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Monumentale Tierbronzen im Mittelalter

Herausgegeben von Joanna Olchawa

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Wondrous Animals

Zoomorphic Metal Figures from al-Andalus*

The metal objects fashioned in al-Andalus are an integral and prominent part of the amazing range of art produced during the Umayyad Caliphate up to its end in AH 423/AD 1031, during the ensuing Taifa period of smaller, independent kingdoms, and on into the early years of the Almoravids (*ca.* 483/1090–545/1150). Together, these constitute the period under consideration in this article, from the fourth/tenth to the early sixth/twelfth century. Metal production from this period takes its place alongside stone, stucco, ivory and wood carving, ceramics, and textiles, revealing the same high standards of technical skill.¹ Just as the famous pyxides (cylindrical boxes with domed lids) carved in relief are outstanding examples of excellence in working ivory, among the various types of extant metal objects it is the zoomorphic figures that stand out as particularly impressive and innovative. They are usually considered bronze, and this has been confirmed recently for several of them by metallurgical analysis. Important evidence has also recently emerged regarding the provenance of copper, a major component of bronze, which in addition to Cyprus we now know to have been sourced in the Maghreb and therefore to have been available in both Spain and Morocco during the period in question.²

As this essay will show, from a stylistic point of view the design and decoration of these figures were informed by a tradition of abstract representation of the natural world as well as by functional considerations and the environment in which they would be placed. Along with their connection to the other art forms of Spain, their role in a palatial

* I would like to thank Joanna Olchawa for inviting me to participate in this project, and for her comments on a draft of this article. My colleagues and friends Antonio Vallejo Triano, Sergio Vidal Álvarez, Mounia Chekhab Abudaya, and Eduardo Manzano Moreno generously answered my queries and provided photographic material: I am very grateful to them. I am also grateful to Farouk Yahya, who helped with bibliographical references and sources online during a time when there was no access to libraries. Note: all readings and translations from the Arabic are mine unless otherwise stated.

1 For useful overviews in English of the arts of al-Andalus, see: Dodds 1992; Rosser-Owen 2010.

2 For recent analysis see Northover 2018, which also contains a discussion of copper from the Maghreb on p. 95; and *id.* 2018b; Ponting 2018; Gener/Montero-Ruiz 2018; Lorenzetti/Grifoni/Legnaioli/Pagnotta/Palleschi 2018.

or garden setting will be highlighted here, placing them among the performative objects that were so much a part of the culture of al-Andalus.

Certain motifs are common to objects across different media, especially wood, ivory, and metal, and also establish a connection with architecture. The splendidly carved stone panels from Madīnat al-Zahrā' (the Caliphal city built by 'Abd al-Raḥmān III in the tenth century), for example, originally on the walls of the Salón Rico, have interesting decorative programmes with the Tree of Life generating branches of vegetal motifs, leaves, and fruits, all celebrating the natural world.³ Scenes from the princely cycle in other media, such as ivory, would thus have been complemented by these representations of the fertility and prosperity sustained by the power and protection of the ruler, whose munificence would be celebrated in panegyric verse recited and sung in his honour at court gatherings. A *qaṣīda* (panegyric ode) by al-Muḥannad (315/927–390/999), recited in Córdoba in 363/974 during the double celebrations of 'Īd al-ḥiṭr and al-Ḥakam II's (350/961–366/976) military victory over the Idrisids, is preserved in Ibn Ḥayyān's (377/987–469/1076) *al-Muqtabis fī tārikh al-Andalus* (primarily based on accounts by 'Isā al-Rāzī, d. 370/980):

- "4 So he protected his flock, seeking victory
from the Throne's Master
5 He expended his wealth on them, unsparingly,
so that their wealth would multiply
6 His beneficence dispelled their misery;
his grace turned their penury to plenty.
7 He assumed the caliphate in its epoch,
then by his piety perfected it.
8 His religion was its adornment;
his luminous days its very image.
9 Were any form of rule raised above it,
he would be the only ruler right for it.
10 No virtue of right guidance can be mentioned
that he has not already acquired."⁴

The theme of the prince as bestower of bounty is ubiquitous – being prominent also in Abbasid panegyric, for example – and could also be expressed indirectly, as in the story of the unicorn in the *Kitāb Na't al-Ḥayawān*. There, the unicorn, as an *amīr*, saves the other animals by cleansing a pool of its poison, thus calling upon an equally ubiquitous core metaphor of water: the prince is a sea of generosity and succour.⁵

Similar decorative programmes are found not only elsewhere in architecture, for instance, on panels and capitals, but also on zoomorphic metal figures produced in the

3 Ewert 1987.

4 Selected verses of the *qaṣīda* and translation by Stetkevych 1997, p. 4; see also: Ibn Ḥayyān 1967, p. 198; Anderson 2013, p. 155; Anderson / Rosser-Owen 2015, p. 36. For courtly art and culture during the Taifa period see: Robinson 2002.

5 Ibn Bakhtishū', *Kitāb Na't al-Ḥayawān*, Baghdad, ca. 617/1220–622/1225, London, British Library, Or. 2784, fols. 196r–198r and fols. 211v–213v (reconstructed fols: 105r–107r and 121v–123v respectively); Contadini 2003, esp. p. 27 and footnotes 51 and 52; Contadini 2012, pp. 96–99.

Caliphal period. Among these figures are the Córdoba Deer, in the Córdoba archaeological collections but presently on display at the Madīnat al-Zahrā' Museum, and the MAN Deer, in the Museo Arqueológico Nacional in Madrid. The decoration on the bodies of each consists of a variety of leaf motifs, at times almost identical in form to those of the stone carvings from the Salón Rico panels just mentioned. That similar imagery appears on later material, such as the mid-eleventh-century capital from Aljaferia, now in Zaragoza⁶, points to a continuity of ornamental approach beyond the Caliphal period, and extending to Morocco.⁷

In many cases these intricately carved or decorated objects have court connections. Inscriptions on ivory boxes and stone capitals, for example, attest that they were produced for caliphs, their relatives, or members of the aristocracy, and although the inscriptions on metalwork may lack such explicit references, some pieces have been unearthed within the palace complex of Madīnat al-Zahrā'. The famous historian al-Maqqarī (ca. 986/1578–1041/1631, quoting Ibn Ḥayyān) speaks of twelve animal figures in red gold (*al-dhahab al-aḥmar*) – which can be interpreted as gilded bronze – that were commissioned by Caliph 'Abd al-Raḥmān III to be placed around a basin in Madīnat al-Zahrā', and produced in the *dār al-ṣinā'a* (or 'house of manufacture', workshop) in Córdoba (*mimmā 'umil bi-dār al-ṣinā'a bi-qurṭuba*).⁸ We may assume that, alongside such special orders, the Córdoba workshop would have produced a range of goods not meant exclusively for the court.

