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The Old Sword and the Sea: A Medieval European Sword Off the Coast of Newe-Yam

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This article examines a sword discovered on the seabed near Newe-Yam, providing an analysis of its physical characteristics. The location of the discovery and the submarine iron corrosion processes are described. The sword, covered in a biogenic crust, was studied using non- and minimally invasive techniques, and compared with contemporary swords. A European origin and an approximate date in the twelfth–thirteenth centuries CE are proposed. The study also discusses the role of swords in Medieval European society, their association with authority and chivalry, and the romantic perceptions concerning Crusader swords.

Keywords: Medieval swords, Crusades, Kingdom of Jerusalem, underwater archaeology, iron corrosion, X-ray radiography.

Introduction

In October 2021, an iron sword covered with a biogenic crust was discovered by divers on the sandy seabed near Newe-Yam, south of 'Atlit (Fig. 1). The sword (Fig. 2) was subsequently turned over to the Israel Antiquities Authority for analysis.[2] Preliminary observations indicated that the sword was made in Medieval European tradition, based on the physical properties of the pommel and cross-guard. Now, following non- and minimally invasive techniques, it is possible to date the sword to the twelfth to thirteenth centuries CE, and associate it with the Frankish settlement in the Holy Land. X-ray analysis was used

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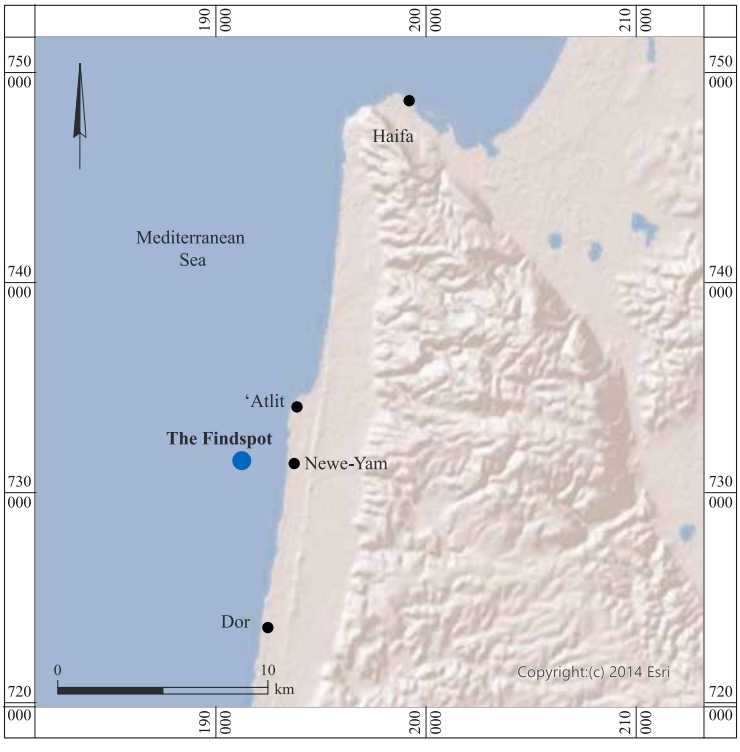

Fig. 1. Location map.

Fig. 2. The crust-covered sword (photography: D. Gazit).

to prevent damage to the sword, but unfortunately, the crust around its upper half partially cracked, exposing a section of the blade.

Swords have served as significant close-combat weapons since the dawn of metallurgy. The strength and flexibility of iron enabled the production of long and thin blades, and different techniques were applied to obtain specific properties: strong but elastic, long but light, sharp at the edge but flexible inside. These properties were achieved by minimizing the slag content and controlling the amount of carbon in the iron, creating low or high-

carbon steel. This study provides a detailed description of the sword based on various analytic techniques and compares it with contemporary swords to propose a rough date using common typologies.

