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CORDAGE PRODUCTION
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André J. Veldmeijer

Tauwerk Produktion
Production de cordage

The term "cordage" refers to rope and string, and to the products made from these, such as netting. Its presence among some of the oldest artifacts found on archaeological sites testifies to its usefulness through the ages. In ancient Egypt, the production of cordage was relatively simple, for it could be made by hand without special implements. However, the manufacture of thick rope required the efforts of more than one person and/or the use of special tools. Various materials were used to make cordage, depending on the availability of the necessary plants and also on the intended function of the cordage.

كلمة <<كورداج>> الإنجليزية تشيرإلى الحبال والخيط وإلى كل ما صنع منهم مثل الشباك. مصنوعات الحبال من أقدم البقايا بالمواقع الآثرية وهذا بسبب تعدد إستخدامات الحبال والخيوط عبر التاريخ. كانت صناعة الحبال في مصر القديمة سهلة نسبياً فكان من الممكن أن تصنع يدوياً دون أدوات خاصه. ولكن صناعة الحبال الكبيرة تطلبت أكثر من شخص. لقد استخدمت مواد مختلفة في صناعة الحبال تبعا للغرض المطلوب والنباتات المتاحة.

The term "cordage" refers to rope and string, and to the products made from these, such as netting. Cordage, basketry, and textiles are closely related. Indeed some objects can be regarded as both basketry and cordage. For example, bed matting is made of spun or plied strings ("linear cordage") that are woven, weaving being considered a basketry technique. In the present discussion, focusing on the cordage of ancient Egypt, the relevant terms have been defined in such a way as to avoid overlapping as much as possible. Definitions and terminology follow those presented in the author's work (Veldmeijer 2005a, 2005b, 2006a; compare Ryan and Hansen 1987; and Wendrich 1989, 1991, 1999). The terms "twist" and "composition" can, accordingly, be explained as follows (fig. 1): The "twist" is the orientation of yarns, plies, and cables, visualized by reference to the letters 'z' or 's' (yarns), 'Z' or 'S' (plies), '[Z]' or '[S]' (cable), '{Z}' or '{S}' (double cable). The central stroke of the letter marks the orientation of the twist. "Composition" refers to the orientation and number of the subsequent levels of the piece. A number following the 'Z' or 'S' shows the number of yarns or plies used. For instance, $zS_2[Z_3]$ means that two z-twisted yarns $(_2)$ are plied in the S-direction. Then three $(_3)$ of these plies are cabled in the [Z]-direction. The composition of non-plied cordage (yarns) cannot be visualized because yarns are the first level of production. Therefore, when yarns are referred to, only the twist is mentioned.

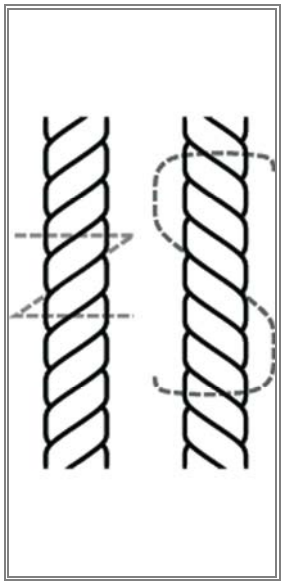

Figure 1. Twist and ply of a Z-plied and S-plied cordage (sZ_2 and zS_2 respectively).

From Plant to Cordage

Two or three phases in the production of cordage can be identified, depending on whether the end product was linear cordage or an object made from linear cordage, such as netting. These phases are depicted in varying degrees of detail in several tombs (Teeter 1987: 72; see also Charlton 1996: 36 - 55). First, before cordage could be made, the required plants had to be grown and their usable components harvested (fig. 2). The plants most commonly used for making cordage constitute the primary focus here—namely halfa grasses, reeds, and palm—as opposed to sedges, cotton, and rawhide/leather. Papyrus, a sedge, seems to have been used mostly for the manufacture of thick rope (Lucas 1948: 161), although thick ropes found in caves at the ancient port of Mersa/Wadi Gawasis (Veldmeijer and Zazzaro 2007) were made not of papyrus but reed (Veldmeijer and Zazzaro: submitted work). Fine string made from the epiderm of the papyrus culm has occasionally been found at Pharaonic-Period sites, as represented by an amphora sling from Amarna, for example (Wendrich 1999: 204 - 205). The epiderm may have been a by-product of papyrus

Figure 2. Two examples of plants used for cordage: dom palm (*Hyphaene thebaica*), Shellal (above); date palm (*Phoenix dactylifera*) (below).

production. Some cultivated plants, such as flax, were employed, but others grew wild and needed only to be harvested, grass being an example.

The preparation of plants for rendering into cordage depended on the material: grass required more preparation than palm, the procedure involving, according to Greiss (1949: 252), soaking and beating. Ethno-archaeological observations made by Wendrich (1999: 283), however, differ in that grass was dried for three to five days and wetted just before use. The preparation of date-palm leaves, according to Wendrich (ibid.: 281), involved thorough drying before the side leaflets were removed; the leaf-sheath fiber could be used after soaking briefly. Dom palm leaves were dried for a minimum of two weeks, after which the leaves were split (ibid.: 275). The preparation of flax for textile production was much more elaborate and involved various stages, including retting and beating, or bruising (Vogelsang-Eastwood 2000: 271). It is noteworthy that this process might have been less intense had its purpose been the manufacture of cordage, as many archaeological examples prove. Less commonly used in cordage manufacture were animal products, namely goat hair, which may have involved washing before spinning and plying.