It is therefore reductive to speak specifically of court ateliers: as with Egyptian, Fatimid textiles of the tenth to twelfth century, or with Iranian metalwork of the twelfth century⁹, the artists and craftsmen of al-Andalus produced different items for different types of clientele. Archaeological finds provide us with evidence of a varied production of metal objects from the Caliphal and later periods. For example, along with the expertly decorated luxury pieces, we have a plain brass pitcher from the second half of the tenth century, found in a quarter of Córdoba.¹⁰

Bronze Zoomorphic Fountain Pieces

Among the most significant examples of zoomorphic metal figures – this cannot be a comprehensive survey – are three from the Caliphal period, and specifically from the second half of the tenth century: the Córdoba Deer, the Doha Hind, and the MAN Deer

6 Museo de Zaragoza, inv. no. 7680; see: Dodds 1992, p. 257, no. 45 (Cynthia Robinson).

7 For an overview see: Contadini 2000; Lintz / Déléry / Tuil Leonetti 2014.

8 Al-Maqqarī 1855–1861, vol. 1, p. 374; Ibn al-'Idhārī 1948, vol. 2, p. 246; see also: Bargebuhr 1956, pp. 214–215; Camber / Contadini 2018, p. 72. The animal figures include a lion, a gazelle, a peacock, and a falcon.

9 Sokoly 1997; Contadini 1998, chapter 2, for the Fatimid *tirāz* industry; and for this particular point and an interpretation of the inscriptions on the Bobrinsky bucket see: Contadini 2017.

10 Córdoba, Museo Arqueológico y Etnológico de Córdoba, inv. no. CE30866; see: Vallejo Triano 2018, p. 272, fig. 11 and note 99. When found, it contained coins from the Caliphal period.



1 Córdoba Deer, Madīnat al-Zahrā', second half of tenth century, Madīnat al-Zahrā', Museum (part of the Museo Arqueológico y Etnológico de Córdoba)



2 Doha Hind, Madīnat al-Zahrā', second half of tenth century, Qatar, Museum of Islamic Art

(figs. 1, 2, 3).¹¹ Together with others of a later date, they shared a common function as fountain objects. The legs of the Córdoba Deer and the Doha Hind are soldered to a rectangular pedestal. In both cases, a metal pipe is visible rising vertically into the underside of this pedestal. As there is no trace of an opening in the belly nor of a pipe inside the mouth, a pipe must have fed the water supply into the pedestal and thence through the legs, into the body, and out through the wide open mouth.¹² In contrast, the MAN Deer, like the later zoomorphic bronzes, is not positioned on a pedestal and has a round hole in its belly into which the water pipe would have fed. This diversity in the technology of channelling the water points to the different ways in which these figures would have been placed in the gardens – some on plinths, others around a basin – carefully staged to add variety to the performative roles of such gardens.

- 11 The bronzes in Córdoba and Madrid show clear evidence that they once had horns. However, I deliberately use the word deer rather than stag, as female deer can also have horns. In the case of the Doha Hind, this is clearly a female: since there is no space or other trace of horns, we are sure of the gender.
- 12 I am grateful to Mounia Chekhab Abudaya of the MIA in Doha for her help in confirming this information for the Doha Hind, and for photographic evidence.



3 MAN Deer, Córdoba, second half of tenth century, Madrid, Museo Arqueológico Nacional

A technology similar to that of the MAN Deer was evidently used in the fountain piece in the shape of a deer in the Bardo National Museum in Tunis (fig. 4)¹³, which still has part of a pipe attached directly to its belly. This piece has lost part of the front legs, and there are holes where the ears would have been and raised concave stumps which would have housed the base of the horns, now lost. Unlike the Spanish bronzes, the Bardo Deer does not have decorative motifs across its body, but does have a ribbon, in relief, around its neck, from which hangs a crescent, as if the deer is wearing a necklace. Found in Cap Bon (Ra's al-tīb) in Tunisia, it is believed to have been made in either Tunisia or Egypt during the Fatimid period, and if so, would confirm the production of zoomorphic metal figures across the Western Islamic world.

Given their common function, these pieces are testaments to the importance of gardens and fountains with animals spouting water in this area during the period in question, the tenth to twelfth centuries, and even well beyond, as demonstrated by other gardens in Spain and North Africa, for example, the gardens and the Patio de los Leones in the Alhambra, which date to the fourteenth century. The twelve stone lions in the Alhambra

13 Tunis, Bardo National Museum, inv. no. 2817, H. 32.5 cm, L. 28 cm; datable to between the tenth and the eleventh century. This is a piece I was not able to examine in person. Cf. Zbiss 1957, p. 303, fig. 43; Jenkins 1993, p. 81.



4 Bardo Deer, Tunisia or Egypt, tenth or first half of eleventh century, Tunis, Bardo National Museum

(although they may date earlier) together support a large stone basin on their backs. An underground supply of water is channelled through a metal pipe inserted into one of the front legs of each of the lions, and runs up to the mouth, where the metal spout is visible.¹⁴

The largest of the three metalwork pieces, the Córdoba Deer is a masterpiece of Caliphal metalwork production. It features the tail and ears of a deer, and stumps on the top of the head, beside the ears, for the insertion of horns (probably of a different material, such as ivory or bone), now lost.¹⁵ A delicate incised decoration of interlocking roundels containing a stylized leaf decoration, with a larger roundel at the chest, produces the effect of a textile covering the back, flanks, and chest.

Surprisingly, perhaps, given its size and the quality of the craftsmanship, the piece has no inscriptions. However, as it was discovered in the ruins of the caliphal city of Madīnat al-Zahrā', its provenance is reasonably secure. As the sixteenth-century historian Ambrosio de Morales (1513–1591) reports in his *Las antigüedades de la ciudades de España*:

“Hanse hallado tambien en Cordova la vieja muchas antiguallas, de diversas maneras en diversos tiempos. Destas son la rica pila de marmol blanco de dos varas en largo, y mas de una en alto, y otra en ancho, qsirve agora de fuente en el monesterio de san Geronimo, e nel claustro principal. Hallaronse

- 14 On the lions, see: Cabanelas Rodríguez / Fernández Puertas 1979–1981; Fernández Puertas 1997. The X-rays done during the restoration of both the fountain and the lions revealed the hydraulic systems used: Villafranca Jiménez 2012, in particular see the images and drawings on pp. 102, 123–124, 136; Fernández Manzano 2011–2012.
- 15 Madīnat al-Zahrā', Museum (but part of the collection of the Museo Arqueológico y Etnológico in Córdoba), inv. no. CE000500, H. 61.6 cm. The literature on this object is vast; see, for example: Dodds 1992, pp. 210–211, no. 10 (Cynthia Robinson); Bernus-Taylor / Delpont 2000, p. 114, no. 90 (Sophie Makariou); Contadini 2018b, p. 211, fig. 13, p. 250; Vallejo Triano 2018, pp. 268–269, fig. 9; Vidal Álvarez 2019.

dentro desta pila un ciervo y una cierva de laton ricamente labrados, poco meno res que un cabrito. El ciervo echa el agua en la pila, y la cierva esta e nel sumptuosissimo monesterio de nuestra Señora de Guadalupe, en la fuente, que esta delante el refitorio.”¹⁶

According to this account, a rectangular white marble basin and a metal deer and hind, all richly decorated, were located in the monastery of San Geronimo, and had come from ‘Old Cordoba’, so called by de Morales because he associated the site of *Madīnat al-Zahrā’* with the Roman city.¹⁷ The nearby palatial city served as a quarry for the monastery of San Geronimo. It is therefore very likely, and commonly accepted, that the two metal figures mentioned by de Morales are the Córdoba Deer and the Doha Hind, and that these were unearthed in the course of removing masonry for the monastery. As they share an aesthetic approach and were found together, they may well have been designed as a pair.

