# An Exceptional Late Antique Belt Buckle Plate from Jaffa: From Metalworking Technology to Cultural Biography


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# An Exceptional Late Antique Belt Buckle Plate from Jaffa: From Metalworking Technology to Cultural Biography

*This paper introduces a technological and cultural biography of an exceptional copper-based belt buckle plate from ancient Jaffa. The exploration of intricate metalworking techniques and the cultural significance of this find provide new insights into late antique material culture in the Levant. Although similar buckles appear in museum collections around the world, few have archaeological provenience and, to date, none have been analyzed and published in terms of their material characteristics. This study establishes a metallurgical database for future comparative analyses, employing X-ray fluorescence spectrometry and scanning electron microscopy with energy-dispersive X-ray spectroscopy to characterize the buckle's composition and manufacture. The results reveal the use of recycled metals, casting, cold fastening, and decorative finishing techniques, including contouring of the openwork shapes. The analysis finds no evidence of enameling, challenging existing theories about these buckles. A comparison of the crafting techniques and design elements of this belt buckle plate with those of similar buckles shows evidence of distinctive artisanal traditions. The socio-cultural inferences of its art and iconography are also explored in light of the geopolitical landscape after the Arab conquests. This study sheds light on the production and distribution of Levantine buckles and enriches understanding of their use in late antique culture and society.*

## *Introduction*

Throughout history, clothing accessories like belt buckles have served not just functional roles, but also as significant indicators of identity, status, wealth, and gender.[1] To effectively represent status and wealth, an object must be publicly visible and possess notable visual appeal, making the human body an

[1] Cooper and Al-Saad 2015; Traykova et al. 2022.

ideal canvas for such expressions.[2] Straddling the spheres of the functional and symbolic, belt buckles and belt mounts can embody cultural and social meaning, as well as presenting evidence of metalworking technology and artistry.

This paper focuses on a decorated belt buckle plate from Jaffa, Israel, dating to the seventh to eighth century CE, a period marking the transition from the Byzantine era to the early Islamic period in the Levant. Belt buckles of this period—often lavishly decorated with openwork geometric, vegetal and animal designs, and religious motifs—represent the fundamentals of decorative metalwork of a distinctly Byzantine style. The Jaffa belt buckle plate, classified as Type F8 in Mechthild Schulze-Dörrlamm's seminal typology for Byzantine buckles,[3] stands out for its archaeological provenience, a relative rarity among such artifacts. This study aims to answer a fundamental question: what insights into late antique material culture in the Levant can be obtained from a combined typological and materials characterization analysis of the Jaffa buckle? In addressing this question, we delve into the buckle-plate's chemical composition, production, and design features, while considering the socio-cultural context that likely influenced its creation. The approach aligns with the concept of the "cultural biography of artifacts," which emphasizes the evolving meanings and roles of objects over time.[4] Drawing on Ian Hodder's concept of "entanglement," there is a complex interdependence between humans and objects that creates cycles of mutual entanglements which can be challenging to assess.[5] Other studies take this approach further, considering the possibility of artifacts acting as social agents.[6] However, as is correctly pointed out by Philip Brey,

> agency is not produced by artifacts themselves, nor by social processes external to artifacts. It is the product of actor-networks in which the physical behaviour of artifacts and the social behaviour of humans blend together into a knot that is often difficult to untie.[7]

With this in mind, our investigation extends beyond the technological aspects of the Jaffa belt buckle plate and seeks to uncover the social and cultural dynamics of its wearers during the period from Byzantine to Islamic rule in Palestine in the post-Arab-conquest era.[8] Thus, this study not only contributes to knowledge of Levantine metalworking practices, establishing a metallurgical

[2] Cooper and Al-Saad 2015, 82.
[3] Schulze-Dörrlamm 2009.
[4] Kopytoff 1986; Gosden and Marshall 1999.
[5] Hodder 2012 and 2016.
[6] Mitcham 2014, with previous literature.
[7] Brey 2005, 83.
[8] Taxel 2013; Avni 2014.

database in the process, but also illuminates broader patterns of cultural and societal behaviors during a pivotal era in the region's history.

## *Historical and Archaeological Context*

Jaffa (Greek *Ioppe*, Arabic *Yāfā*) is located on the central coast of Israel at the southern edge of the Sharon Plain, in the oldest part of the city of Tel Aviv-Yafo. Ancient Tel Yafo sits on a promontory overlooking the Mediterranean Sea, bounded by a lower city (figure 1). Jaffa was one of the few southern Levantine coastal cities in antiquity with a relatively good anchorage and, as it lies on the intersection of the coastal road and the road leading to Jerusalem, the city grew in importance from marine and land trade, connecting the coastal plain with the highlands and beyond, throughout its history.[9]

Literary accounts of Jaffa show that it housed both Jewish and Christian communities in Late Antiquity. From the fourth century CE onwards, Jaffa's importance as a pilgrimage stopover began to emerge, and by the sixth century increasing numbers of foreign visitors on their way to the Holy Land brought wealth to the region.[10] Jaffa was conquered by Muslim forces after the battle of Ajnadayn in 634 CE. A period of radical geopolitical transformation followed in which Byzantine rule and a Greek-speaking elite were replaced with Arab-Islamic rule and an Arabic-speaking elite.[11] Despite the upheavals, the different religious communities in the city coexisted. Jaffa became one of the main ports of entry for pilgrims to the Holy Land, and continued to serve the economy of the region well into the eleventh century.[12]

Early excavations of ancient Tel Yafo were conducted from 1948 to 1955 by P. L. O. Guy and the University of Leeds,[13] followed by extensive excavations from 1955 to 1974, directed by Jacob Kaplan on behalf of the Israel Department of Antiquities and Museums.[14] Since the 1990s, numerous archaeological endeavors have taken place at Tel Yafo and its neighboring areas. They include research-oriented excavations that are part of a comprehensive plan to explore the ancient tell and its lower city as well as salvage archaeology conducted in response to threats to the archaeological record—in this case modern development projects. These initiatives have revealed much information about the settlements at Tel Yafo during different historical periods.[15] Several major salvage excavations were conducted at the so-called Ganor Compound

[9] Fantalkin and Tal 2009, 225–27; compare Fischer et al. 1996.
[10] Foran 2011, 109–11.
[11] Shboul and Walmsley 1998, 256.
[12] Foran 2011, 112–15.
[13] Bowman, Isserlin, and Rowe 1955.
[14] Kaplan 1972; Kaplan and Ritter-Kaplan 1993.
[15] Peilstöcker and Burke 2011; Arbel 2020.

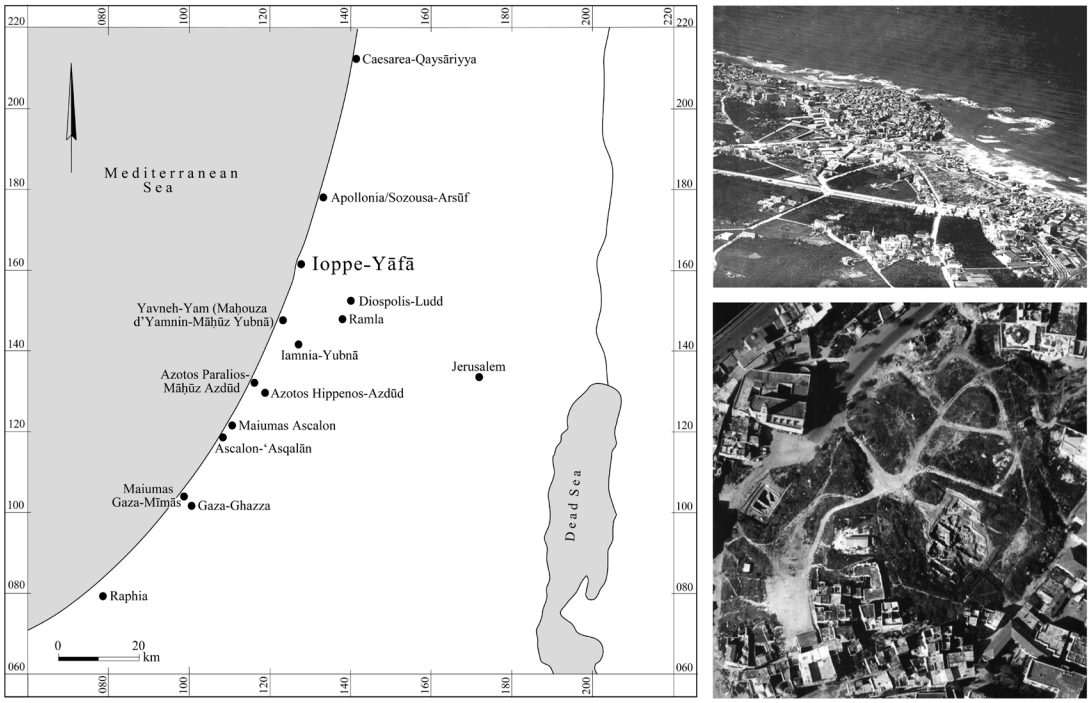


*Figure 1: Location of Jaffa. Left: Jaffa (Greek* Ioppe*, Arabic* Yāfā*) among other late antique cities. Image: Natalya Zack. Right: aerial photographs of the town of Jaffa in 1917 (top) and the ancient mound in 1965 (bottom). Images courtesy of the Jaffa Cultural Heritage Project.*

ahead of modern redevelopment. The compound is situated on the eastern outskirts of Tel Yafo, along the fringes of the lower city but within the boundaries of the central part of modern Jaffa.[16] One of these excavation projects was located along Yefet Street, to the south of Rabbi Pinḥas Street (32.052887 34.754333 decimal degrees). Fieldwork took place there during July through September 2000.[17] Though the area under investigation had been severely disturbed by modern construction, excavations revealed significant occupational remains with discrete chronological phases from the Iron Age IIA to the Ottoman period.[18] The Jaffa belt buckle plate was recovered from fill inside an

[16] Peilstöcker and Burke 2011.