Even today, swords are still associated with authority, knighthood and chivalry, with Crusader swords particularly invoking romantic associations, notwithstanding their main purpose to harm or kill other humans. This paper discusses the role of swords in Medieval society, evaluating both material and immaterial aspects. The study assesses the contribution of this find to the study of the Kingdom of Jerusalem and highlights how romantic perceptions of swords influence the public's reaction to a newly discovered 'Crusader sword.'

Findspot of the Sword

Over the past three years (2020–2023), an underwater survey has been carried out in the area between Newe-Yam and Ha-Bonnim. The survey focused on the small bays bordering the eastern Mediterranean shore, and the chin of shallow abrasion tables and small islands to the west. The seabed in this region is buried under a continuously shifting layer of sand, periodically revealing portions of the seabed and the artifacts lying on them. In early 2021, swimmers and divers reported to the IAA Marine Archaeology Unit the retrieval of ancient artifacts exposed on the seabed near the mouth of Naḥal Me'arot and the small sandstone cape. The underwater survey that followed revealed many artifacts belonging to ancient shipwrecks and cargos, dating from the Middle Bronze Age through the Late Islamic period. Among the artifacts found at the site was the Crusader sword presented here (Fig. 2), heavily concreted with sand, shells and small pebbles. Unfortunately, no other finds belonging to a contemporary shipwreck, crew or cargo were found.

Corrosion Processes of Submarine Iron

The object was discovered in a stable submarine environment and it exhibits a corrosion process, briefly described below, distinct from objects originating in a terrestrial context. When iron is exposed to oxygen and water, it oxidizes—a chemical reaction known as rusting. All metals, except gold, are prone to oxidization, but the oxidization of iron is the most destructive. Oxidization products of silver or copper alloys often form a protective layer that prevents further oxidization. Therefore, objects made of these metals are often found in very good condition. The corrosion layer of iron is complex and it may be composed of different iron-oxides and oxyhydroxides, including magnetite (Fe_3O_4) and goethite (α-FeOOH) (Jegdić et al. 2012:233). These corrosion products have a higher volume than metallic iron, meaning that they occupy more space and will therefore not form a sealing layer, but rather flake and crack. Through these cracks, oxygen and water can reach the iron under the rust layer, causing the process to continue. The corrosion layer flakes and crumbles, resulting in the fragmentation and disintegration of the object.

Fig. 3. Close-up of the biogenic crust (photography: D. Gazit).

Iron corrodes on land and underwater, but in submarine conditions, iron corrosion follows another path, leading to the encrustation of the object (Moore 2015:201). Initially, a corrosion layer will form on the iron, but shortly after, microorganisms will attach themselves to this corrosion layer, interacting with the corrosion products and creating a biofilm. This presents a suitable substrate for other microbes to settle on, including, eventually, even corals and mollusks. The rough surface of this layer traps sand and coral debris, incorporating them into a thick and hard concretion that covers the whole object, often including parts made of other materials, such as wood (Fig. 3). The crust forms a semi-permeable barrier between the seawater and the iron, and the microbes reduce the amount of oxygen in this environment. In some cases, this almost stops corrosion (North 1976:253). Removing this concretion is a time-consuming process and can be especially destructive when the metal is not completely preserved. When all the metal is lost, a biogenic crust can still be used to form a cast of the lost object (Worth, Keith and Rodriguez 2002:293). Regardless of the preservation of the metal, the shape of the original object can be observed using X-ray radiography. For the sword under discussion, it was decided that the potential additional information obtainable through the removal of the biogenic crust did not outweigh the cost and danger of removing it.

Non-Destructive Testing (NDT) by Ionizing Radiation

The radiography imaging of the sword aimed at characterizing the general shape of the sword to provide general dating. Radiography, an NDT method, utilizes ionizing radiation emitted from an X-ray tube or radioactive isotope for object examination. Radiography produces a 2D projection image, in which each pixel represents a line integral along the ray's path on the inner part of the object, positioned between the radiation source and an imaging detector. As the object's thickness and density increase, higher energy is required to

penetrate it. To obtain maximum information, the object is usually imaged at two different angles (0° and 90°). The following radiation sources were used to image the sword: X-ray tube—radiography with energies up to 300 keV; 192Ir—radiography at an average energy of 340 keV; and 60Co—radiography at an average energy of 1.25 MeV. The high energy from 60Co was required for the pommel, while low and medium energy from an X-ray tube was used for the blade.