The Doha Hind has the tail and ears of a deer, but lacks any evidence of horns, an indication that this is a female, a hind.¹⁸ It, too, has a delicate decoration of roundels incised across the body, but the leaf contained in each roundel differs from that on the Córdoba Deer. The bigger roundel on the chest here has an eight-petalled rosette at its centre, surrounded by rings containing other decorative motifs, including a series of stylized lily-of-the-valley flowers.¹⁹ These are, however, minor features differentiating otherwise strongly similar decorative shapes and designs between the Doha Hind and the Córdoba Deer.

The third and smallest of our deer-like bronzes, now in the MAN, is a very beautiful piece that was found in the 1940s in a dig in a quarter of Córdoba.²⁰ The head, rather damaged, bears traces of ears (now holes) and of horns (now a hole and a raised stump). A series of incised, interlocking roundels covers the body, and, unlike on the other two pieces, the leaves contained therein are of diverse types, one of which is similar to that on the Córdoba Deer. It is worth noting that here, unlike the Córdoba Deer and the Doha Hind, not all the roundels contain a design: some are contoured with gilt, yet left empty. This clever and carefully planned alternation of roundels with and without designs enhances the overall design effect, highlighting through contrast those roundels with the internal designs.

16 Morales 1575, fol. 116v.

17 At that time nothing was known about *Madīnat al-Zahrā’*. As mentioned in Ruggles 1991, pp. 133–135 and footnote 17, it was al-Maqqarī’s translation by Pascual de Gayangos (al-Maqqarī 1840–1843) that led historians and archaeologists to start a search for *Madīnat al-Zahrā’*, the earliest being that of Ricardo Velázquez Bosco in 1910 in and around the area known as ‘Córdoba la Vieja’. Thanks to Eduardo Manzano Moreno for discussing this point with me.

18 Doha, Museum of Islamic Art, inv. no. MW.7.199, H. 48.1 cm (from the top of the ears to the bottom of the base); see: Allan 2002, p. 19; Greenwood 2018.

19 It is interesting to find here lily-of-the-valley motifs, as these seem to be associated with Spain. For example, they are later found in Mamluk-like gilded and enamelled glass produced in Spain (Barcelona?) in the fourteenth or fifteenth century; see: the mosque lamp in Carboni 1989, pp. 150–151, fig. 6; Contadini 1999, p. 13, fig. 32.

20 Madrid, MAN, inv. no. 1943/41/1; see: Camps Cazorla 1943; Torres Balbás 1944; Gómez-Moreno 1951, p. 336, figs. 387a, b; Contadini 2018b, p. 226, fig. 36, p. 250; Vidal Álvarez 2019.



5 Monzón Lion, Spain, late eleventh to early twelfth century, Paris, Musée du Louvre

Whether the Córdoba Deer and the Doha Hind were gilded is still a matter of investigation. However, there is no doubt in this respect for the MAN Deer, which retains much gilding, as has now been confirmed by the technical analyses performed within the “Griffin and Lion” project.²¹ Marc Gener and Ignacio Montero explain the technique well:

“In the case of the gilt objects, the Madrid deer and the Nasrid bucket, the presence of mercury is indicative of fire gilding, a widely known technique that involves the preparation of a gold and mercury amalgam that is then applied to the surface to be gilt. Afterwards, heat is applied in order to evaporate the mercury, leaving behind a thin layer of metallic gold that was then burnished as a final step.”²²

On the MAN Deer, gilt was used to accentuate certain aspects of the incised decoration: on the contours of the roundels and on the dotting and floral motifs within them, as well as on the contours and the dotting of the geometrical design in between the roundels.

In terms of visual rendering we note also an indented vertical line dividing the chest, and the more pronounced sculptural treatment of the articulation of the thighs, making them stand out in relief against the body, a feature that would be carried on later, as the Mari-Cha Lion demonstrates.²³

21 The output of this project has been published as Contadini 2018; see also four short videos: Contadini 2012b.

22 Gener / Montero-Ruiz 2018, p. 142, table on p. 140.

23 Abu Dhabi, Louvre, inv. no. LAD 2017.002, H. 45 cm, L. 73 cm; see: Camber / Contadini 2018 and Camber 2018 and fig. 8 in the present contribution.

Stylistically, these three pieces have much in common, and as we move on in time, the aesthetic approach to the form and decoration of zoomorphic figures exhibits a continuation and enhancement of their characteristic features, as shown in the next important bronzes, which date to the eleventh and early twelfth centuries.

The Monzón Lion (fig. 5), was found at Monzón de Campos in the province of Palencia²⁴, and is datable to the period in question on the basis of epigraphical and stylistic evidence.²⁵ Now in the Louvre, it was previously part of the collection of the Spanish painter and collector Mariano Fortuny y Marsal. Rather than being found by him, as is often reported, it was probably an accidental find by local people.

This animal too, with an opening in the belly and wide open mouth, was a fountain piece. Past literature sometimes classified it as an aquamanile, probably taking its impressive tail as a handle. That it could not have had this function is shown by the fact that the tail is articulated and movable, hinged to the rear of the lion with a bolt. As there is no opening into the body at the tail, the reason for the movable tail is obscure. I would suggest that this feature was added to enhance the effect of wonder.

Apart from the presence of stylized tufts that evoke a mane, the Monzón Lion differs from the earlier pieces in how its decoration is conceptualized. Rather than being spread all over the body, the varied motifs are organized within specific, delineated areas. These include shield-like elements filled with volutes in the transitional zone between the body and the legs, a feature also seen in other bronzes to be considered here, including the Pisa Griffin. The back is richly decorated with varied patterns organized in sections and bordered by a rope-like frame in relief and, beyond it, by bands of inscriptions, the whole mimicking a *firāz* textile that would typically include such bands of inscription at the borders. The inscriptions are of a benedictory and augural nature, expressing good wishes.