[17] The excavation project (license no. B-211/2000) was conducted on behalf of the Institute of Archaeology of Tel Aviv University via Ramot-Archaeology, financed by Shaked-Nethanel Ltd., and directed by A. Fantalkin. Participants included Itamar Taxel and Andrey Tass (area supervisors); Yulia Gotlieb (registrant); Gil Kobo (plans/surveying); Pavel Shrago and Sasha Flit (photography); and Yosef Kapelyan, Alina Speshilov, Ada Kaspi, and Na'ama Earon (drawings).

[18] Fantalkin 2005.


*Figure 2: Excavation of Jaffa. Left: aerial view of Jaffa's Old City showing location of excavation site (oblong) and vicinity of Byzantine-era mosaic floor (circle). Image courtesy of the Jaffa Cultural Heritage Project. Right: photographic excavation records showing Byzantine-era mosaic floor and Locus 558 (L558), where the Jaffa buckle-plate was recovered (top), and after excavation (bottom). Images: A. Fantalkin.*

early Islamic stone-robbers' trench targeting a Byzantine wall (Stratum V, Area F, Locus 558; see figure 2). The wall was related to a mosaic floor of a possible church that had been severely damaged by the Ottoman period house. During the early Islamic period, the mosaic floor was partially dismantled and transformed, it seems, into a kitchen. While the archaeology suggests a Byzantine to early Islamic (and perhaps even a religious) context, the nature of the deposit means a precise date of the object is not able to be determined by relational stratigraphy or co-occurring datable artifacts. Stylistic parallels are therefore used in the following discussion to submit a chronology of the seventh to eighth centuries CE.

## *Physical Description of Find*

The object is a copper-based plate in the shape of a long D with a knob on the curved end, and with hinging and attachment lugs (figure 3a). Its dimensions are 54 millimeters long, 19 millimeters wide, 2 millimeters thick, and 12.1 grams in weight. It is made from three distinctly layered components: an openwork decorated panel of a metallic, golden-orange color; a solid backing panel of a similar metallic, golden-orange color; and a thin sheet of a metallic, reddish-orange color inserted between the two panels (figures 3a, 3c). The

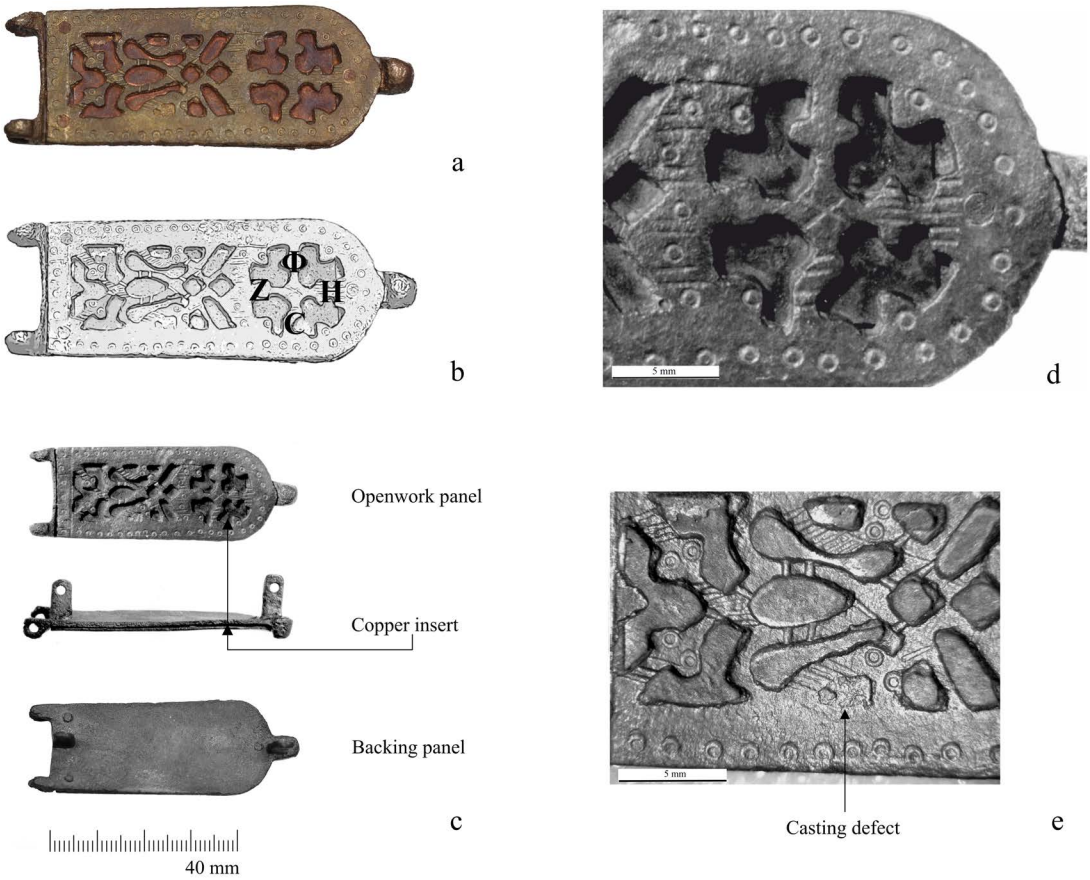


*Figure 3: Belt-buckle plate from Jaffa. The montage shows: (a) face view of contrasting metallic colors; (b) cruciform Φ_C-Z_H graphic on medallion (letters superimposed for guidance); (c) tripartite components; (d) close-up of medallion and Φ_C-Z_H graphic; (e) close-up of openwork panel showing casting defect. Images: Pavel Shrago and M. Mazis.*

three layers are joined by three round-profile rivets, also of a metallic, reddish-orange color. Beginning with the openwork panel, a third of the design is dominated by a cross medallion with an engraved saltire in the center. The arms of the cross are asymmetric because the finials are stylized Greek letters. With reference to figures 3b and 3d, the vertical axis displays a block outline of phi (Φ) at north and a lunate sigma (C) at south. The latter is delineated by being heavily engraved with parallel lines. The horizontal axis comprises the block outline of zeta (Z) at west and an eta (H) at east. Like the lunate sigma, the eta is also delineated by heavily engraved parallel lines. The monograms represent a cruciform arrangement of Φ_C (*phōs*, light) and Z_H (*zōē*, life), with the

saltire taking the place of where the omega (Ω/ω) might be expected to be. Separated from the medallion by an engraved metope filled with dotted circles are entwined, goggle-eyed, serpentine bodies demarcated by an arrangement of lenticular, rectangular, and ovate openwork shapes. The arrangement has longitudinal symmetry, except in the case of one shape that was miscast and presents as an irregularly formed depression (figure 3e). The long sides and curved edge of the panel are bordered by a repeating series of punched circles of the same size and form as the serpentine eyes. The short, straight edge of the panel has a band of metopes formed by engraved lines and filled with the same punched circles. The openwork aesthetic is set off by the thin, reddish-orange sheet, sandwiched between the openwork plate and the flat, undecorated back. The backing plate has two hinge barrels and a pierced lug at the non-curved end and another pierced lug at the curved end that forms part of the knob. This object would have been sewn onto one end of a belt via the two pierced lugs and hinged to a buckle frame with a prong. The buckle frame and prong are missing for this piece. Thus, the object is technically the plate part of a belt buckle but, in the interests of brevity, it is referred to here as the Jaffa buckle.

## *Metallurgical Analysis*

While numerous studies have explored the early technological aspects of ancient metallic objects, the field of archaeometallurgy has often overlooked Late Antiquity. This era is significant in the development of metalcraft, occurring at a time when ancient artisanal skills and metalworking practices rooted in the Graeco-Roman tradition were juxtaposed with the production of new art forms and changes in consumption habits. Despite this, metallurgical research for this period, especially concerning metal workshops, is unevenly documented, with a greater focus on western as opposed to eastern regions. It is important, therefore, to thoroughly investigate different metal objects from Late Antiquity in the Levant, including methods of manufacture, usage, and circulation and recycling.[19] In the case of belt fittings from this era, they can serve as valuable chronological markers, noting their role as evolving fashion items.[20]

Despite a number of examples of belt buckles like the one from Jaffa (under Discussion, see Typology and Chronology below), to our knowledge, scientific investigations of the material have not been reported (an exception is the testing of one object for traces of enameling: see A Question of Enameling below). A key aim, therefore, was to gather chemical and microscopic details

[19] Giannichedda 2008, 187–209; Kellens 2008, 41–51.
[20] Traykova et al. 2022.

of the methods of production and to compare them to previous descriptions of similar tripartite buckles.[21] An additional aim was to add to the nascent pool of data about the material characteristics of late antique copper alloys from the East.[22]

## *Material Characterizations*

An inspection of the Jaffa buckle with the naked eye revealed that it was well preserved and the external surfaces were relatively smooth. X-ray fluorescence (XRF) analysis was conducted on prepared surfaces of the openwork panel and the backing panel.[23] The results revealed composition of: 83.3–87.3 wt% copper (Cu); 7.2–9.3 wt% tin (Sn); 3.3–4.6 wt% zinc (Zn); 2.0–2.6 wt% lead (Pb) and 0.2 wt% iron (Fe) (table 1). The presence of low percentages of the element zinc in the alloy is likely responsible for the golden-orange color of the openwork and backing panels. Scanning electron microscopy (SEM) of the surfaces revealed that rivets had been inserted into drilled holes, each around 1.3 millimeters in diameter, and then hammered to mechanically join the three layers together by plastic deformation (figure 4). In addition, parallel lines, each about 200 micrometers wide, were engraved onto the surface. Small circles with an external diameter of 700 micrometers and contour width of 200 micrometers were stamped as decoration (figures 4 and 5). SEM also revealed that the inserted thin sheet is rougher and more corroded than the

[21] Schulze-Dörrlamm 2009; Fecht 2009; Eger 2001a.

[22] Ashkenazi et al. 2015; Orfanou et al. 2020.