Stage 1: Radiography of the Sword—Front View

Due to the length of the sword, it was imaged in three sections. An image plate (IP) was positioned beneath the sword, while an X-ray tube was positioned above it (Fig. 4). The images were taken under the following conditions: film-source distance FFD: 700 mm; tube voltage: 100–150 keV; tube current: 2 mA; exposure time: 60 seconds; imaging plate type: Fuji IP; resolution: 50 µm.

The radiography images (Fig. 5) enabled the identification of the blade, the fuller, the cross-guard and the pommel, although the penetration at the pommel was insufficient. It appears that the sword is moderately preserved with corroded areas.

Fig. 4. Image of the x-ray tube above the sword and imaging plate (face view) (photography: I. Hershko).

Fig. 5. Radiographic image of the three imaged sections.

Stage 2: Radiography of the Sword: Side View

Tangent radiography was performed on the sword using two different methods. The first was radiography with 60Co around the pommel (Figs. 6, 7). This revealed the octagonal shape of the pommel, as well as the technique used to insert the tang into it. The images were taken under the following conditions: film-source distance FFD: 1000 mm; exposure time: 20 minutes; imaging plate type: AGFA D4+Pb; resolution: 50 µm; source activity: 90 Ci.

The second method used radiography with a micro-focus X-ray tube (Figs. 8, 9), allowing for geometric magnification of different features, revealing findings in the order of tens of µm. A micro-focus image of the blade was obtained (Fig. 10), as well as an image of the grip (Figs. 11, 12), which was found to have survived beneath the crustation. The images were taken under the following conditions: X-ray tube: AMAMATSU-L12161–07; film-source distance FFD: 700 mm; tube voltage: 50–100 keV; tube current: 0.5 mA; exposure time: 120–180 seconds; detector: Digital flat panel, Perkin Elmer XRD 1622; and magnification: × 5–7.

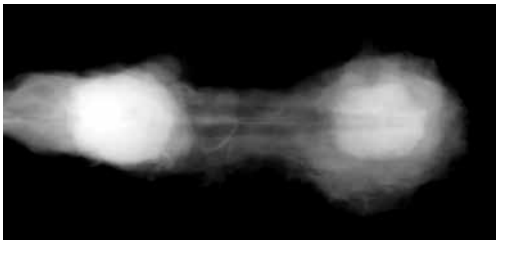

Fig. 6. Radiography using 60Co.

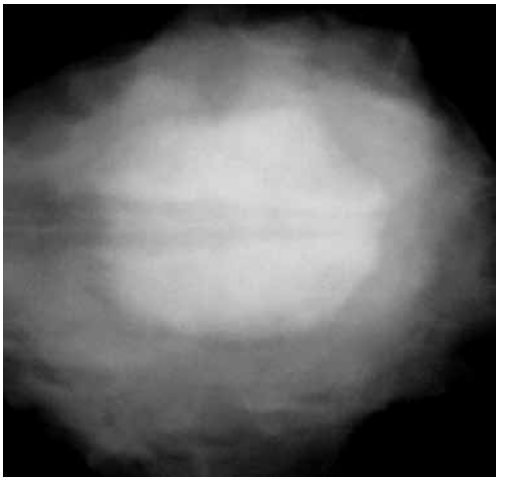

Fig. 7. Close-up of the pommel, displaying its octagonal shape.

Fig. 8. The micro-focus tube and the edge of the blade (photography: I. Hershko).

Fig. 9. Image of the blade tangent with the imaging plate in the background (photography: I. Hershko).

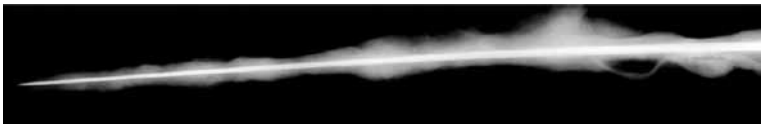

Fig. 10. Image of the edge of the blade.

