons left this Mosan city via Antwerp's harbour and then La Rochelle to end up in the New World as objects of trade. The cities of Dinant and Namur were therefore highly appropriate to host this symposium around copper productions in the Middle Ages.

# ADRESSES DE CONTACT DES AUTEURS / *CONTACT ADRESSES OF THE AUTHORS*


**Lluïsa Amenós**
Cultural heritage
Barcelona Cathedral
C/ Sant Sever, 9
08002 · Barcelona
Spain
*inventari@catedralbcn.org*

**Bastian Asmus**
Labor für Archäometallurgie
Beroldingerweg 1
D-79194 Gundelfingen
Germany
*b.asmus@archaeometallurgie.de*

**Sally Badham**
Dawn Cottage
Purrants Lane
Leafield
Oxfordshire OX29 9PN
United Kingdom
*sallybadham@uwclub.net*

**Károly Belényesy**
HistoriArch Archeological Consulting Ltd,
Német utca, 10
1084 Budapest
Hungary
*historiarch@gmail.com*

**Francesca Bewer**
Harvard Art Museums
32 Quincy Street
Cambridge MA 02138
United States of America
*francesca_bewer@harvard.edu*

**Marc Bouiron**
Institut National de Recherches
Archéologiques Préventives
121 rue d'Alésia
F-75014 Paris
France
*marc.bouiron@inrap.fr*

**David Bourgarit**
Centre de Recherche et de Restauration des
Musées de France
Palais du Louvre
14 quai François Mitterrand
F-75001 Paris
France
*david.bourgarit@culture.gouv.fr*

**Caroline Bourlet**
CNRS - Institut de recherche et d'histoire des
textes
40 avenue d'Iéna
F-75116 Paris
France
*caroline.bourlet@irht.cnrs.fr*

**Roderick Butler**
Marwood House
Honiton
Devon EX14 1PY
United Kingdom
*v.butler9@btinternet.com*

**Francesco M. P. Carrera**
Ministero dei beni e delle attività culturali e del
turismo
Soprintendenza Archeologia, belle arti e
paesaggio per le province di Sassari e Nuoro
piazza Sant'Agostino, 2
07100 – Sassari (SS)
Italia
*francesco.carrera@beniculturali.it*

**Manon Castelle**
Centre de Recherche et de Restauration des
Musées de France
Palais du Louvre
14 quai François Mitterrand
F-75001 Paris
France
*manon.s.castelle@gmail.com*

**Sophie Challe**
Service public de Wallonie–DGO4
AWaP–Direction d'appui scientifique et technique
Rue des Brigades d'Irlande, 1
B-5100 Jambes
Belgique
*sophie.challe@awap.be*

**Yann Codou**
Université Côte d'Azur
CNRS UMR 7264 CEPAM
Pôle universitaire Saint-Jean-d'Angély
Avenue des Diables-bleus, 24
F-06357 Nice Cedex 4
France
*yann.codou@unice.fr*

**Lise Damotte**
Service d'Archéologie de Nice Côte d'Azur – SANCA Route de Canta Galet, 107
F-06364 Nice
France
*lise.damotte@nicecotedazur.org*

**Pete Dandridge**
Objects Conservation
The Metropolitan Museum of Art
10000 5th Ave,
New York, NY 10025
United States of America
*pete.dandridge@metmuseum.org*

**Claire Delhon**
Université Côte d'Azur
CNRS UMR 7264, CEPAM
Pôle universitaire Saint-Jean-d'Angély
Avenue des Diables-bleus, 24
F-06357 Nice Cedex 4
France
*claire.delhon@cepam.cnrs.fr*

**Michael Depreter**
Harris Manchester College (University of Oxford)
Mansfield Road
OX1 3TD Oxford
United Kingdom
*michael.depreter@history.ox.ac.uk*

**Paul Dooley**
Irish World Academy of Music and Dance,
University of Limerick,
Castletroy,
V94 DK18 Limerick
Ireland
*paul.dooley@ul.ie*

**Arne Espelund**
Valøyvegen 10
7031 Trondheim
Norway
*arne.espelund@outlook.com*

**Florence Fabijanec**
Zavod za povijesne znanosti HAZU
Strossmayerov trg 2
10 000 Zagreb
Croatie
*flofaber@hazu.hr*

**Daniel Fellenger**
Auf der Horst 117
D-30823 Garbsen
Germany
*fellenger@hotmail.de*

**Silvia Faccin**
Fondazione Museo del Tesoro del Duomo e Archivio Capitolare
Piazza Alessandro D'Angennes, 5
13100 Vercelli
Italy
*silvia.faccin@tesorodelduomovc.it*

**Carlotta Gardner**
The Fitch Laboratory
British School at Athens
Souedias 52
GR10676 Athens
Greece
*Carlotta.gardner.11@ucl.ac.uk*

**Mainardo Gaudenzi Asinelli**
Research Group in Mechatronics and Modelling Applied on Technology of Materials (UVic-UCC)
Carrer de la Laura, 13
08500 Vic
Spain
*mainardo.gaudenzi@uvic.cat*