[23] The scientific procedure is as follows: non-destructive examination was performed in order to study the composition and manufacturing processes of the belt buckle plate and if possible the origin of their raw materials. The following characterization methods and tools were applied: (a) Visual testing was done to examine the state of preservation and to gain more information concerning manufacturing techniques; (b) X-ray fluorescence (XRF) chemical analysis was performed with a handheld (HH-XRF) OXFORD X-MET 8000 instrument, equipped with a 45 kV Rh Target X-ray tube and Silicon Drift Detector and LE operation mode. In preparation for analysis, sampling surfaces were locally ground with silicon carbide paper (minimally destructive testing). Each measurement was performed within a detection area of 5 millimeters in diameter for thirty seconds. The accuracy of the measurements was within less than 0.5% of the detected alloy elements' value. However, light elements such as oxygen (O) could not be detected with this HH-XRF instrument due to instrumental limitations. Examination of the external surface of the object may not be representative of its core (bulk alloy) composition. Hence, the surfaces of the belt buckle's openwork and backing panels were roughly ground and cleaned with ethanol before analysis. When using this HH-XRF, instrumental differentiation between the peaks of Pb and As is required due to low-level peak overlap. Therefore, a comparison was done between the As Kα and the Pb Mα peaks, and between the As Kβ and the Pb Lβ peak. In addition, (c) an environmental scanning electron microscope (E-SEM) instrument (FEI Quanta 200FEG) was used with an Everhart-Thornley secondary electron detector at high-vacuum mode. The composition of the objects was measured using Energy-dispersive X-ray spectroscopy (EDS) that included a Si(Li) liquid-cooled X-ray detector.

Table 1. XRF analysis results of the copper-alloy belt buckle plate from Jaffa after locally grinding the surface of the items with silicon-carbide paper.

| **Description of examined area** | **Composition (wt%)** | | | | |
|---|---|---|---|---|---|
| | Cu | Sn | Zn | Pb | Fe |
| Openwork panel, Fig. 3c | 83.3 | 9.3 | 4.6 | 2.6 | 0.2 |
| Backing panel, Fig. 3c | 87.3 | 7.2 | 3.3 | 2 | 0.2 |

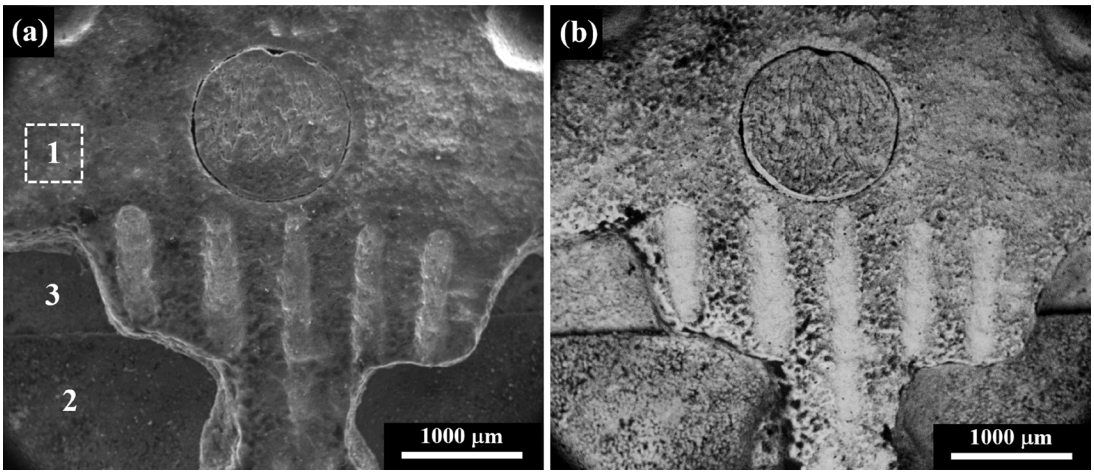


*Figure 4: SEM images of the belt-buckle plate. The images show the relationship of the three layers (openwork panel, inserted sheet, and backing panel layers, numbered 1, 2, and 3, respectively) and their condition; parts of the engraved-line decorations of the openwork panel; and the round cross-section of one of three rivets that connects the layers: (a) the area of the dashed square examined by EDS (SE mode); and (b) bright metallic areas surrounded by darker soil elements and corrosion products (BSE mode). Images: D. Ashkenazi.*

backing panel (figure 6). Energy-dispersive X-ray spectroscopy (EDS) of the openwork and backing panels revealed compositions of 50.5–61.4 wt% Cu; 5.1–5.8 wt% Sn; and 2.5–3.7 wt% Zn, as well as the presence of arsenic (As), lead (Pb), oxygen (O), silicon (Si), sulfur (S), chlorine (Cl), and aluminum (Al) (table 2). The SEM-EDS results, after omitting O, Si, S, Cl, and calcium (Ca) peaks (produced by corrosion products and soil elements), revealed composition of 82.4–87.2 wt% Cu; 7.2–9.4 wt% Sn; 4.1–5.3 wt% Zn; up to 0.3 wt% As; and up to 4.1 wt% Pb (table 2). The EDS results of the inserted sheet revealed composition of 69.6–71.3 wt% Cu; 28.7–30.0 wt% O; and up to 0.4 wt% Si. The composition of the inserted sheet, after omitting O and Si peaks, was 100.0 wt% Cu (table 2). Based on the XRF analyses, therefore, the

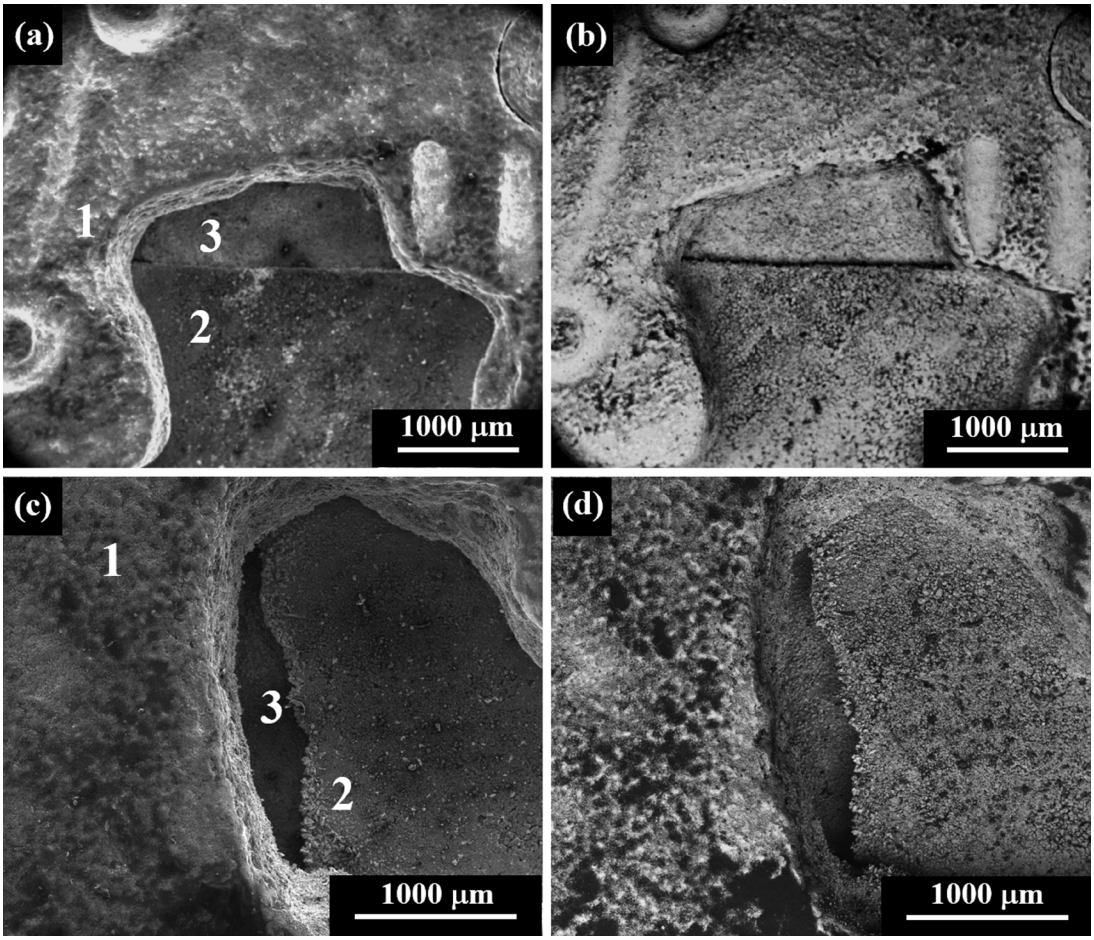


*Figure 5: SEM images of the belt buckle plate. The images show the relationship of the three layers (openwork panel, inserted sheet, and backing panel layers, numbered 1, 2, and 3, respectively) and their condition, and parts of the stamped-circle and engraved-line decorations of the openwork panel: (a)–(b) the three layers, where the inserted sheet is comparatively more damaged by corrosion (SE mode and BSE mode, respectively); and (c)–(d) the three layers (SE mode and BSE mode, respectively). Note that the edges of the cavities have been mechanically worked (possibly drilled and/or chiseled). Images: D. Ashkenazi.*

openwork and backing panels of the Jaffa buckle were made of a quaternary Cu-Sn-Zn-Pb alloy, whereas the inserted sheet was made of pure copper. The SEM-EDS results for the backing panel were relatively consistent with the XRF, whereas the SEM-EDS results for the openwork panel showed a ternary Cu-Sn-Zn alloy (table 3).