Fig. 11. Imaging of the grip, with the flat panel detector in the background (photograph: I. Hershko).

Fig. 12. Image of the grip showing the manner of insertion of the grip into the pommel.

Description and Typology

Despite being covered with a biogenetic layer, the macroscopic examination of the sword permitted its tentative identification as European, dating from the late Medieval period (1000–1500 CE). This was further supported through the X-ray radiograms that revealed the sword's shape (Fig. 5). The unintended event of the cracking of the crust, resulting in the exposure of the upper half of the sword, allowed us to evaluate the quality of observations made using the X-ray radiographs (Fig. 13). It was found that the thinner parts of the blade at the tip are roughly 25% wider than initially observed in the X-ray radiographs, and at the middle of the blade, it is only 5% wider than observed on the X-ray radiographs. These data provide a formula to correct the previous estimates of the width of the section of the blade that is still covered with the biogenic crust.

The blade of the sword is 88 cm long and 4.6 cm wide (Figs. 5–7, 10, 12, 13). It has parallel edges for two-thirds of its length, tapering to 2.2 cm and ending in a rounded point. The fuller is about 1 cm wide and runs at least three-quarters of the blade's length, possibly extending into the tang. The cross-guard, 31 cm long, is plain, straight, and has a square section (Fig. 14); it is slightly widened at the center. The handle tang is 11 cm long and 3 cm wide, tapering to 1.1 cm where it enters the pommel. The X-ray radiographs illustrate that the tang penetrates the pommel and exits it on the other side, where it must have been bent

Fig. 13. The sword after the crust cracked (photography: D. Gazit).

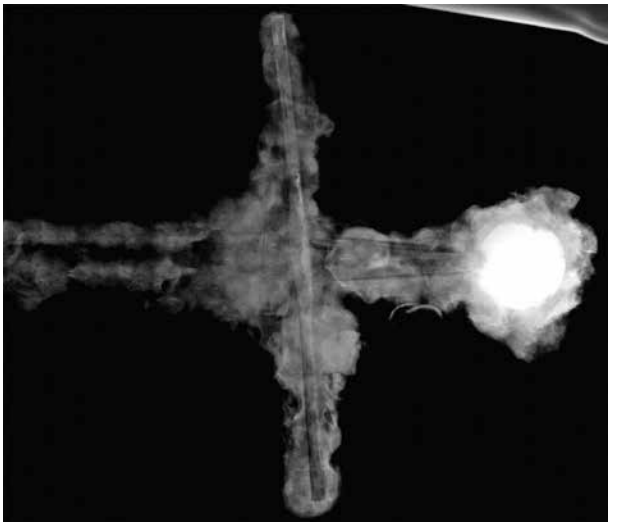

Fig. 14. The cross-guard.

to keep the pommel in place. The wooden handle is also visible on the X-ray radiograph, but only on the side view. Therefore, it must have been constructed of two scales kept in place with a leather band. The wooden scales are thinner close to the pommel, probably because this was where a metal sleeve or ring, c. 1 cm wide, was placed around the scales. The pommel (6 cm wide, 6 cm long, 5 cm thick) is disc-shaped with chamfered edges.

In the 1960s, Oakeshott defined a typology for medieval swords, from the period between 1000–1500 CE, subsequently revising it (Oakeshott 1994). Although this typology is still often used, it has been criticized for using misdated and forged swords (Tzouriadis 2019:5). Additionally, structural problems due to the large variety in sword shapes, the extensive periods of use and the overlap between types, hinder the use of this typology for precise

dating. Nonetheless, its application can provide a broad date and offer a common vocabulary to describe swords. Oakeshott (1994) distinguishes between three parts of the sword: the blade/tang, cross-guard and pommel. He defines 22 blade types and subtypes, more than 40 pommel types and 12 types of cross-guards. Alfred Geibig (1989) defined a sword typology spanning the eighth–twelfth centuries CE, mainly focusing on Germany, presenting 19 blade types and subtypes and 19 pommel types, with more detailed measurements. Both Oakeshott's and Geibig's typologies are used in regional studies in Europe (see, e.g., Aleksić 2007).