As has recently been highlighted, the Monzón Lion was found with a bronze mortar, now in the Museum of Vilanova i Geltrú²⁶ and likewise datable to the late eleventh to early twelfth century. Attached to each of the handles of the mortar is a lion head remarkably similar in design and sculptural approach to that of the Lion. The mortar also has an inscription whose script can be stylistically linked to that on the Lion, and both the style and the content of the inscriptions on the two objects are part of the epigraphical reper-

24 Paris, Musée du Louvre, inv. no. OA7883, H. 31.5 cm, L. 54.5 cm. This piece has a long bibliography including: Amador de los Ríos 1875; Migeon 1907, pp. 226–227 and fig. 189 (aquamanile, Spain, eleventh century); Kühnel 1924, fig. 121 (aquamanile, Spain, ca. 1200); Lozoya 1931, fig. 313; Gómez-Moreno 1951, p. 336, fig. 396a (aquamanile); Bernus-Taylor 1989, p. 154, no. 127 (part of a fountain, Spain twelfth to thirteenth century); Dodds 1992, pp. 270–271, No. 54 (Cynthia Robinson) (part of a fountain, Spain, twelfth to thirteenth century); Deléry 2012, pp. 184–186 (fountain piece); Lintz / Deléry / Tuil Leonetti 2014, p. 390, no. 234; Contadini 2018b, p. 211, fig. 14 (part of a fountain, al-Andalus, twelfth century); Deléry 2018 (part of a fountain, al-Andalus, twelfth century).

25 Martínez Núñez 2007, p. 181 and no. 69.

26 Biblioteca-Museu Víctor de Vilanova i la Geltrú, inv. no. BMVB-1924, H. 20 cm, Diam. of the opening: 32.4 cm; see: Delery 2018. For the object also see: Gayangos 1864; Gómez-Moreno 1951, fig. 394; Lintz / Deléry / Tuil Leonetti 2014, p. 392, no. 235.



6 Bargello Deer, Spain, late eleventh to early twelfth century. Florence, Museo Nazionale del Bargello

toire of Spanish material of the period.²⁷ Beyond confirming the Spanish provenance of both objects, these shared characteristics point to the continuation and the breadth of high-quality metal craftsmanship after the Caliphal period.

The aesthetic of the Monzón Lion is similar to that of other pieces, including the Bargello Deer (fig. 6).²⁸ This smaller bronze is yet another example with incised decoration, an open mouth, and an opening in the belly. It has a hole beside either ear (for horns, once again missing), and a damaged right hind leg. At the meeting point between the body and each of the legs is a shield-like form containing volutes, and the decoration covering the body consists of another 'saddle cloth', with a concentric circle pattern bordered by bands of inscriptions at the sides, on the chest, and around the neck. In this case too, the inscription is a benedictory one.

Scholars have offered differing opinions as to its species. Gómez-Moreno prudently calls it a quadruped, as I, too, have done in the past²⁹, and in previous literature it was variously identified as a lion, a dog, or a deer.³⁰ However, as the holes beside the ears were surely meant for horns, the latter identification is preferable, and is further supported by the nature of the feet, which are not feline paws but rather hoofs. Once more, the opening on the belly and the form of the mouth point to this being a piece for a fountain.

27 See: Martínez Núñez 2007.

28 Florence, Museo Nazionale del Bargello, inv. no. 63c, H. 12.4 cm.

29 Gómez-Moreno 1951, fig. 397d; Curatola 1993, pp. 124–125, no. 41 (Anna Contadini); Contadini 2015b, pp. 209–211.

30 Described as a lion by Scerrato 1966, no. 30; deer: Arts Council 1976, p. 167, no. 173; dog: Monneret de Villard 1946, p. 23.

The Bargello Deer has features in common with the previously discussed animals (apart from the Fatimid Bardo Deer): all five have a decoration on their body reminiscent of that on textiles, another indication, indeed, of the cultural importance of textiles in al-Andalus. Textiles were continuously produced from the Caliphal period on, and many descriptions in historical sources attest to the splendour of the textiles that were lavishly displayed in courtly ceremonies.³¹ The bronzes also show a common stylization of form that differentiates them from the more naturalistically rendered Fatimid metal zoomorphic figures.³² Another feature shared by the Bargello Deer and the Monzón Lion is the organization of the decoration within sections delimited by inscriptions or decorative bands, a type of organization seen on other bronzes made in al-Andalus between the tenth and twelfth centuries, including the Pisa Griffin and the Mari-Cha Lion, discussed below, and three aquamanilia in the form of a peacock, now in Paris, Cagliari, and Vaduz.³³ In addition, the inclusion of shield-like decorations in the area of transition between the body and the legs is shared among the Bargello Deer, the Monzón Lion, the Mari-Cha Lion, and the Pisa Griffin, and it is interesting to note that these decorations recur on the lions in a stone relief on an eleventh-century fountain basin now in the Alhambra in Granada (known as the Pila de Badis or the Pila de Almanzor), which was found in Madīnat al-Zāhira, the palatine city built outside Córdoba by the Amirid prince al-Manṣūr (b. ca. 327/938–d. 393/1002).³⁴ These lions in relief have, further, a familiar decoration of circles on their bodies. These commonalities among design features on zoomorphic representations and objects in different media indicate once again the circulation of ornament within a shared visual culture.

Zoomorphic Sound-Producing Bronzes

With a height of 107 cm, the Pisa Griffin is by far the largest of these bronzes dating to the late eleventh or early twelfth century on the grounds of epigraphic, stylistic, and carbon dating elements (fig. 7).³⁵ Half bird with wings and half lion, it has wonderful decorative motifs incised all over its surface and an Arabic inscription, also incised, that runs