Copper alloys are commonly divided into a few main groups, where bronzes refer to alloys that contain more than 5 wt% Sn and less than 5 wt%

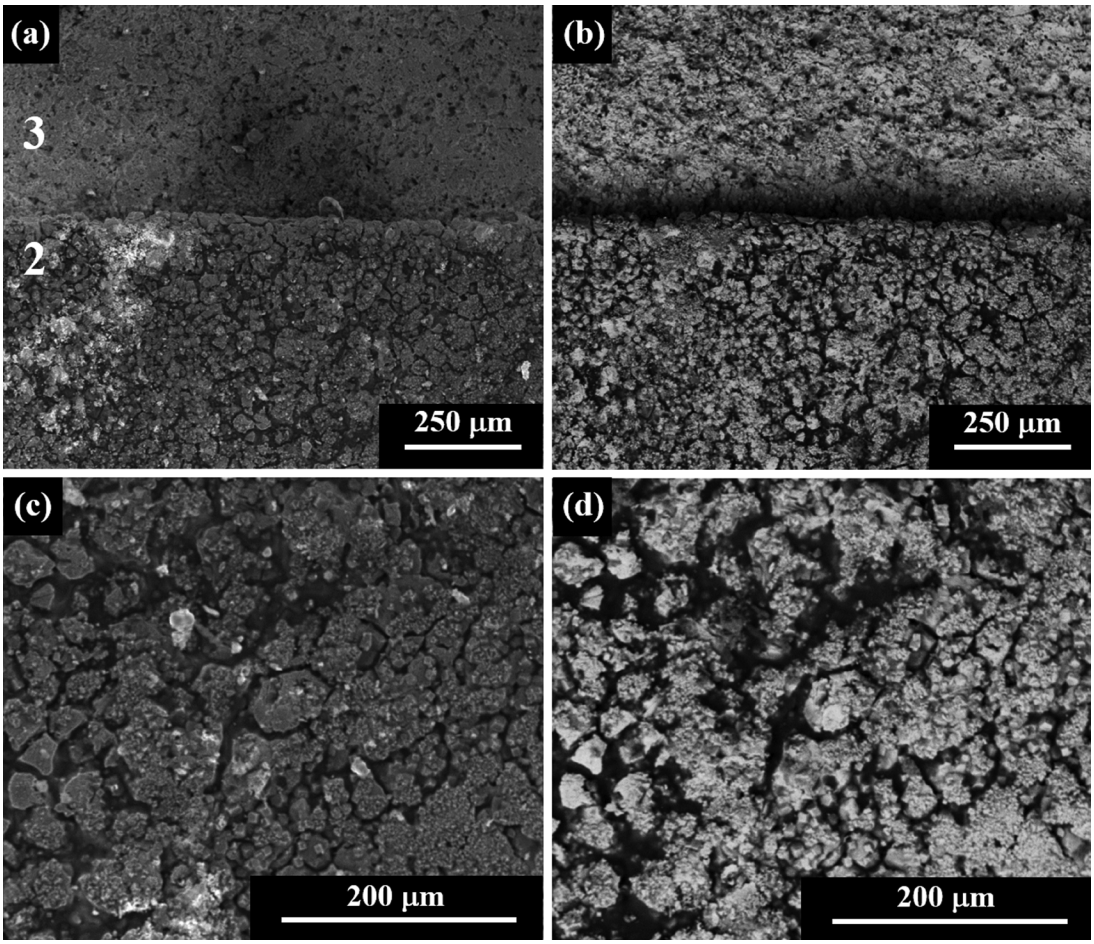


*Figure 6: SEM images of the belt buckle plate. The images show the relationship of the inserted sheet and the backing panel layers (numbered 2 and 3, respectively) and their condition: (a)–(b) the inserted sheet and the backing panel layers, where the inserted sheet is comparatively more damaged by corrosion (SE mode and BSE mode, respectively); and (c)–(d) higher magnification of the inserted sheet. Images: D. Ashkenazi.*

Zn, relatively pure brasses contain more than 15 wt% Zn with little to no tin or lead, and leaded-copper alloys contain more than 1 wt% Pb.[24] Ancient alloys that contain less than 5 wt% Zn are usually not referred to as brasses because such concentrations could be unintentionally formed by smelting certain ores or by mixing scrap brass rather than reflecting the primary production of

[24] Ashkenazi et al. 2015.

Table 2. SEM-EDS analysis results of the copper-alloy belt-buckle plate from Jaffa, where SA represents scanned area.

| **Description of examined area** | **Composition (wt%)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cu | Sn | Zn | As | Pb | O | Si | S | Cl | Al |
| Openwork panel, Fig. 4a<br>SA: 500 µm × 500 µm | 61.4 | 5.1 | 3.7 | 0.2 | – | 27.5 | 0.5 | 0.5 | 0.8 | 0.3 |
| Openwork panel, Fig. 4a* | 87.2 | 7.2 | 5.3 | 0.3 | – | – | – | – | – | – |
| Inserted sheet, Fig. 5a<br>SA: 500 µm × 500 µm | 71.3 | – | – | – | – | 28.7 | – | – | – | – |
| Inserted sheet, Fig. 5a* | 100 | – | – | – | – | – | – | – | – | – |
| Inserted sheet, Fig. 5c<br>SA: 500 µm × 500 µm | 69.6 | – | – | – | – | 30 | 0.4 | – | – | – |
| Inserted sheet, Fig. 5c* | 100 | – | – | – | – | – | – | – | – | – |
| Backing panel, Fig. 5c<br>SA: 500 µm × 500 µm | 50.5 | 5.8 | 2.5 | – | 2.5 | 37.7 | 0.5 | – | 0.5 | – |
| Backing panel, Fig. 5c* | 82.4 | 9.4 | 4.1 | – | 4.1 | – | – | – | – | – |
| * Processed results following the elimination of corrosion products and soil elements | | | | | | | | | | |

Table 3. Side-by-side comparison of XRF and SEM-EDS results of the copper-alloy belt buckle plate from Jaffa.

| **Description of examined area and detection method** | **Composition (wt%)** | | | | | |
|---|---|---|---|---|---|---|
| | Cu | Sn | Zn | Pb | As | Fe |
| **Openwork panel** | | | | | | |
| XRF | 83.3 | 9.3 | 4.6 | 2.6 | – | 0.2 |
| SEM-EDS* | 87.2 | 7.2 | 5.3 | – | 0.3 | – |
| **Inserted sheet** | | | | | | |
| SEM-EDS* | 100 | – | – | – | – | – |
| **Backing panel** | | | | | | |
| XRF | 87.3 | 7.2 | 3.3 | 2 | – | 0.2 |
| SEM-EDS* | 82.4 | 9.4 | 4.1 | 4.1 | – | – |
| *Processed results following elimination of corrosion products and soil elements | | | | | | |

brasses through the cementation process. Variation in the zinc content and low weight percent values of zinc in copper alloys can be the result of remelting because each remelting of brass alloys reduces the original zinc content by about 10 wt%.[25] Further losses can occur through working and heat treatment of brass objects.[26] Moreover, scraps of both bronzes and brasses were often melted together,[27] and the presence of tin and lead in particular would reduce the zinc absorption significantly.[28] Copper alloys with 70–85 wt% Cu and all three alloying elements—zinc, tin, and lead—are almost certainly the consequence of intensive recycling.[29] Thus, in relation to the components of the Jaffa buckle, the openwork and backing panels were probably made of recycled metals. The small quantity of iron (0.2 wt% Fe) detected in the XRF analysis of the openwork and backing panels could be related to impurities or due to corrosion.[30] The insert was a thin, worked sheet of pure copper with a fine, reddish-orange appearance, which is in contrast to the golden-orange hue of the openwork and backing panels. These color differences were most likely deliberate, according to aesthetic and artistic considerations (figure 3a).

### *Manufacture, Construction, and Decoration*

The openwork and backing panels of the Jaffa buckle were cast as separate pieces and fitted together precisely with rivets, followed by surface polishing, presumably with a paste of fine sand or other minerals. Considering that several of these buckles have been found with matching or similar designs (under Discussion below, see Buckle Production), the Jaffa specimen's openwork panel was likely produced from a stone mold or a clay mold formed from a metal model or prototype.[31] However, the SEM results clearly show a combination of both round and sharp contours of the panel cavities (figure 5), meaning that the edges and corners of the openwork designs had been worked (most likely drilled, sawed, and chiseled), probably as part of deburring work to trim casting excess. This has resulted in a design with excellent definition. To date, this appears to be the first time such finishing techniques have been identified on a cast, Type-F8 openwork panel.

The engraved linear decorations on the openwork panel were achieved using a sharp tool made of hard metal such as high-tin bronze or steel, whereas the

[25] Craddock 1978, 12–13.
[26] Orfanou et al. 2020.
[27] Gliozzo et al. 2010.
[28] Craddock 1985.
[29] Facsády and Verebes 2009; Biswas et al. 2023.
[30] Facsády and Verebes 2009.
[31] For steatite molds used for casting buckles, see Ivanišević 2018, 713–14. For clay molds and metal models for buckles, see Fecht 2009, 341–45. For lead buckle models found in the Crypta Balbi workshops, see Ricci 2012. For lead models from Caričin Grad, see Ivanišević 2018, 716–17.

decorative circles were punched/stamped by hammering a hard tube. The copper insert was plastic-deformed to create a thin and flat sheet. The holes in the attachment lugs and hinges of the backing panel were drilled with a bow drill. Three additional holes were drilled through the layers into which rivets were inserted and bucked by plastic deformation to secure the layers together (figure 4, circle). Thus, the three layers are mechanically joined as a cold connection (that is, without the use of adhesives or soldering). Indicative of the artisanal skills involved is the number of fine-work fabrication techniques represented in this small item: mold-work, mechanical shaping, engraving, deburring, polishing, and the precise fitting and riveting of differently performing materials.