Swords from the late Medieval period in Europe differ physiologically from earlier and later swords, and from swords from other parts of the world. These swords, used for stabbing and slashing, have a straight blade of medium length, a relatively wide cross-guard and a prominent pommel. Earlier swords, known as "Viking period swords," are characterized by a shorter, wider blade and a narrower cross-guard (Oakeshott 1994:29). Cross-guards grew longer during the late Middle Ages (Aleksić 2007:94), likely a result of increased sword-on-sword fighting and the added defensive function it provided. The use of plate armor, which took hold in the fourteenth century CE, led to additional changes in swords. As armor provided sufficient protection, shields became obsolete, freeing up an extra hand for the sword. Double-handed swords were larger and heavier, providing a weapon that could cause significant damage to a heavily armored opponent (Aleksić 2007:84). However, one-handed swords did not disappear; they became known as "side swords," mostly used for stabbing, as they had sharper tips (DeVries and Smith 2007:184–185).

Swords of the Islamic world were different in shape. In the seventh century CE, all swords were straight. In the Abbasid period, the Turks introduced the *saber*, a sword with a curved blade, which became widespread by the Seljuk Turks in the eleventh century CE and dominant during the Mamluk period (Alexander 2001:205). Eventually, straight swords disappeared in the Ottoman period (Nicolle 1991:304–305; Al-Sarraf 2002:167–172). The cross-guards on swords and *sabers* from the Islamic world were narrow and often cross-shaped, but literary evidence suggests that only swords had straight cross-guards, while *sabers* had down-turned cross-guards. A cross-guard of this type was found at Belvoir (Fig. 15), with a metal cap at the end of the handle, smaller than the European pommel. The use of later cross-guards and pommels on early swords, however, complicates the archaeological record (Al-Sarraf 2002:175–176).

Returning to the sword from Newe-Yam, the shape and size of the blade and fuller are closest to Oakeshott Type Xa, most of which date to 1050–1150 CE (Oakeshott 1991:36–52) and Geibig Type 9, dating to the twelfth century CE (see Petri 2014:129). The cross-guard matches Oakeshott Style 1, although extremely long. This style is in use during the entire period Oakeshott had defined and beyond. Geibig (1989:247) argued that cross-guards that measure over 25 cm long appear from the twelfth century CE onward. Furthermore, Aleksić (2007:94) stated that throughout Europe, such cross-guards were very rare before the end of the twelfth century CE, becoming frequent during the thirteenth century CE. The handle was commonly made of two scales, and a metal sleeve or ring was often placed around the

Fig. 15. Islamic type cross-guard from Belvoir (photography: M. Salzberger).

end of the scales. The tapering of the tang is common in Oakeshott Type X and Xa blades, less so in other types.

Oakeshott Pommel Type I is found on Viking swords, but gained popularity in the mid-thirteenth century CE. It belongs to the disc pommel group, which was prevalent from 1150 to 1400 CE, replacing the Brazil-nut type. Disc pommels do not appear in Geibig's typology.

The blade and handle suggest an eleventh–twelfth century CE date, while the cross-guard and pommel are more likely from the thirteenth century CE. Based on sword typologies and other evidence from Europe, it is unlikely that the blade is later than the twelfth century CE. It is possible that the blade was refitted with a new cross-guard and pommel at that time. That said, it is not possible to connect this sword to a specific military campaign, Crusade, or military order.

Discussion

When news of the discovery of the Newe-Yam sword broke, it attracted significant public interest. At times, the reports were tinged with romantic associations, while others criticized the rash use of the term 'Crusader' (Perry and Gabriele 2021). The reasons for the strong emotions that the sword elicited, as well as its academic significance, are discussed below.