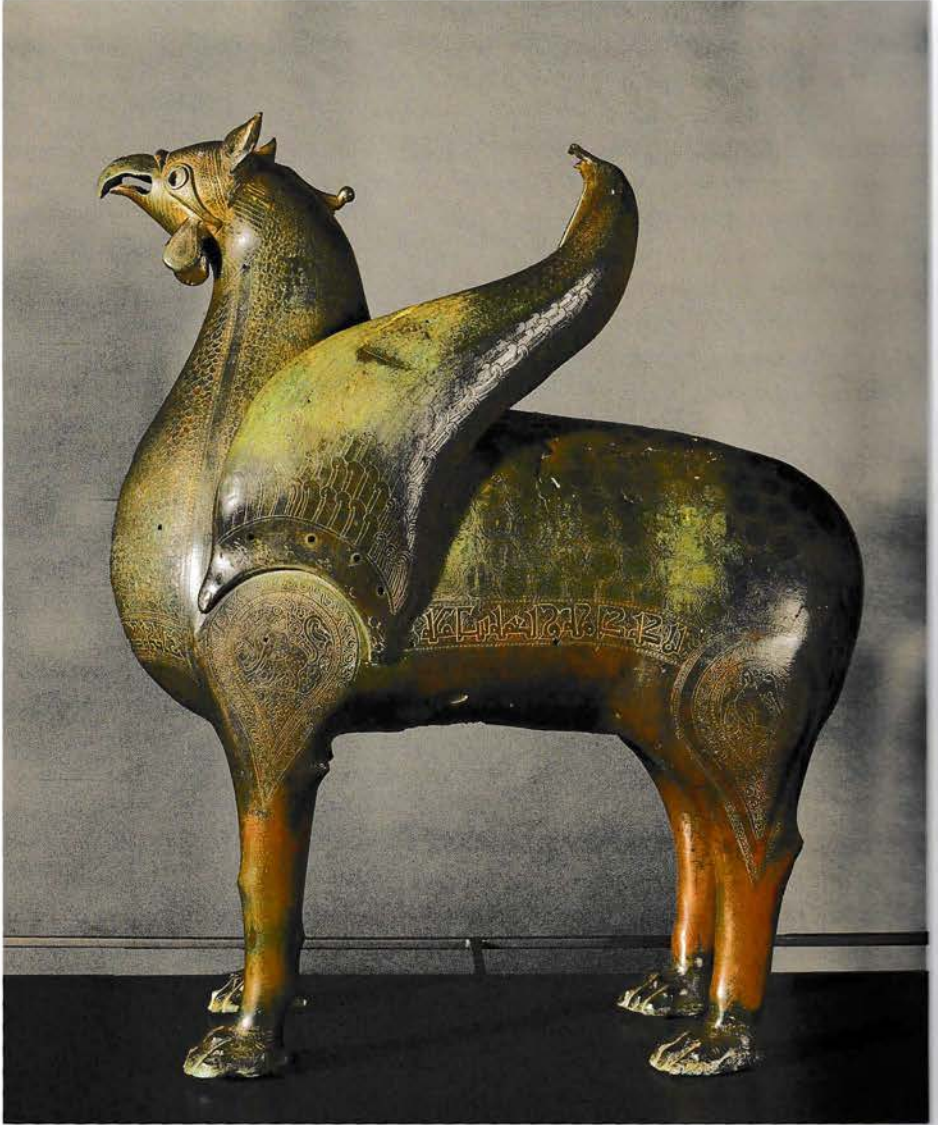
31 For textiles in al-Andalus, see, for instance: Partearoyyo 1992; Cabrera Lafuente 2001; Partearoyyo 2007; Jacoby 2017.

32 Contadini 2018b, p. 213.

33 Paris, Musée du Louvre, inv. no. MR 1569, Spain, probably Córdoba, 972; see: Bernus-Taylor / Delpont 2000, p. 111, no. 87 (Sophie Makariou); Makariou 2012b. Cagliari, Pinacoteca Nazionale, inv. no. 1445, Spain, eleventh to twelfth century; see: Anedda 2018. Vaduz, Furusiyya Art Foundation, Spain, eleventh to twelfth century; see: Bernus-Taylor / Delpont 2000, p. 113, no. 88 (Sophie Makariou).

34 Granada, Museo de la Alhambra, inv. no. 000243; see: Lozoya 1931, p. 255, fig. 317; Gómez-Moreno 1951, fig. 247a; Bargebuhr 1956, fig. 42d; Marinetto Sánchez 1995. Also: Rosser-Owen 2007, which is also a study of al-Manṣūr and Madīnat al-Zāhira. See also: Torres Balbás 1956.

35 Pisa, Museo dell'Opera del Duomo. During the "Griffin and Lion" project, organic material found inside the tips of the wings of the Pisa Griffin was carbon dated, resulting in indicative mid-points of 1085, 1100, and 1115; see: Calcagnile 2018.



7 Pisa Griffin, Spain, late eleventh to early twelfth century, Pisa, Museo dell'Opera del Duomo

around three sides of the body. The shield-like features at the transition between the body and the legs contain lions, on the front legs, and birds, possibly eagles, on the hind legs.

The Pisa Griffin has been attributed to several different areas of the Middle East and the Mediterranean: from Iran to Egypt, North Africa, Sicily, and Spain, a range that points to how the usual Western obsession with classification by date and geographical provenance has hitherto found this object enigmatic. Asking different and more productive questions, the latest research carried out within the “Griffin and Lion” project suggests with greater confidence that it is the work of craftsmen of late eleventh- or early twelfth-century Spain, al-Andalus, and that it was most likely Pisan booty from the conquest of Mallorca, at the time a rich and growing palatial city. Sources speak about the magnificence of the booty, with the most precious objects being assigned to the cathedral newly built as part of the amazing monumental project of the Piazza del Duomo (otherwise known as Piazza dei Miracoli) begun in the eleventh century, also comprising the leaning tower, the baptistery, and the cemetery.

Together with another object from al-Andalus, a wonderfully carved marble capital from Madīnat al-Zahrāʾ, signed by Fath, a known tenth-century carver³⁶, the Pisa Griffin was placed on top of the cathedral, set on a short column and fixed at the apex of the apsidal area.³⁷ It remained there until 1828, when it was taken down and stored in the Camposanto, and it was later transferred to the diocesan museum. Apart from its being a magnificent trophy, the chosen placement of the Pisa Griffin may also have related to the ancient understanding of griffins as guardian figures and symbols of protection. In a Christian context, the double nature of the griffin, when combining lion and bird, could be seen as referring to earth and sky and by extension to the double nature of Christ, earthly and celestial, and there is some evidence that this was how its recipients interpreted it. Accordingly, the Pisa Griffin, with its Arabic inscription, was assigned to the most important project of medieval Pisa, the cathedral, and placed over the apse to guard its most sacred area.

The inscription itself proceeds horizontally along three sides of the animal, starting on the left flank, running across the chest, and terminating on the right flank. On the sides, the inscription runs beneath a series of circles covering the back and sides of the bronze, so that it frames the decoration like *ḫirāz* bands on a textile. Indeed, the similarity with Spanish textiles of roughly the same period is striking, as may be seen from the pillow of María de Almenar, datable to around 1200, and from the tunic of Don Rodrigo Ximenez de Rada, datable to around 1247.³⁸ The inscription is of a benedictory and augural type, expressing good wishes for fortune, success, and well-being to the owner:

36 Pisa, Museo dell’Opera del Duomo; see: Monneret de Villard 1946; Contadini 2010; ead. 2018b, pp. 238–239, fig. 48.

37 For an interpretation of the agency of the Pisa Griffin as well as other bronze animals in European towns see: Weinryb 2016, pp. 140–146.