## *A Question of Enameling*

There is a theory that the openwork panel and backing of these types of buckles provided the hollowed frame needed for champlevé decoration, with the copper sheet acting as the adhesive substrate for an enamel inlay.[32] Champlevé would have involved fusing powdered glass, comprising mainly silica and additive pigments, to the metal substrate by high-temperature firing. In previous examinations of tripartite buckles, the phenomenon of pitted or rough surfaces of the exposed parts of the inserted copper sheet was observed—Maiken Fecht explains that this characteristic damage varied in severity but was noticeable at the bottom of larger depressions where enamel would have likely pooled, retaining heat longer and solidifying more slowly.[33] She argues that a chemical reaction of the enamel additives altered the original smooth texture of the copper-sheet surface into a rough, grainy structure, giving it the appearance of being scorched.[34] Several parts of a tripartite belt buckle from the Römisch-Germanisches Zentralmuseum in Mainz, Germany (referred to here as RGZM 365) were analyzed.[35] SEM-EDS analysis of the surface of the copper insert, as well as ablated areas of the copper insert and copper-alloy backing, showed silicon and calcium peaks. The researcher concluded that this was from sub-surface penetration by a relatively high-temperature process such as the baking of enamel and not simply from corrosive migration from the soil environment.[36]

In relation to the Jaffa buckle, pitting was noted in the copper sheet, including in the centers of the openwork panel cavities and minor material losses. Our interpretation for the Jaffa buckle is that this damage is simply

[32] Fecht 2009; Greiff and Fecht 2000.
[33] Fecht 2009, 345–50.
[34] Fecht 2009, 346.
[35] Schulze-Dörrlamm 2009, 171, number 365 (RGZM accession number 40163 said to come from Asia Minor). The analytical results are reported in Fecht 2009 and in Greiff and Fecht 2000.
[36] Fecht 2009, 349–50, figures 157–58.

due to the effects of corrosion of a significantly thin piece of metal (approximately 0.1 millimeters), in particular, due to galvanic corrosion processes between the comparatively reactive copper sheet in contact with the openwork and backing panels that contain alloying elements more resistant to corrosion. We acknowledge that the Jaffa specimen had been mechanically cleaned after excavation and before analysis. However, no traces of silicate-based in-fill were observed at the macroscale or by SEM analysis, nor could this be surmised from the chemical evidence. The silicon peaks recorded in the SEM-EDS results of the Jaffa specimen (0.4–0.5 wt% Si) were similar for *all* the layers examined, not just the copper sheet (table 2)—this is most consistent with soil contamination and corrosion. Of the over fifty examples of these types of buckles identified to date,[37] apart from the traces reported for RGZM 365, none appears to have been documented as enameled. An alternative explanation for the tripartite design is that the copper sheet was intended as a metallic color contrast to the alloyed panels and that enameling, if it occurred, was relatively rare.

## *Discussion*

In order to fulfill the aim of the research to contribute further information concerning late antique material culture in the Levant and to establish a metallurgical database for future comparative analyses, a twelve-step methodology was applied: (1) In the Introduction, we began with the concept of decorated belt buckles and emphasized the significance of the Jaffa belt buckle's provenience in shaping the research question. (2) We established the historical and archaeological context of the Jaffa belt buckle, detailing its provenience with descriptions of the excavation area and the exact findspot. (3) A thorough physical description of the belt buckle was included, covering dimensions, openwork style, decorations, designs, and monograms. (4) The metallurgical section explained why scientific analysis of different types of late antique Levantine metal objects is important. (5) This section also detailed the scientific methods employed and the results, which fully characterized the buckle's three-layered composition. (6) Inferred from the analytical results, an explanation of manufacturing processes was included, focusing on construction, decoration, and the question of enameling. (7) The following discussion comprises the typology and chronology of the Jaffa belt buckle, including comparisons to parallel belt buckles excavated from other archaeological sites. (8) Following this, we delve into the production process, centered on theories of the use of recycled alloys and serial production. (9) This leads to exploring

[37] Schulze-Dörrlamm 2009, 183–85.

potential locations of the buckle's workshop and the techniques used in its production. (10) Aspects related to the buckle wearer, including gender-specific use and social significance, then follow. (11) Subsequently, the art, iconography, and Christian nature symbolism of the belt buckle are discussed in terms of contemporary notions of identity and social meaning. (12) The summary and conclusions integrate the results of the cultural and metallurgical analyses and address the central research question.

## *Typology and Chronology*

The Jaffa buckle's discovery in what might have been a religious setting during the Byzantine to early Islamic period provides a general cultural and chronological setting. However, the absence of datable contextual elements limits our ability to more precisely date the artifact, leading us to examine stylistic parallels for additional evidence.

Four articulated copper-alloy buckles were found in the crypt burials of one of several Christian churches at Qanawat in the Hauran of southern Syria.[38] Two of them are of the same type as the Jaffa buckle and have openwork designs that feature entwined serpents with goggle eyes—Thomas Fischer's *Glotzaugen*—but no monogrammed medallion. Recovered in excavations in 1966, the Qanawat belt buckles could not be allocated to particular crypts based on the available record (Fischer could only cite stylistic parallels dating to the seventh century CE). Another case, with an openwork animal and diamond-patterned trellis design, came from the 1939 excavations at Antioch, but it was recovered from an unstratified context alongside Late Classical and Byzantine ware. Its published date (sixth century CE) is based on buckles collected by Friedrich Sarre (said to be from Damascus but without archaeological provenience).[39] A comparable specimen, described as decorated with openwork pomegranate flowers, was found in a family tomb of the Roman era at Al-Quweismeh, near Amman in Jordan, that had been disturbed. Nabil Khairy dates the period of tomb usage from the late second to mid-fourth century CE.[40] Also near Amman, the site of Umm al-Summaq produced a belt buckle plate with animal and vegetal openwork: it is one of several specimens dated by Christoph Eger to circa 630 to 700 CE.[41] Similar to the Qanawat case, the chronology of the Umm al-Summaq belt buckle plate is construed from stylistic considerations rather than a datable archaeological context.

[38] Fischer 1999, 166–67, figures 6–7.

[39] Ross 2005 (1965), 41, plate 33.41.

[40] Khairy 1980, 53, 59, figure 7a; Eger, 2003, 176, number 8. Khairy describes the Al-Quweismeh tomb as completely disturbed but estimates the date of its usage from architectural features, pottery, glass, and a decorated sarcophagus.

[41] Eger 2003, 173–74, figure 4.3, and 177, number 13.

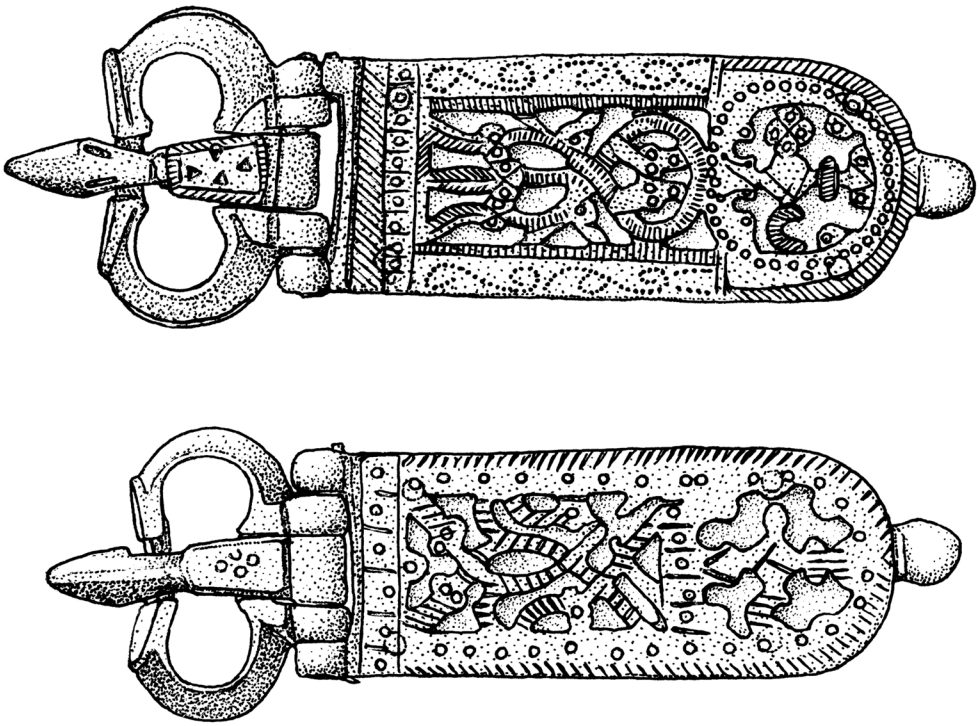

*Figure 7: Type-F8 buckles RGZM 387 (top) and RGZM 388 (bottom) (Schulze-Dörrlamm 2009) (not to scale). Images courtesy of the Römisch-Germanisches Zentralmuseum, Mainz.*

Though lacking archaeological provenience, there are dozens of comparable specimens in museums and private collections. Closely matching the Jaffa buckle with cruciform monogrammatic devices and sinuously intertwined and goggle-eyed serpentine bodies are two buckles published by Schulze-Dörrlamm that were acquired by the Römisch-Germanisches Zentralmuseum in Mainz, Germany (RGZM). Although Schulze-Dörrlamm interprets the sinuous formations as vine tendrils and the rondels as fruit, the Jaffa buckle is closely aligned with the only two Group-2h, Type-F8 buckles in her typology (referred to here as RGZM 387 and RGZM 388) (figure 7).[42] Both RGZM 387 and RGZM 388 have a cruciform arrangement of stylized Greek letters congruent to the Jaffa specimen's, including the eta and lunate sigma being partly delineated with heavily engraved parallel lines. In particular, the designs of the Jaffa specimen are notably similar to those of RGZM 388 (of unknown provenance) with respect to the openwork pattern, decorative

[42] Schulze-Dörrlamm 2009, 181–83, numbers 387–88.