Medieval European-type swords are relatively rare in the Levant. Although some have been found in the sea, none have been excavated and most cannot be dated based on their context. In the Abbasid and Mamluk periods, the mace served as the primary weapon, useless for stabbing but very good for slashing (Al-Sarraf 2002:160–161). During the Early Middle Ages, the spear became the primary weapon for close-combat in Europe. It was lightweight, long and inexpensive, making it well-suited for thrusting. During the European

late Middle Ages, the sword evolved as the primary close-combat weapon. It was expensive, but effective for both thrusting and slashing. Given the abundance of such swords, the question of the importance of the current find arises.

Three swords were found in the sea near ʻAtlit (Linder 1967:27; Ronen and Olami 1978:38), one of which is likely the sword currently on display at Ha-Mizgaga Museum of Archaeology and Glass in Kibbutz Naḥsholim (Fig. 16, front). This sword was cleaned for the "Knights of the Holy Land" exhibition at the Israel Museum (Raphael 1999:151). Part of the blade, the hilt, pommel, and the cross-guard were preserved; the latter is not kept with the sword, and seems to be located in the box containing the crust that covered the sword before it was cleaned, which also contains a bar that is likely the cross-guard seen in old pictures of the sword. The straight cross-guard is approximately 15 cm wide. The hilt is covered with two pieces of wood, originally held in place with a leather strap wrapped around the hilt. The sword was found inside a scabbard, allowing for an estimate of its original length at 73 cm. At its widest point, the blade is only 3.5 cm wide. The hilt is about 9 cm and the pommel is 4.0 × 4.5 cm. The fuller runs along the entire length of the preserved blade (three-quarters of its original length). In old pictures, it appears that the fuller ran the entire length of the sword, although this cannot be verified. The pommel is worn but seems to have the shape of an expanded octahedron (Fig. 17). The other two previously found swords are now lost, although a photograph of one of them shows a pommel, hilt, cross-guard and the beginning of the blade (Fig. 18; Ronen and Olami 1978:38, Fig. 38). The pommel is disc-shaped and the cross-guard appears to be plain. The photograph is not clear enough to determine whether the blade had a fuller and its length remains unknown, but the blade appears to be about 5 cm wide.

Fig. 16. Swords at Ha-Mizgaga Museum of Archaeology and Glass in Kibbutz Naḥsholim (photography: J. Gosker).

Fig. 17. Close-up on the pommel of one of the swords at Naḥsholim (photography: J. Gosker).

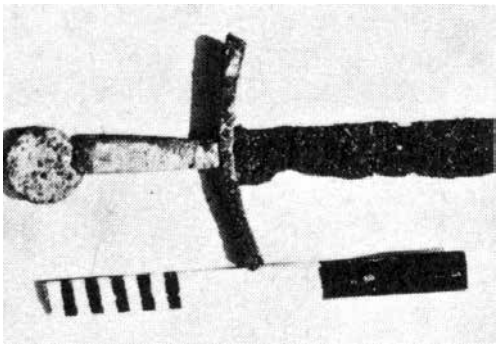

Fig. 18. Photograph of the currently lost sword from the vicinity of ʻAtlit (Ronen and Olami 1978:38).

Three more swords were found in the sea near Dor. Two were published in drawings (Kingsley and Raveh 1996:28), yet their current location is unknown. The third sword is on display at Ha-Mizgaga Museum in Kibbutz Naḥshonim (Fig. 16, back). One of the published swords had a 95 cm long blade and a 10 cm long hilt, visible on an old photograph from Ha-Mizgaga Museum (Fig. 19). The cross-guard was 23 cm wide and the oblong pommel was about 9 × 3 cm. The other sword was broken and the length is unknown. The width of the blade was 6 cm, and the cross-guard was 17 cm wide. The sword in Ha-Mizgaga Museum, still covered in a crust of shells and sand, is broken. The entire sword, including the crust, is 110 cm long. The break allows us to estimate the blade's width, approximately 5 cm at its widest point. Furthermore, the cross-guard has a rectangular cross section. The wooden scabbard was also exposed. In addition to these swords, the empty encrustations of two other swords were found in the sea at Dor.