38 Pillow of María de Almenar, now in Burgos, Museo de Telas Medievales, Monasterio de Santa María la Real de Huelgas, inv. no. 011/002 M.H.; see: Dodds 1992, pp. 322–323, no. 90 (Concha Herrero



8 Montefrío Lamp, Spain, late eleventh to early twelfth century, Granada, Museo de la Alhambra

1. *baraka kāmila wa ni'ma shāmila* (perfect blessing and complete favour)
2. *ghibṭa kāmila wa salāma dā'ima wa 'āfiya* (perfect felicity, lasting peace, good health)
3. *kāmila wa sa'āda wa'ida li-ṣāhibihi* (in full, and the promise of happiness to its owner)³⁹

The inscription is incised in a type of angular (or *kufic*) script used during the eleventh and twelfth centuries. It is identical to that on a Spanish lamp found in Montefrío, not far from Granada (fig. 8), and bears a familial resemblance to that on several other metal objects from Spain, pointing therefore to a connection with al-Andalus in terms of epigraphic style.⁴⁰

Another link with Spain has been provided by the discovery of the use on other objects of a particular tool that contributed to the decorative repertoire of the Pisa Griffin and the Mari-Cha Lion (fig. 9).⁴¹ A rectangular five-dot punch, measuring 3 mm × 1 mm, it was used to create closely packed dotted lines as a background to other larger decorative motifs. While our investigation of metal objects considered Fatimid or Iranian revealed no trace of this particular punch, we found it to have been used on at least three further pieces of

Carretero). Tunic of Don Rodrigo Ximenez de Rada, now in Soria, Monasterio de Santa María, Santa María la Real de Huerta; see: Dodds 1992, pp. 330–331, no. 94 (Christina Partearoyyo); its connection with the Pisa Griffin was first noted by Rogers 1992; see also: Contadini 2018b, pp. 213, 215, fig. 21b and 21c.

39 My full reading of the inscription, including the word *wa'ida*, was first published in: Lintz/Déléry/Tail Leonetti 2014, pp. 154–155, no. 151 (Anna Contadini).

40 Raby 2018, pp. 305–325; Contadini 2018b, pp. 227–230.

41 Bassi 2018, pp. 54–56; Contadini 2018b, pp. 218–221.



9 Mari-Cha Lion, Spain or southern Italy, eleventh to twelfth century, Abu Dhabi, Louvre, Mari-Cha Collection

metalwork attributed to Spain. The same dotted imprint, with exactly the same measurements as on the Pisa Griffin, appears on an ewer with a lion spout in the MAN and on two lamps, the one from Montefrío and another from Jimena de la Frontera, now both in the Museo de la Alhambra in Granada.⁴² In the case of the Montefrío Lamp, the connection with the Pisa Griffin is reinforced by the presence, as noted above, of the identical angular script. All three pieces are dated to the eleventh to twelfth century, and the fact that the five-dot punch appears on neither earlier nor later material supports a dating to this period for the Pisa Griffin itself.

The Pisa Griffin and the marble capital from Madīnat al-Zahrā', both placed atop Pisa Cathedral, and the Lucca Falcon aquamanile, also probably produced in al-Andalus, are all spectacular examples of the process of transculturation, put to a novel use and differently received in a new cultural sphere into which they had been transferred. Of the three, the Lucca Falcon was subjected to a particularly drastic transformation before being installed, like the Pisa Griffin, on the roof of a church, that of San Frediano in Lucca.⁴³ Covered in a

42 Ewer: Madrid, MAN, inv. no. 1966/10/1, Spain, eleventh century; see: Bernus-Taylor / Delpont 2000, p. 152, no. 169 (Sophie Makariou); Contadini 2018b, p. 217, fig. 23, p. 247. Lamps: Granada, Museo de la Alhambra, inv. nos. 002828 and 002827 respectively; see: Fernández Puertas 1975; Lintz / Déléry / Tuil Leonetti 2014, p. 252, cat. 149; Contadini 2018b, p. 210, fig. 12, p. 220, fig. 28, p. 247.

43 Contadini 2018c; Lorenzetti et al. 2018; Vidale and Ferrari 2018; Bassi and Garzella 2018; Baracchini 2010, pp. 199–201, no. 91 (Rachel Ward). For a comprehensive study of Islamic and Christian aquamanilia see: Olchawa 2019, and cat. no. 5 for the Lucca Falcon.

new coat, with an exaggerated comb attached to its back, it became a cockerel; perforated at the belly and neck so that it could rotate on a pole, the aquamanile was conjured into a new existence as a weathervane. What could pour forth from it, then, was no longer water but sound: a short, everted cone over the beak – in effect a miniature megaphone – amplified the sound of the air as it blew through the holes in the body, depending on the strength and direction of the wind, to a high-pitched whistling that was still remembered by the inhabitants of Lucca long after it was taken down in 1954. Similarly, from high on the cathedral roof, the Pisa Griffin was reported to have emitted uncanny sounds when the wind blew, the vibrations of the air striking the rim of the hole in its belly doubtless amplified by the resonance of the metal.

But what purpose, prior to the amazing functional transformations to which they were subjected, might these pieces have served? For the Lucca Falcon we can confidently say that, like the Louvre, Cagliari, and Vaduz peacocks, it began life as an aquamanile. The original function of the Pisa Griffin, however, was long uncertain. Because of the hole in the belly, it had been assumed that water was involved here too, and that, like the bronzes discussed above, it was a fountain piece. But the shape of its beak is quite unlike their wide-open mouths, and quite ill-suited to be a spout. Matters were complicated further by my discovery of an inner vessel, attached to the rear of the belly and opening only towards the front, which could not have had a hydraulic function. Nor could it have served as a container for burning incense as, apart from its exceptional size, it lacks the various small holes in the body characteristic of incense burners, through which the smoke and the scent are emitted into the atmosphere. Analysis of the interior of the inner vessel have further discounted this possibility.

What I have suggested, in contrast, is that this vessel functioned as part of a noise-making mechanism, the sound amplified by the type of bronze alloy of which the body is made, which is resonant, like a bell.⁴⁴ The Pisa Griffin would then belong to the world of automata, many in the shape of animals, designed to inspire wonder and induce awe, and attested from both the pre-Islamic and Islamic periods.⁴⁵ Among the best-known accounts of such mechanisms are those relating to Byzantium, most notably the famous tenth-century description by bishop Liutprand of Cremona of the Byzantine emperor's throne in the Magnaurea Palace in Constantinople. The throne was movable so that the emperor could be raised up high, and in front of it,

"[...] was set up a tree of gilded bronze, its branches filled with birds, likewise made of bronze gilded over, and these emitted cries to their different species. This throne was of immense size and was, as it were, guarded by lions, made either of gold or of wood covered with gold, which struck the ground with their tails and roared with open mouth and quivering tongue. [...] As I came up, the lions began to roar and the birds to twitter [...]."⁴⁶

44 Contadini 2018b, pp. 230–238.

45 Camber/Contadini 2018.

46 *Liudprandi Cremonensis Opera Omnia VI*, pp. 5, 147; Mango 1972, pp. 209–210; Weinryb 2016, pp. 152–155.