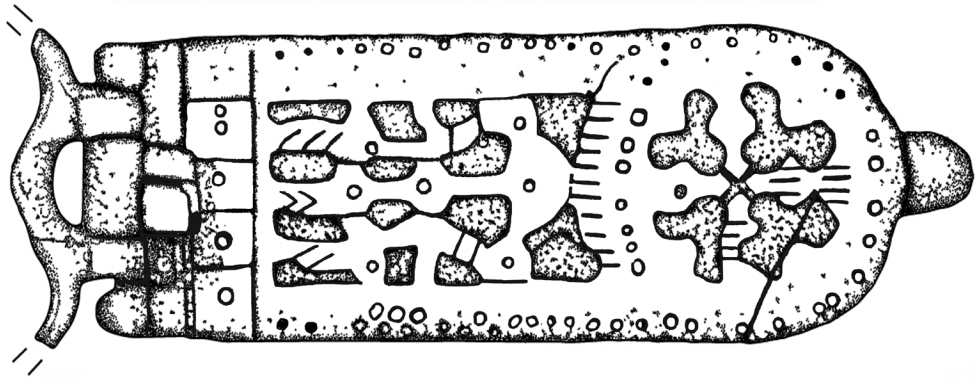

*Figure 8: Type-F8 buckle SBF 3 in the Studium Biblicum Franciscanum in Jerusalem (not to scale). Image courtesy of Christoph Eger. Digital adaptation: Slava Pirsky.*

themes, and monogrammatic motifs. Another buckle with close stylistic links to the Jaffa specimen is in the collection of the Studium Biblicum Franciscanum (SBF) in Jerusalem and is one of six buckles of Type F8 said to have come from the immediate region.[43] This particular Jerusalem specimen has an openwork medallion with cruciform monograms and a serpentine motif to the side (here, SBF 3) (figure 8).[44] Similar to the Jaffa buckle, SBF 3 has a saltire in the center of the cross. Further, like the Jaffa and RGZM 387–88 specimens, SBF 3's eta and lunate sigma are partly delineated by heavily engraved parallel lines. Its serpentine creatures, however, are relatively stylized. A sixth-to-seventh century CE buckle in The Metropolitan Museum of Art (no. 66.152.2, hereon the Met buckle), doubtfully identified as Spanish-Visigothic, also has a monogrammed medallion adjacent to a deer-and-serpents battle motif (figure 9).[45] Apart from a lunate sigma, however, the monograms of the Met-buckle medallion are an enigma.[46] A Type-F8 buckle from private collector C. S. (no. 755, referred to here as CS 755) also has a monogrammed medallion with a rather inscrutable arrangement of four letters that appear to include eta and lunate sigma.[47] Alongside its medallion is a scene depicting a long-necked bird with a serpent in its beak (figure 10): the CS 755 buckle is dated from the late seventh to the early eighth century CE on stylistic grounds.[48]

[43] Eger 2001a, 345–49, figure 3.
[44] Werner 1988, 307, plate 52.2; Eger 2001a, 347–48, number 12, figure 3.3.
[45] Ripoll López 1999, 205–6.
[46] Ripoll-López 1999, 204; Garipzanov 2018, 214, figure 7.10.
[47] Wamser and Zahlhaas 1998, 231, number 346; Eger 2001b, 341–43, number 4.92.
[48] Eger 2001b.

*Figure 9: Type-F8 buckle in The Metropolitan Museum of Art no. 66.152.2 (Met buckle) (not to scale). Image: Metropolitan Museum of Art (CC0).*

*Figure 10: Type-F8 buckle in a private collection in Munich (buckle CS 755) (not to scale). Image courtesy of Hermann Reichenwallner and with the kind permission of Christian Schmidt.*

Schulze-Dörrlamm identified over fifty Type-F8 buckles and buckle plates,[49] which she dates to the eighth century CE based on decorative trends across the later Roman Empire from Central Europe to the East in personal ornaments, vessels, architecture, and other works.[50] One example in the British Museum collection, said to come from Jerusalem, is also catalogued as eighth century CE.[51] Eger dates the six specimens of the SBF late seventh to early eighth century CE,[52] and this date range is also reflected in the catalogue details of specimens said to be from Asia Minor and Syria.[53] The latter

[49] Schulze-Dörrlamm 2009, 183–85.
[50] Schulze-Dörrlamm 2009, 186–94.
[51] British Museum no. 1889.0511.16; Werner 1988, 307, note 14, plate 52.2.
[52] Eger 2001a, 345–49.
[53] The specimens are in the collection of the Archäologische Staatssammlung München. Wamser 2004, 280, figures 443–46.

includes one of solid gold depicting an animal struggle-scene[54] and a matching copper-alloy version also said to be from Syria.[55] Still, there are chronological interpretations that favor a seventh-century CE date. In addition to the Qanawat burial finds, several Type-F8 specimens in the Aleppo and Damascus museums are also dated to the mid-seventh century CE on stylistic grounds: two examples, one purportedly from southern Syria[56] and one from Mareg near Damascus of silver-plated bronze,[57] have a three-medallions motif; two further specimens from Damascus feature a serpentine motif and a pelte- and amphora-shaped medallion, respectively.[58] In contrast, Khairy's late second- to mid-fourth-century CE dating of the Al-Quweismeh tomb in Jordan indirectly suggests a similar age for the Type-F8 buckle found there; this indirect dating seems aberrant compared to the prevailing dating of other specimens.[59] Considering the wider scholarly consensus, therefore, a seventh-to-eighth century CE date for the Jaffa buckle is more likely.

### *Buckle Production*

In the Roman period, large-scale production of brass (copper alloyed with zinc) became commonplace for coinage and decorative metalwork using an alloying method known as the cementation process.[60] This coincided with steady reductions in the use of tin bronze, a general trend observed all over the Roman world, and accelerated towards the end of the Roman period by difficulties in obtaining supplies of tin from former provinces.[61] At the same time, there is increasing evidence that brass scraps were remelted and mixed with bronze and leaded bronze in Late Antiquity and the Islamic period,[62] resulting in quaternary alloys of mixed composition that could comprise up to 8 wt% Sn, 3–15 wt% Zn, and other elements such as lead (Pb).[63] Evidence suggests that a variety of alloys from bronze to high-purity brass, leaded brasses and bronzes, as well as quaternary alloys were circulating in Late Antiquity[64] and the Islamic period.[65]

[54] Werner 1988, figure 1, plate 51.1; Wamser and Zahlhaas 1998, 230, number 342; Wamser 2004, 280, number 443.

[55] Wamser 2004, 280, number 446.

[56] Kazanski 2003, 38–39, figure 4.1.

[57] Baldini Lippolis 1999, 227, number 1; Ruprechtsberger 1993, 407–8, number 26; Kazanski 2003, 38–39, figure 4.2.

[58] Kazanski 2003, 39, figure 4.3, 5; figure 10.1–2.

[59] Khairy 1980, 59.

[60] Craddock 1978, 9–11; Craddock et al. 1998, 75–76.

[61] Craddock et al. 1998, 73.

[62] Riederer 2002; Craddock et al. 1998, 77; Giumlia-Mair 2005, 285.

[63] Ashkenazi et al. 2015; Dungworth 1997; Ratković et al. 2009.

[64] Dannheimer 1979; Craddock et al. 1998; Richards 1980; Drandaki 2020.

[65] Al-Saad 2000; Orfanou et al. 2020; Craddock et al. 1998; Ponting 2010.

In terms of composition, both the openwork panel and the backing panel of the Jaffa buckle have a relatively medium to high tin content, suggesting that tin bronze was a dominant constituent with additions of lead or scrap leaded alloys resulting in approximately 0–4 wt% Pb, and scrap brass resulting in approximately 3–5 wt% Zn. Thus, the Jaffa buckle shows characteristics of castings made from remelted scraps of different alloys, resulting in two pieces with slightly different chemical compositions. This is consistent with the growing body of evidence of remelting and recycling in this period. The use of different alloy batches is a reminder that the tripartite structure of these buckles necessitated the sourcing of diverse materials, particularly the pure copper insert, which played a vital color-contrast role.

In her examinations of Type-F8 buckles from the RGZM, Maiken Fecht observed numerous casting defects and flaws in the openwork panels. The defects highlight the challenges in casting these intricate layers, exacerbated by the fineness of the panel and the intricacy of the openwork cavities, in contrast to the relatively straightforward casting of the base panels.[66] Fecht's observations would account for a potential casting defect in the Jaffa specimen (figure 3e): one of the ovate designs appears to have failed to form and has been left as an irregularly surfaced depression, even as other panels were carefully deburred and contoured after casting. Fecht suggests the Type-F8 buckle parts were cast from clay molds formed from a metal prototype that had itself been created from a wax model (lost wax casting). Further, she found evidence of changes in the design of the clay mold in which a partial reworking during the process of production appeared in successive editions of specific RGZM buckles, with the variant itself likely to have been used as the prototype.[67] This implies that the openwork panels were mold-cast in a series: molds were reused until failure or design updates necessitated their replacement, likely enhancing production efficiency. However, there is more to the story. The individualized craftsmanship evident in the decorative finishes of the Type-F8 buckles, including the contoured openwork of the Jaffa buckle, combined with the reports of casting difficulties, suggests that there were additional motivations beyond efficiency in their production. Arguably, the buckles were adhering to certain design requirements of their basic form, perhaps one that was even broadly socially mandated, whereas post-cast customizations served more individual cultural or artistic purposes.

We explore this notion in the case of the Jaffa buckle and RGZM 388 (figure 11). The basic Type-F8 features are present in these two buckles—long-D form with knob, tripartite structure, and openwork panel—but the two

[66] Fecht 2009, 340–41.
[67] Fecht 2009, 341–45.


*Figure 11: Comparison of Type-F8 buckles from Jaffa (top) and RGZM 388 (bottom). RGZM 388 photographed with kind permission of the Römisch-Germanisches Zentralmuseum, Mainz. Image: M. Mazis.*

objects were clearly not cast from the same mold. There are differences in the size of the frame, the layout of the panel cavities, some of the engraved patterns, and in the number of rivets required to secure the components together (three for the Jaffa piece, four for RGZM 388). However, the two buckles share similar artistic traits in the matching arrangement of the sinuous bodies of the openwork panel and the design of the medallion. Many of the engraved features of the Jaffa and RGZM 388 buckles are also remarkably similar, including the positioning and order of the metope panels and frieze of dots, the striped decorations of the serpents, and the manner of engraving particular monograms. The fact that the two buckles did not come from the same mold, yet show striking similarities in the decorations and symbols applied after casting, suggests individual craftsmanship was operating within a recognized style or tradition. We note that the Jaffa buckle and RGZM 388 are also morphologically connected to examples that contain monogrammed medallions and/or goggle-eyed serpents, such as RGZM 387, SBF 3, the Met buckle, and buckle CS 755 (figures 7–10). The possibility that these buckles came from related workshops or from different workshops within the same cultural influence further implies a recognized and valued design aesthetic that was shared and reproduced by different artisans. Thus, while the basic shape of

the Type-F8 may have been standardized to some extent, there were opportunities for individual expression in the context of cultural or artistic norms.