**Enrico Giannichedda**
ISCUM-Instituto della Cultura Materiale
Piazza Sarzano 35
16128 Genova
Italy
*e.giannichedda@libero.it*

**Isabelle Gillot**
Université Côte d'Azur
CNRS UMR 7264 CEPAM
Pôle universitaire Saint-Jean-d'Angély
Avenue des Diables-bleus, 24
F-06357 Nice Cedex 4
France
*gillot@unice.fr*

**Christopher Green**
School of Archaeology, Geography and
Environmental Science
University of Reading
Wager Building
Whiteknights
PO Box 227
Reading RG6 6AB
United Kingdom
*greenc@waitrose.com*

**Dorothee Kemper**
Deutscher Verein für Kunstwissenschaft e.V.
Jebensstr. 2
D-10623 Berlin
Germany
*dvfk@alice.de*

**Emmanuel Lamouche**
Université de Nantes - UFR d'Histoire, Histoire
de l'art et Archéologie
Département d'Histoire de l'art et Archéologie
Chemin de la Censive du Tertre - BP 81227
F-44312 Nantes Cedex 3
France
*emmanuel.lamouche@hotmail.fr*

**Susan La Niece**
Department of Scientific Research
The British Museum
London WC1B 3DG
United Kingdom
*slaniece@britishmuseum.org*

**Bernard Léchelon**
27, avenue de Tourville
F-75007 Paris
France
*bernardlechelon@wanadoo.fr*

**Robert Lehmann**
Wülferoder Str. 34
D-30880 Laatzen
Germany
*dr.robertlehmann@web.de*

**Mathieu Linlaud**
Université Paris Nanterre
Département d'Histoire de l'art et Archéologie
200 avenue de la République
F-92001 Nanterre Cedex
France
*mlinlaud@parisnanterre.fr*

**Étienne Louis**
Arkéos – Musée – Parc archéologique
4401, route de Tournai
F-59500 Douai
France
*elouis@douaisis-agglo.com*

**Marcos Martinón-Torres**
McDonald Institute for Archaeological
Research
Downing Street
Cambridge CB2 3ER
United Kingdom
*m.martinon-torres@cam.ac.uk*

**Elisabetta Neri**
CNRS-UMR 8167 Orient & Méditerranée
INHA, Institut national d'histoire de l'art
2, rue Vivienne, salle 241
F-75002 Paris
France
*elisabetta.neri.fr@gmail.com*

**Sophie Oosterwijk**
School of Art History
University of St Andrews
79 North Street
St Andrews Fife KY16 9AL
United Kingdom
*so4oosterwijk@gmail.com*

**Željko Peković**
Department of Art History
Faculty of Philosophy
Universtiy of Split
Sinjska 2
21000 Split
Croatia
*zeljko.pekovic@gmail.com*

**Catherine Péters**
Service public de Wallonie–DGO4
AWaP–Direction opérationnelle de la Zone Est
Avenue des Tilleuls, 62
B-4000 Liège
Belgique
*catherine.peters@awap.be*

**Fabienne Ravoire**
Institut National de Recherches
Archéologiques Préventives
Zac des Jalassières
F-13510 Éguilles
France
*fabienne.ravoire@inrap.fr*

**Catherine Richarté-Manfredi**
Institut National de Recherches
Archéologiques Préventives
Zac des Jalassières
F-13510 Éguilles
France
*catherine.richarte@inrap.fr*

**Monique de Ruette**
Musées royaux d'Art et d'Histoire
Parc du Cinquantenaire, 10
B-1000 Bruxelles
Belgique
*m.deruette@mrah.be*

**Pascal Saint-Amand**
Maison du patrimoine médiéval mosan
(MPMM)
Place du Bailliage, 16
B-5500 Dinant
Belgique
*bouvignes@hotmail.com*

**Lise Saussus**
Centre de recherches d'archéologie nationale
Université catholique de Louvain
Collège Érasme - L3.03.01
Place Blaise Pascal, 1
B-1348 Louvain-la-Neuve
Belgique
*lisesaussus@gmail.com*

**Dylan Smith**
Department of Objects Conservation
National Gallery of Art
2000B South Club Drive
Landover MD 20785
United States of America
*dt-smith@nga.gov*

**Irfan Teskeredžić**
Stanak – the Society for the Study of Medieval
Bosnian History
Franje Račkog, 1
BIH-71000 Sarajevo
Bosnia and Herzegovina
*narfi_sa@yahoo.de*

**Peter Tiernan**
Bernal Institute, School of Engineering
Faculty of Science and Engineering
University of Limerick
Castletroy
Limerick V94 T9PX
Ireland
*peter.tiernan@ul.ie*

**Nicolas Thomas**
Institut National de Recherches
Archéologiques Préventives
34-36 avenue Paul-Vaillant-Couturier
F-93120 La Courneuve
France
*nicolas.thomas@inrap.fr*