We also have descriptions of such devices in the Islamic world, indeed as early as the eighth century, during the early Abbasid period. The treatises of the Banū Mūsā and, later, al-Jazarī give details of several sophisticated sound-producing automata⁴⁷, and there are accounts of both hydraulic and pneumatic organs.⁴⁸

Evidence that the technical skills needed for such complex systems were known in Spain is provided by the treatise on mechanical devices, including clocks and automata, by the eleventh-century Andalusī mathematician and astronomer Ibn Khalaf al-Murādī. He probably wrote his *Kitāb al-asrār* in Toledo⁴⁹, known at the time as an intellectual centre and as a centre of technological skills like those that would have been required to construct the artifices, described by Ibn Bassām (d. 542/1147), that adorned the ostentatious eleventh-century court of the Banū Dhī l-Nūn.⁵⁰ Quoting Ibn Ḥayyān, his account includes mention of the fabulous celebrations for the circumcision feast for the nephew of al-Ma'mūn ibn Dhī l-Nūn (435/1043–468/1075), where gold (or gilded) waterspouts in the form of lions sprayed water into two pools with large central basins carved with animals, birds, and trees; in the middle of each basin stood a tall silver tree over which water cascaded like light rain, producing a soft murmur.⁵¹ Similar hydraulic technologies are referred to by al-Maqqarī, according to whom al-Ma'mūn would sit beneath a dome of coloured glass in the middle of a pool, while the water slid over the dome.⁵²

Given this context of Toledo court luxury combined with technological expertise, Teresa Pérez-Higuera raised the possibility that the Pisa Griffin had been crafted there.⁵³ A case could also be made for Seville, for example, where in the palace of the Abbādīd prince al-Mu'tamid (462/1069–483/1090), as al-Maqqarī states, on the authority of Ibn Bassām, there was an elephant made of silver (*fil min fiḍḍa*) by a pool, spouting water.⁵⁴

47 For the Banū Mūsā: Wiedemann 1910; for al-Jazarī: al-Jazarī 1974.

48 Yuhannā ibn al-Bīṭrīq (d. ca. 200/815), who briefly mentions a hydraulic organ used in warfare; Banū Mūsā ibn Shākir (d. 259/873), who wrote a treatise on an automatic hydraulic organ; and Murīstus, translated in the ninth century, who wrote a treatise on the construction of the reed-pipe pneumatic organ “the sound of which may be heard from sixty miles.” These sources are included in Farmer 1965, nos. 7, 43, and 113 respectively. See also: Farmer 1931, pp. 60–73, fig. 1, which is a diagram of Murīstus organ.

49 The *Kitāb al-asrār* (Book on the secrets of the results of thinking), a text known through a copy done in Toledo in 1266, now in Florence, Biblioteca Medicea Laurenziana, ms. Or. 152; see: Vernet/Samsó 1978, pp. 154–156; also: Hill 1992; Hill 1998, who says it demonstrates a “mastery of mechanical technology.” There was also Ibn Firnās, the ninth-century Andalusī polymath (Ronda 195/810–Córdoba 274/887); among his various other accomplishments he was noted for his scientific discoveries and technical innovations; see: Terés 1960 (translated into English as Terés 2017).

50 With the dispersal of craftsmen following the collapse of the Caliphate there were various centres of production for various luxury goods, for example, the ivory workshop in Cuenca (1026–1050).

51 Ibn Bassām 1997, vol. 4.

52 Al-Maqqarī 1840–1843, vol. 1, pp. 239–240; al-Maqqarī 1855–1861, vol. 1, pp. 347–348; see also: Bargebuhr 1956, p. 248, footnote 60.

53 Pérez-Higuera 2013, pp. 63–64.

54 For the Seville elephant see: Ibn Bassām 1997, vol. 4; repeated from: al-Maqqarī 1855–1861, vol. 2, p. 612; Bargebuhr 1956, p. 235.

For the Pisa Griffin itself, the most likely technology was pneumatic, so that it functioned like a bagpipe: a bellows-driven air supply, probably housed within a pedestal, would be fed through a pipe, through the aperture in the belly, and into a sealed bag held taut within the inner vessel, into which a reed pipe pointing towards the mouth would be inserted. The pitch and volume of the sound, amplified by the resonant bronze, would have been determined by the air pressure, the length and width of the pipe, and the position and size of the reed. Striking in this regard is the description that appears in al-Hamdānī (ca. 279/893–333/944) and Yāqūt (575/1179–626/1229) of the tall and imposing Ghumdān Palace in Ṣanʿāʾ, which relates that:

“[...] on each of its corners a statue was set, of yellow brass [?], of the biggest size of lion there is. When the wind blew in the direction of one of these statues it would go in through its posterior and come out through the mouth and make the sound of a wild beast roaring.”⁵⁵

Wondrous Animals and Their Performative Aesthetic

Where would the Pisa Griffin originally have been placed? On the basis of what known sources tell us about palace life, its ceremonies, and its related physical environment, there are two plausible hypotheses that can be proposed: that it was featured in a palace interior, next to a throne; or that it was featured in a garden setting, perhaps alongside other animal pieces.

The first hypothesis is supported by Byzantine and Abbasid precedents, particularly when account is taken of the relatively recent discovery of the Mari-Cha Lion (Fig. 8), another large zoomorphic bronze the proportion of which are similar to those of the Pisa Griffin.⁵⁶ Possibly slightly later in date than the Pisa Griffin, it was not necessarily cast in Spain, but its decorative plan and repertoire closely resemble those of the Pisa Griffin and were probably executed there. The likelihood of this is strengthened by the tell-tale traces of the five-dot punch, and, crucially, by the similarly attached inner vessel, evidently designed to function in the same way as that of the Pisa Griffin. Although not beating the ground with their tails, the Pisa Griffin and Mari-Cha Lion as an imposing and frightening pair would provide a close parallel to the animal guardians of the Byzantine throne⁵⁷, and would also fit in perfectly with the impressive theatrical elements of the palace ceremonies described by Andalusi historians. Ibn Ḥayyān in his *al-Muqtabis*, for example, describes various delegations and embassies received by Caliph al-Ḥakam II at Madinat al-Zahrāʾ, and the ceremonial ostentation that came with such occasions.⁵⁸ Likewise, Ibn Firnās in the ninth century, al-Rāzī in the tenth, and, relying on much earlier texts, al-Maqqarī in the sixteenth, all give accounts of court ceremonies through which the Umayyad caliphs of

55 Serjeant/Lewcock 1983, p. 44, quoting al-Hamdānī 1931, p. 24; Wüstenfeld 1866–1873, vol. 3, p. 811.

56 Contadini 2018.

57 It is important to note that in addition to the lions of Liutprand's description there were two griffins, mentioned by Byzantine chroniclers from the late tenth century on (Camber/Contadini 2018, p. 67).