An additional sword (Fig. 20) is said to have been found in el-ʻArish in Sinai (Yehoshua Dray, pers. comm.). It was given to an archaeologist by its owner, whose whereabouts are no longer known. A metallurgical study conducted to determine its authenticity showed that the sword dates to the twelfth–thirteenth century CE (Golan, Raphael and Ashkenazi 2014). It is not known how the sword ended up in el-ʻArish and its identification as a Crusader sword is tentative. All of the iron parts of the sword were preserved, save for the tip. The blade has a fuller, which is described as occupying two-thirds of the blade. The published reconstruction of the blade, however, shows an extremely long point, which is unlike the Oakeshott Type XII that the authors attributed it to. Therefore, it seems likely that the sword was shorter and that the fuller occupied three-quarters of the blade. The 14 cm long cross-guard is plain and straight, but the arms expand at the ends. The pommel is octagonal bifrustum in shape (Fig. 21).

Bashford Dean, who published the early twentieth-century excavation at Montfort, mentions two swords that "were found in the hands of an antiquary in Jerusalem"; however,

Fig. 19. The swords on display in Ha-Mizgaga Museum in Kibbutz Naḥsholim.

Fig. 20. The sword from el-ʻArish (Collection of Arzi and Avner Yarom, Haifa; photography: © The Israel Museum, Jerusalem).

Fig. 21. Close-up of the pommel of the sword from el-ʻArish (photography: J. Gosker).

their current location is unknown (Dean 1927:44). The Franciscans have a sword in their custody that is, according to tradition, the sword of Godfrey of Bouillon, the first ruler of the Kingdom of Jerusalem; this sword, however, does not date to the Frankish period. Iron blades, possibly of swords, have been found in ʻAtlit and Montfort (Dean 1927:38; Boas 2017:206), but are too small to determine the original proportions of the sword.

Medieval European swords did not disappear from the Eastern Mediterranean after the Frankish occupation of the Holy Land ended. Frankish rule continued on the island of Cyprus, and the Italian city-states continued to engage in Eastern Mediterranean trade (armed). A collection of European swords from the armory of Alexandria are on display in various museums in Istanbul (Alexander 1985; 1986), spanning the fourteenth and fifteenth centuries CE, some bearing Arabic inscriptions, as they were used as trophies.

Further evidence of the use of swords and daggers in the Kingdom of Jerusalem is found in two large collections of pommels held in the Metropolitan Museum of Art, New York, and the Israel Museum, Jerusalem (La Rocca 2011; Lewis, Tsach and Finkelstein 2021). These findings were identified as Frankish due to their suspected provenance in the Middle East, as well as the typological dating to the twelfth and thirteenth centuries CE. Most pommels on the swords of the Frankish inhabitants of the Holy Land were probably similar to the iron pommels on the swords that have been found.

The scarcity of Frankish-period swords is somewhat puzzling. It was suggested that Muslims reused and reforged Crusader swords, or made them into trophies (Michalak 2011:54). However, swords are rarely found in excavations, even in castles. This is not specific to Frankish swords, as large metal objects, such as swords, were often recycled, making them scarce in the archaeological record. There is also no evidence of intentionally depositing swords in burials or rivers in the Levant during the Frankish period. It is therefore not surprising that most swords have been discovered in the sea.

This scarcity makes the discovery of the Newe-Yam sword an important addition to the limited record of swords from the Kingdom of Jerusalem. The Newe-Yam sword is notable as it did not have a scabbard, present in the two swords on display in Ha-Mizgaga Museum. The biogenic crust of one of the swords was removed, revealing the wooden sides of the scabbard and handle, while the broken crust of the other sword exposed the wood of the scabbard. The two wooden sides of these scabbards would have been held together with leather or fabric (not found). While the X-ray radiographs of the Newe-Yam sword show the wooden parts of the handle, no evidence of a wooden scabbard are visible. Furthermore, the breaking of the crust around the top of the sword only revealed corroded iron.