**Nikolina Topić**
Taborska 31
10000 Zagreb
Croatia
*nikolinatopic@gmail.com*

**Françoise URBAN**
Restauratrice d'œuvres en métal
Rue Marie-Thérèse, 89
B-1210 Bruxelles
Belgique
*michiels.urban@gmail.com*

**Laurent VERMARD**
Institut National de Recherches
Archéologiques Préventives
12 rue de Méric
CS 80005
F-57063 Metz Cedex 2
France
*laurent.vermard@inrap.fr*

**Carla VOGT**
Technische Universität Bergakademie Freiberg
Fakultät für Chemie und Physik
Institut für Analytische Chemie
Leipziger Straße 29
D-09599 Freiberg
Germany
*Carla.Vogt@chemie.tu-freiberg.de*

**Jean-Marie WELTER**
7, rue de l'Ordre de la Couronne de Chêne
L-1361 Luxembourg
Grand-Duché de Luxembourg
*jean-marie.welter@pt.lu*

**Lisa WIERSMA**
Universiteit Utrecht
Departement Geschiedenis en
Kunstgeschiedenis
Drift 6
3512 BS Utrecht
Netherlands
*A.L.Wiersma@uu.nl*

# COMITÉ SCIENTIFIQUE DU COLLOQUE ET ÉVALUATEURS DES ARTICLES / *SCIENTIFIC COMMITTEE OF THE SYMPOSIUM AND REVIEWERS OF THE ARTICLES*

**SPW** | *Éditions*

# CUIVRES, BRONZES ET LAITONS MÉDIÉVAUX / MEDIEVAL COPPER, BRONZE AND BRASS

Histoire, archéologie et archéométrie des productions en laiton, bronze et autres alliages à base de cuivre dans l'Europe médiévale (12e-16e siècles)

History, archaeology and archaeometry of the production of brass, bronze and other copper alloy objects in medieval Europe (12th-16th centuries)

Cet ouvrage contient les actes d'un colloque international consacré aux productions médiévales en alliage à base de cuivre qui s'est tenu à Dinant et à Namur les 15, 16 et 17 mai 2014. Ces journées ont été organisées par le Service public de Wallonie (Belgique) et l'Institut national de recherches archéologiques préventives (France). Les actes rassemblent 34 contributions originales livrées par des spécialistes, archéologues, historiens, historiens de l'art ou encore métallurgistes et chimistes. Ils montrent la grande diversité des approches et des thèmes abordés au moyen de ce matériau très présent dans la culture matérielle. Au Bas Moyen Âge, le cuivre entre progressivement dans la fabrication de nombreux objets du quotidien, que ce soit pour la parure, sous forme de boucles de ceintures ou de petits éléments décoratifs du costume, ou encore dans la cuisine et les maisons quand il devient chaudron, aiguière, bassin ou puisette. À ces productions en série, souvent de masse, s'opposent des travaux réalisés sur commande pour l'aristocratie ou à des fins liturgiques. Le métal se décline alors sous l'aspect d'aquamaniles, de chandeliers d'autel, de lutrins… Le matériau est utilisé pour des œuvres monumentales comme des colonnes, des portes, des fonts baptismaux, des fontaines, des monuments funéraires ou encore des cloches. On trouve aussi le cuivre dans des contextes artisanaux, dans l'artillerie, les instruments de musique ou encore la monnaie. En explorant un vaste sujet par des angles variés, ce livre intéresse l'archéologie bien sûr, mais aussi l'histoire des techniques, l'histoire de l'art, l'histoire économique ou encore l'histoire sociale. Il s'adresse à un public averti, ou plus simplement curieux de l'histoire du Moyen Âge en Europe.

*This volume contains the proceedings of the International Conference on Medieval Copper Alloys Production, held at Dinant and Namur on 15, 16 and 17 May 2014. The conference was organised by the Service public de Wallonie (Belgium) and the Institut national de recherches archéologiques préventives (France). The proceedings include 34 original contributions presented by archaeologists, historians, conservators, art historians, and other specialists, including metallurgists and chemists. Collectively, they show the great diversity of approaches being taken to elaborate the multiple themes associated with copper and its alloys in the material culture of medieval and post-medieval Europe. In the late Middle Ages, there was a gradual increase in the use of copper and its alloys for making everyday objects, whether for dress accessories, such as belt buckles or small decorative studs, or in kitchens and houses where the metal became a cauldron, ewer, basin or lavabo. In contrast to these common objects fabricated in serial or mass production, were the exceptional, discrete objects satisfying the needs of the aristocracy and liturgy. Such made-to-order masterpieces might include aquamanilia, candelabra or lecterns. Additionally, copper alloys were used for more colossal works of art such as columns, doors, baptisteries, fountains, funeral monuments and, of course, bells. Copper was equally sought in artisanal contexts, for artillery, for musical instruments, and for coinage. In exploring such a vast subject from multiple points of view, this volume will be of interest not only to archaeologist, but also to those involved in the history of techniques,*

Prix de vente : 40 €

9 782390 380160

Wallonie patrimoine AWaP

Institut national de recherches archéologiques préventives

Inrap