58 Ibn Ḥayyān 1967, esp. pp. 80–84 and pp. 184–186.

Spain sought to impress their visitors, receiving them in the throne room with its opulent furnishing and textiles, and wearing splendid robes. According to Ibn Ḥayyān, as quoted by al-Maqqarī, in *Madīnat al-Zahrā'* during the reign of 'Abd al-Raḥmān III:

"[...] one reception room (*majlis*) had in the centre a great basin filled with mercury. Around the room were eight doorways set within arches of ivory and ebony, inlaid with gold and various precious gems, that stood upon columns of coloured marble and clear crystal. Entering through these doorways, the sun's rays would strike the ceiling and walls of this room, creating a blinding light. When al-Nasir wished to strike fear into one of his courtiers he would give a signal to one of his Slavs to agitate the mercury, creating lightning flashes that would so affect those present that for as long as the mercury was in motion they imagined that the room was carrying them off."⁵⁹

Dazzling décor designed to impress was likewise a feature of the eleventh-century courts of Toledo, Seville, and Mallorca, and the Pisa Griffin and Mari-Cha Lion, with their imposing appearance and the awe-inspiring noises they could make, would have been a spectacular and highly effective addition to such environments. Before being captured by the Pisans, the Pisa Griffin might have been positioned in the Almudayna Palace in Mallorca, where it might have complemented the stone lion waterspouts around the courtyard pool.⁶⁰

The second hypothesis is that these figures may have been placed alongside other animals in a garden setting. In an Arabic manuscript made in Spain in the twelfth or early thirteenth century, which tells the love story of Bayāḍ and Riyāḍ, illustrations depict several garden scenes, one with a pond into which two animal heads, depicted in gold, spout water.⁶¹ Historians also talk about animals made of gold – although for gold we may understand gilded bronze, as with the MAN Deer – that were placed in gardens. We are told by al-Maqqarī, for example, that Caliph 'Abd al-Raḥmān III commissioned a large pool in the garden with an imposing gold lion, its eyes studded with jewels, that incorporated a hydraulic mechanism. Fed from an aqueduct, itself an impressive feat of engineering, the water entered the lion from behind and came out from its mouth with such force that it filled the various channels throughout the garden⁶², which in turn fed its pools and basins. Similarly, in a description (in verse) of a *majlis* of Prince al-Manṣūr b. Abī 'Āmir (Almanzor, d. 393/1002), the vizier Abū Marwān al-Jazīrī (d. 394/1003) refers to a waterspouting lion (*hizabr*) with a pearl necklace, as well as to tortoises in a deep pool (*lujja*) that do not cease to croak (*bintu al-salāḥifi mā tazālu tunaqniqū*)⁶³, raising the question of whether the latter could have been sound-producing mechanical devices in the shape of tortoises.⁶⁴

59 Al-Maqqarī 1855–1861, vol. 1, p. 346; also id. 1840–1843, vol. 1, pp. 236–237; Holod 1992, p. 46.

60 For the Mallorca lions see: Rosselló-Bordoy, 1978.

61 Rome, Biblioteca Apostolica Vaticana, Vat. Ar. 368; see: Camber / Contadini 2018, pp. 72–73, fig. 6.

62 Al-Maqqarī 1840–1843, vol. 1, p. 241; see also: Bargebuhr 1956, pp. 215–216; Ruggles 2000, p. 50; Camber / Contadini 2018, p. 72.

63 Al-Maqqarī 1855–1861, vol. 1, p. 348; see also: Bargebuhr 1956, p. 233; Rosser-Owen 2007, pp. 87–88.

64 This possibility has also been raised by Ruggles 2018, p. 24.

The tradition continues in the fourteenth-century Alhambra gardens and the fountain of the lions.⁶⁵ Just as with the palace interiors, historians' accounts of the gardens, pools, and statuary read almost like theatrical staging designed to impress, and the zoomorphic bronzes could well have formed part of such ensembles. Beautifully gilded to highlight their floral incised decoration within a garden setting, they would have been integral elements of a choreographed courtly life. Indeed, the pool with the noise-making tortoises and the water-spouting lion were referred to in relation to a *majlis* – interpretable as a gathering that could have taken place either indoors or outdoors.⁶⁶ Within that programme, these animal figures would have had their own aesthetic contribution to make, one marked not only by the consistency of their decorative features, visible from close range, but also, visible from further away, by the consistency of their non-realistic proportions. These are sometime commented on in the literature as a deficiency: it may be said that the neck is too long or the legs too short, or that the body is too large or the mouth too wide. But apart from the fact that these figures were not meant to mimic nature, even though they have features that allow them to be identified as representing particular species, I would suggest that their proportions were in part dictated by function. This is self-evidently the case with regard to the size of the open mouths but, even if less obvious, it may also have influenced the angle of the paws or hoofs, or the shape and size of the legs relative to the body and neck. The paws or hoofs may well have been deliberately tilted to fit a curved or stepped basin. Likewise, away from fountains, the shaping of the soles of the paws of the Pisa Griffin with a protruding central bulge, for example, would have permitted it to be fitted securely onto a pedestal with corresponding concavities. Further, for all the fountain pieces discussed here, it is important to note that the heads protrude either beyond the border of the metal pedestal onto which they are soldered or beyond their feet, thus perfectly modelled to allow the water clearance to drop into the basin below.

To have imposing sound-making animals placed near or among the animal fountain pieces in a palace garden would have added another dramatic element to the theatricality of the setting, not merely visually but also by expanding the sensorium. The various zoomorphic bronzes would form part of a multisensory experience: of sight, with them placed in different spots and at different heights, over a plinth or around a rectangular or circular basin, and resplendent when their decoration and gilding was hit by the sun, and mixing with the colours of the many shrubs, trees, and flowers; of smell, with perfumes coming from flowers and scented herbs, a great variety of which are mentioned in the sources as having been planted in the gardens⁶⁷; and of sound, with the experience of the wind passing through the leaves of the trees enveloping an enlarged soundscape in which, against the persistent backdrop of the splashing of the water pouring from the spouts of

65 Bargebuhr 1956.

66 On the connections between the architectural, material, and performance aspects of the *majlis*, see: Anderson 2018.

67 Dickie 1968, p. 247, quoting al-Himyari (ca. 418/1026–440/1048).

the zoomorphic bronzes, the cries of living animals, such as peacocks, would mix with the sounds emitted by these automata.⁶⁸

These features are therefore testimony to careful planning: the aesthetic conceptualization of these truly wondrous zoomorphic figures was informed simultaneously by a tradition of abstract representation of the natural world, by functionality, and by their relation to the environment where they would be placed.

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68 For the sensorial in gardens, including sound, see: Ruggles 2017; ead. 2017b; ead. 2018.

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