### *Distribution and Workshops*

The six currently known Type-F8 finds with archaeological provenience are from southern Syria (two from Qanawat); northern Jordan (two near Amman); Israel (one from Jaffa); and southern Turkey (one from Antioch) (figure 12). Where recorded, the acquisition details of non-archaeological Type-F8 specimens in museum collections concur with this geographic spread: the settled and purported find spots of Type-F8 forms identified to date are heavily skewed towards a Levantine-West Asia distribution.[68] Being highly mobile, these objects could no doubt travel far afield as loot or gifts, thus accounting for the occasional pieces said to have been found in Europe. However, the dominant pattern likely reflects the locations of key workshops and the relatively local circulation areas of the principal traders and users.

In the previous section, the discussion centered on contemporary remelting and recycling, sourcing materials for the tripartite design, and evidence of serial-mold production of the openwork panel. These buckles clearly required a high level of individual attention and organization, including precision-matching pieces for assembly, mechanical joining of the panels with rivets, engraving and punching, (possibly) enameling, drilling, sawing, and polishing—each part of a series of staged actions that likely involved the efforts of more than one individual. From a design and production perspective, a standard suite of products but with multiple components and multi-step finishes are signs of well-organized workshops, industrial quarters, and/or crafting guilds. Some of these are documented in late antique relief scenes, papyri, and other literary sources concerning the work of contemporary artisans, metalsmiths and guilds, and their integration in urban life.[69] Archaeological discoveries confirm that contemporary urban workshops were enterprises for casting and forging multiple components and small items, for conducting finishing work and decorations, and for undertaking repairs. The Crypta Balbi in Rome was a center of production in the late antique period where the mass production of belt ornaments and horse harness for elite markets in Europe, Egypt, and West Asia occurred.[70] In Southeastern Europe, the significant installations

[68] Schulze-Dörrlamm 2009, 183–84, figure 65.

[69] For a synthesis of sources on workshops, guilds, and locations, see Drandaki 2020, 287–91. On the location of the fifth-to-seventh century CE copperworkshops of Constantinople in the vicinity of Hagia Sophia, see Mango 2000, 197, figure 20. Regarding designations of late antique crafts specialists, see Petrikovits 1981.

[70] Ricci 2012.

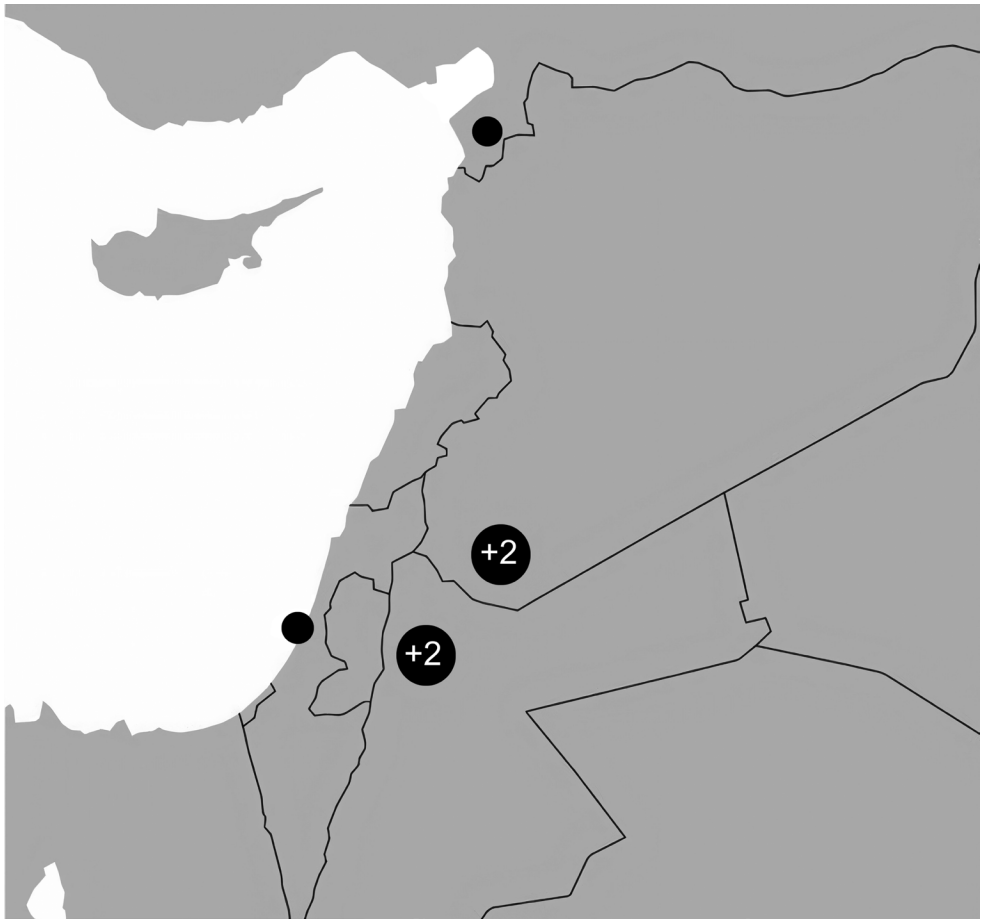


*Figure 12: Distribution of Type F8 buckles with archaeological provenience. Image: M. Mazis.*

of metal workshops in the upper and lower city of Caričin Grad (known as Justiniana Prima from 535 to 615 CE) included numerous molds for small ornaments such as brooches, pendants, and buckles.[71] Several stone molds for buckles and belt fittings had been used multiple times, indicating that quantities were produced to a standard form.[72] In Elephantine (near Aswan), there is evidence of fifth- and sixth-century CE artisanal quarters in the city where metal vessels were produced for export in urban workshops.[73] Bronze

[71] Ivanišević 2018.
[72] Ivanišević 2018, 712.
[73] Drauschke 2016.

workshops specializing in jewelry and buckles were located in the lower city below the Acropolis in Byzantine Pergamon.[74] At Beth Shean (Scythopolis), about 100 kilometers north-east of Jaffa, commercial and artisan activities are represented by a late antique copperware recycle and repair shop, as well as an Umayyad-period blacksmith's shop and separate goldsmith's workshop.[75] Also dating to the early Islamic period, an industrial area within the city of Ramla (about twenty kilometers southeast of Jaffa) presented a wide-range of metal production processes: copper-alloy working, silver working, and iron working, as well as remelting and recycling copper alloys are attested there.[76] In the Flea Market Complex at Jaffa, in Bet Eshel Street, at least one of the installations excavated served as a furnace for smelting metals in the early Islamic period.[77] This short survey underscores the likelihood that casting foundries and fabrication areas were fairly ubiquitous and part of the urban fabric of Byzantine to early Islamic cities, producing household wares and personal accessories. In some cases, workshops would have focused on a local, domestic market. In other cases, such as the production center at Crypta Balbi, specialist buckle and belt makers mass-produced material that made its way across a large geographic area. Product-based specialization flourished in Late Antiquity, with workshops making specific items rather than necessarily specializing in types of raw materials.[78]

### *Buckle Wearers*

The archaeological context of the Jaffa buckle, which provides us with only a tentative association with structures that may have been part of a Byzantine church, conveys little in terms of its wearer(s). In contrast, there is more information about the Qanawat buckles, which are the same Type F8 as the Jaffa buckle—they came from burials that belonged to priests.[79]

In general, dress belts and buckles would have been used, much as they are today, to cinch and secure garments and from which to hang other ornaments and accessories. Although leggings or trousers had become part of standard male attire in the eastern Mediterranean in Late Antiquity,[80] belts and their buckles were decorative and status-oriented adornments worn where they could be seen.[81] In terms of military dress, by the beginning of the sixth cen-

[74] Gaitzsch 2013, 91.
[75] Khamis 2007.
[76] Ponting 2010.
[77] Peilstöcker et al. 2006; Arbel 2017, 73.
[78] Drandaki 2020, 291.
[79] Fischer 1999, 165, note 11. The Type-F8 buckle from the Late Roman tomb in Al-Quweismeh in Jordan does not appear to be associated with a particular individual or group (Khairy 1980).
[80] Russell 1982, 145–46.
[81] Schulze-Dörrlamm 2009, 301.

tury CE, the *zostarion* had come into favor as a belted garment[82] and was recommended as desirable to cover a soldier's armament.[83]

Like other Type-F8 pieces, the Jaffa buckle would have fit a narrow leather belt of about twenty millimeters wide and, judging from the length of the pierced attachment lugs, a relatively thick piece of leather of eight to nine millimeters. From specimens with an obvious orientation, such as the present example, the buckle was secured onto the left end of the belt from the perspective of the wearer, as is customary with men's belts and buckles today. In fact, it is argued that late antique buckles such as the Type F8 were for men's attire and that standardized elements attest to a prescribed military or official's dress.[84] This custom was likely sustained from the Roman period where the belt or *cingulum* was an important part of a soldier's dress as an accessory from which to hang equipment and a visible symbol of social and military status.[85] It follows that the belts and buckles of Late Antiquity were not only functional accessories but status-riddled sources of social meaning. According to Eger, this style of belt buckle was used to close the *cingulum* of official male dress in Late Antiquity and, after the Arab conquests, by Christian dignitaries as well as Muslim Arabs.[86] Schulze-Dörrlamm clarifies that many of these objects, particularly those displaying symbols and motifs of Christian meaning, would have been worn by Christians.[87] Thus, the Jaffa buckle and others like it can be used to explore themes of social identity and religious symbolism. In this regard, we turn to the significance of the cruciform graphic of ΦΩC (light) and ZΩH (life) and the goggle-eyed serpents.

## *Art, Iconography, and Meaning*

From the sixth century CE, the art and architecture of the later Roman Empire developed a characteristic style, derived from its earlier Roman heritage, of a new Christian symbolism.[88] The artistic koine of the period included intense stylizations and presentations of a mystical world represented in Christian nature symbolism from which the perceived moral and symbolic qualities of animals, mythical beasts, plants, and stones were treated as types for good and evil.[89] In addition to the nature-symbolic representations were patterns,

[82] Dawson and Sumner 2015, 190, plate 4.

[83] Maur. *Strat*. 1.2 (translation at Dennis 1984, 13).

[84] Schulze-Dörrlamm 2009, 194; Eger 2003, 163.