The sword is slightly bent, and the cross-guard is not positioned at a right angle to the haft and blade (Figs. 14; 22). When forging a sword, a smith seeks to create a strong and tough blade. On impact, a sword will at first temporarily deform elastically, but when the impact is exceptionally strong, a tough blade will deform plastically (permanent) instead of break. Therefore, bent swords are not uncommon on the battlefield; however, they can also be easily bent back into shape (Kunz 2008:115). The bent state of this sword, along with the fact it was not within a scabbard, suggests that it might have fallen into the waters during

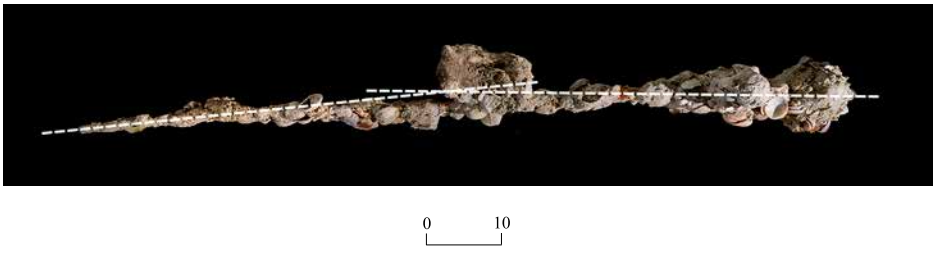

Fig. 22. Side view of the sword illustrating its bent form (photography: D. Gazit).

battle, which would also explain the position of the cross-guard. This allows us not only to approximately place the sword within the broader context of the Frankish period but reveal a small part of its biography.

The popular presentation of items, such as this sword in the media, usually focuses on the relationship between Crusader swords and romantic images of knighthood. Crusaders *are* in many ways the ultimate knights. Aggression, especially lethal violence, was always constricted by customs and laws, and the use of force was often restricted to a select group (Blanshei 1982:136; Theotokis 2018:444–445). The procession and use of swords was also regulated, though we do not know their specifics and how they were enforced. Sword fighting requires a great deal of practice, especially in the stress of battle (Molloy and Grossman 2007). High levels of stress can cause the loss of motor skills, causing inexperienced fighters to resort to slashing motions. This can be avoided through practice and muscle memory. In addition, fighters needed to be accustomed to taking the life of another human, which is counter-intuitive and against social norms. Hesitation for even a split second can result in death. Due to these challenges, peasants were poor sword fighters, often trained as archers, which was less stressful and distanced them from the act of killing. Professional soldiers, on the other hand, dedicated time to sword practice and became experienced in battle.

The connection between swords and knighthood is also a conscious construction rooted in symbolism. In the knighting ceremony, swords played a crucial role, and in medieval literature, swords often played an important role. Examples of this can be seen in the legendary swords: King Arthur's Excalibur and Charlemagne's Joyeuse. This historic connection between swords and knights was based on practical reasons and enforced by ceremony and mythology. Even as knights and swords disappeared from the battlefield, the symbolic connection between the two persisted in modern knighting ceremonies and in cultural works, such as books and movies (Lobach 2018:782).

The romantic image of the knight as an altruistic and heroic figure, who defeats his enemies in battle, finds its roots in chivalric romance. In these stories, the knight is often depicted as fighting for a higher purpose, such as defending a lady or serving God. Despite criticism of the Crusades and the violence associated with them, the term "Crusade" is still often used to refer to a quest for a greater good. Examples of this can be found in news

articles with titles such as "Crusade against corruption" and "Crusade against consumerism" (Powell 2013; Siegle 2018). The form of late Middle Age swords, with a widened cross-guard, greatly resemble a cross, enforcing the association between the sword and the Crusades (Lobach 2018:781). This combination of the knight, Crusade and sword created a powerful and enduring image. Despite its romantic appeal, it is important to recognize that swords were used by a small elite as brutal instruments of control, both practical and symbolic.

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