[85] Hoss 2011. In contrast, the large volume of Byzantine buckles of lyriform type in the Iberian Peninsula were likely worn by a broad demographic without distinctions of a civil-administrative or military nature (Ripoll-López 1998, 190).

[86] Eger 2003, 175.

[87] Schulze-Dörrlamm 2009, 192.

[88] Ricci 2012, 1–2.

[89] Curley 1980.

geometric symbols, and monograms whose meanings were understood by those cognizant of the emerging figurative language.[90]

The ΦΩC-ZΩH graphic is found on a variety of early Byzantine objects used in personal, domestic, and liturgical settings. Devices with inspirational or invocational messages in the form of a cross not only represented belief in its power to Christian followers but may have functioned as a charm of protection, help, or hope. Ildar Garipzanov articulates this in the context of the diverging cultural paths of the Greek East and the Latin West from the second half of the sixth century CE, with ΦΩC-ZΩH being a particularly Eastern motif, which encoded divine attributes and recalled passages from John 1.4 and 8.12 on divinity and salvation.[91] One cannot but wonder, however, at the relatively enigmatic nature of the monograms on some of the belt buckles under discussion. They do not appear to serve as glaringly visible or readily comprehensible writing, at least compared to other forms with a far more obvious graphic of similar messaging and arrangements.[92] For instance, compared to the Jaffa buckle, the cruciform graphics on the Met buckle (figure 9), and CS 755 buckle (figure 10) are relatively difficult to decipher. The obscurity could indicate that they are derivative, catering to customers with social aspirations who valued the impression of such symbols and monograms. On the other hand, the cryptic lettering may have been a deliberate representation of a special status to the buckle wearers in a relatively exclusive circle of understanding, what Garipzanov calls "visual exegetical anchors for educated minds and eyes . . . [that] provide exclusive access to hidden symbolic meanings within specific sections of religious texts."[93] Given the chronology of the Type-F8 buckles, which corresponds to the period of transition from Byzantine to Islamic rule in Palestine,[94] one could theorize on an object's importance to the wearer in terms of their sense of identity and self-image at a time of political tensions, conflicts of identity, and complex tribal and familial loyalties.[95] The Islamization of the Holy Land in the wake of the Arab conquests in the early seventh century CE was a complicated and gradual process.[96] The attested persecutions of Christian communities in Palestine during the Abbasid period[97] do not necessarily imply the existence of the same practice during the earlier Umayyad period, although scholarly opinions may differ.[98]

[90] Garipzanov 2018, 19–23 and 132–33; Garipzanov 2021.
[91] Garipzanov 2018, 216–19.
[92] For example, Wamser 2004, 281, number 449 and Garipzanov 2018, figure 7.13.
[93] Garipzanov 2018, 241.
[94] Taxel 2013; Avni 2014.
[95] Shboul and Walmsley 1998, 270–71.
[96] Ehrlich 2022.
[97] Ehrlich 2023.
[98] Compare Levy-Rubin 2016 versus Yarbrough 2016, in the same edited monograph.

Therefore, the trajectories of evolvingly tense relations between the non-Muslim communities and the Islamic conquerors—and in particular the question of whether the Umayyads were already instituting policies barring Christians and other non-Muslims from employment by the government—remains a controversial topic.[99] It is entirely within the realm of possibility, however, that the belt buckle represents the wearer's faith but does so in a way that is a manifestation of the new geopolitical reality: it proffers a veiled Christian identity, conveyed through decorative motifs and Greek monograms that are open only to those who could understand and appreciate their hidden figurative meanings.[100] This also applies to the meaning of the animal scenes, particularly those containing serpent motifs.

Serpent imagery can have dual associations in the ancient world, from regeneration and healing encoded in the *asklepian*, to sin, death, and the underworld. Portrayals of animals defeating snakes and dragons are viewed as allegories of good overcoming evil: the bird-devouring-snake motif, in particular, gained traction in sixth-to-seventh century CE iconography of the East.[101] The Met buckle depicts the struggle between deer and serpents (figure 9); the CS 755 buckle shows a long-necked bird with a serpent in its beak as a key part of its openwork design (figure 10). Such representations of struggle, however, are not obvious in the Jaffa buckle nor in its closest parallels RGZM 387, RGZM 388, and SBF 3 (figures 7–8), unless ΦѠC-ZѠH is meant to represent good/Christ as a counter to the serpentine motifs. Alternatively, there are Christian themes involving serpents that represent elements of good. This includes Moses's healing serpent of brass (Num 21.8–9), an association with wisdom (Matt 10.16), or the first nature of the serpent of *Physiologus*, the premier exposition of Christian nature symbolism and allegory, to cast off its old skin and renew itself after fasting for forty days and forty nights.[102] The latter recalls Christ's fasting (Matt 4.2), as well as Pauline exhortations to put aside one's old self (Col 3.9; Eph 4.22).[103] However, a function of the goggle-eyed serpents, not least the border-panel of eye-like features, may have simply been apotropaic, as advanced by Gisella Ripoll-Lopez for struggle scenes between crocodiles and serpents of sixth-to-seventh century CE belt buckles from Iberia.[104] Snake and staring-eye representations have long been associated with powers to avert evil or ill luck and appear on amulets and charms to prevent malevolent influences or repel demonic spirits from the wearer.

[99] Borrut and Donner 2016.
[100] Shboul and Walmsley 1998, 279–81.
[101] Wittkkower 1939, 317.
[102] Curley 2009, 16–17.
[103] Curley 1980, 9.
[104] Ripoll-Lopez 1998, 108, 190.

Illustrating this tradition is a seventh century CE amulet-medallion from Sicily, which features a face with stylized snake heads.[105] The fear of the evil eye and its effects (ailments, misfortune, and death) permeated all classes of Byzantine society, including those of wealthy and educated individuals.[106]

## *Summary and Conclusions*

The Jaffa buckle is a rare example of its type with archaeological provenience. Its findspot was associated with Byzantine to early Islamic strata, which included the potential remains of a church. The general archaeological context and the buckle's style date it to seventh to eighth century CE, an era marked by significant geopolitical transformation from Byzantine to Arab rule. Like other contemporary belt buckles, the Jaffa buckle has openwork symbolic motifs, and messages of Christian faith and religious references. All the components of the Jaffa buckle are now chemically identified: the thin metal insert is of pure copper, and the outer panels are of cast quaternary and ternary alloys, consistent with scrap-metal alloying. Our analyses show no evidence of enameling; however, the openwork had been mechanically finished to a high level by contouring the sides of the panel cavities with hand tools to better emphasize the design. Made from three distinctly layered components, the Jaffa buckle embodies several fine-metalworking techniques, including mold-cast openwork, engraving, stamping, and cold connecting, demonstrating a variety of artisanal skills. The sourcing of different components and the technical demands of the tripartite construction likely necessitated a well-organized workshop or one that was under the control of a group of artisans. The Jaffa buckle was likely produced in a local urban workshop such as the contemporary workshops in the nearby Flea Market Complex in Jaffa,[107] in Ramla,[108] and in Beth Shean.[109] Providentially, the Jaffa buckle resembles RGZM 388[110] with similar openwork and engraved and punched decorations. This resemblance, however, does not extend to the frame-shape, size, and rivets, nor to all the decorative elements, suggesting that various buckle versions and qualities within a recognized style or tradition were in circulation.[111]

[105] Metaxas 2012, 47, figure 9.
[106] Vakaloudi 2000, 184.
[107] Peilstöcker et al. 2006; Arbel 2017, 73.
[108] Khamis 2007.
[109] Ponting 2010.
[110] Schulze-Dörrlamm 2009, 183, number 388.
[111] For an example of a copper-alloy version of a gold Type-F8 buckle, purportedly from Syria, see Werner 1988 and Wamser 2004, 280, numbers 443, 446. On copperware imitations of silver vessels, see Drandaki 2020, 295–96.

Thus, the basic form of the Type-F8 buckles was consistent, characterized by a long-D shape with a knob, a tripartite structure, and openwork panel, but within this standard, variations in size, decorations, and symbols were introduced to cater to exclusive demands. The concept can be traced to the military dress accessories of the Roman period, which transcended their prescribed, functional role and were a medium for sophisticated social expression among soldiers.[112] Buckles such as the one from Jaffa held a similar level of prestige in Late Antiquity, particularly when adorned with complex or meaningful symbols that resonated with a specific audience or were restricted for use by distinct societal groups such as priests, soldiers, or civic officials. In their design and iconography, the buckles present a distinctly Byzantine style, embodying an exclusive figurative language of religious symbols, motifs, and monograms. The ΦѠC-ZѠH graphic, for example, likely served as an inspirational or invocational message recognized within contemporary Christian circles. Similarly, the goggle-eyed-serpents motif was likely understood as a nature allegory or a symbol conferring protection to the wearer. These iconographic elements, prevalent during a period marked by significant societal shifts from Byzantine to Arab-Islamic rule, not only reflected the wearer's identity but also subtly signaled their faith to others during this transformative period.

The Jaffa belt buckle emerges as an exceptional archaeological artifact in the study of Late Antiquity, providing invaluable insights into the metalworking techniques, symbolic iconography, and practical uses of objects in the Levant during this era. Its intricate design and high-quality finishes are a testament to the skill of the artisans who crafted it. The interplay of metallic colors, detailed design, and religious symbolism together underscore the buckle's status as a prestige item, intended for display and recognition within the wearer's community. The buckle transcends its functional role in cinching formal male attire,[113] embodying a profound expression of the wearer's status, personal identity, and Christian faith[114] during the critical transition from Byzantine-Christian to Arab-Islamic rule in Palestine.

Our multidisciplinary approach for the Jaffa buckle, grounded in a comprehensive twelve-step methodology that includes archaeology, metallurgy, culture, and iconography not only contributes a valuable database of metallurgical and artisanal techniques for future studies but also highlights the influence on metalworking of late antique society and culture in the Levant. The research lays the foundation for future investigations of Byzantine and

[112] Hoss 2011.
[113] Eger 2003, 175.
[114] Cooper and Al-Saad 2015, 82.

early Islamic copper alloy artifacts, highlighting the complex interdependencies or entanglements between the physical behavior of artifacts and the social dynamics of their human users.

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