The second phase comprised the production of linear cordage. Short lengths of grass or palm linear cordage could easily be made by rolling two bundles between the hands (for example, Henein 1988: 190; fig. 3; Ryan 1993: 72 - 73). Wendrich (1999: 298 - 300) describes in detail how a string with alternating twist is made in two simple movements. It is noteworthy that the composition of string varied widely (see Veldmeijer 2005b); string featuring alternating twists prevails (the alternating direction of the spinning and plying strengthens the piece, making it less prone to falling apart), although non-alternating twists do occur. The strength of the spinning and plying influences the strength of the cordage and is itself dependent on various factors, among which is the material (Veldmeijer 2008; cf. 2006b). The production of longer and thicker pieces of linear cordage, such as those discovered at Mersa/Wadi Gawasis (fig. 4; Veldmeijer and Zazzaro 2007; Veldmeijer and Zazzaro:

Figure 3. The manufacture of linear cordage by the hand-rolling method.

Figure 4. A large number of coils of rope were found in Cave 5 at Mersa/Wadi Gawasis.

submitted work), involved various persons, as can be seen in tomb representations, and may therefore have been a (semi-) specialized craft. Depicted in the tomb of Khaemwaset (MacKay 1916; Teeter 1987), for example, is a scene in which a person twists fibers into a yarn by means of a tool with a weight. A second person plies two pieces of yarn, while a (third) person in the center regulates the tension of the plying. Texts mention ropes as long as 1000 cubits, the rough equivalent of 500 meters (Janssen 1961: 84, 86 - 87, 90). In the later New Kingdom we know that the price of rope was about 1 *deben* of silver—that is, the worth of about 2 cattle—for 100 cubits (Janssen 1975: 175).

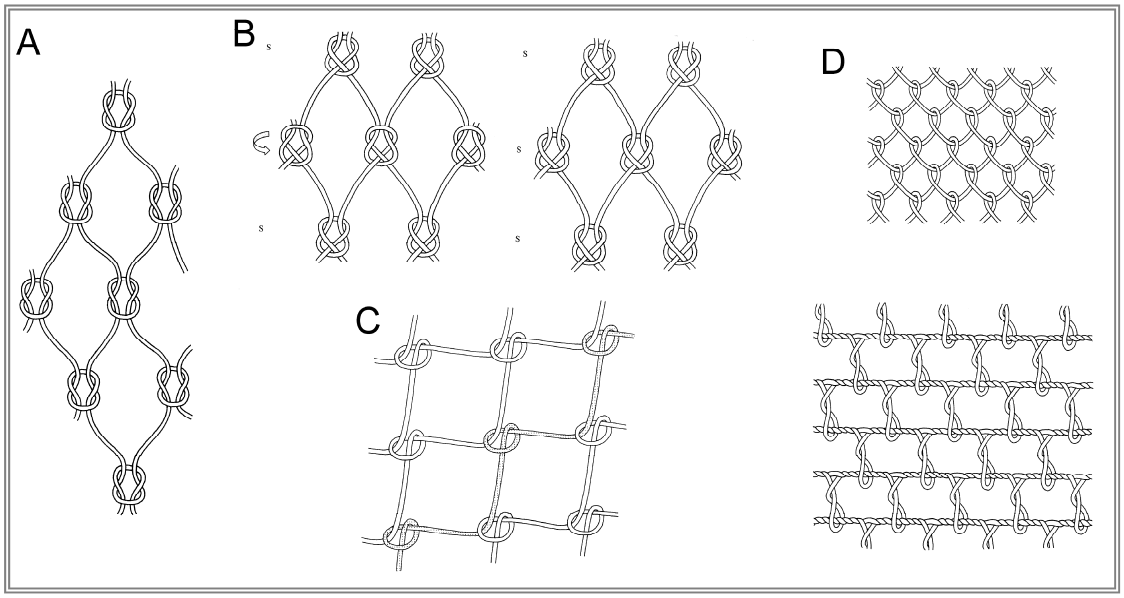

Figure 5. Various types of knots used for netting: (A) reef knots; (B) mesh knots; (C) half knots; (D) two types of knotless netting.

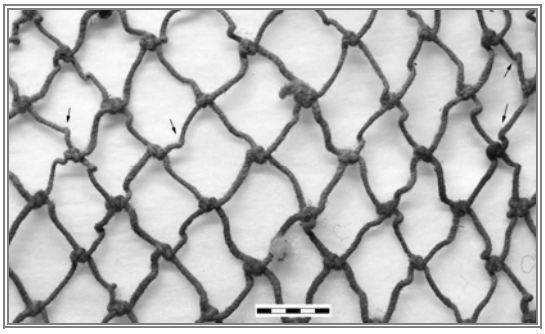

Figure 6. Detail of a fishing net from Qasr Ibrim (unstratified context), made with mesh knots (cf. fig. 5B). Note the strong plying of the strings (sZ_2), which results in curling (see arrows). Flax.

The spinning of flax thread for the production of textiles is well known and described in detail by various authors. Vogelsang-Eastwood (2000: 271 - 274) suggests that first the flax fibers were loosely twisted and then spun into the final thread in a second stage. Usually, flax fibers were wetted before being spun, after which the thread could be plied, used in the manufacture of textiles, or, less commonly, made into a net, most of the flax netting having been made of plied string.

A third phase of manufacture can be identified if the linear cordage was used to

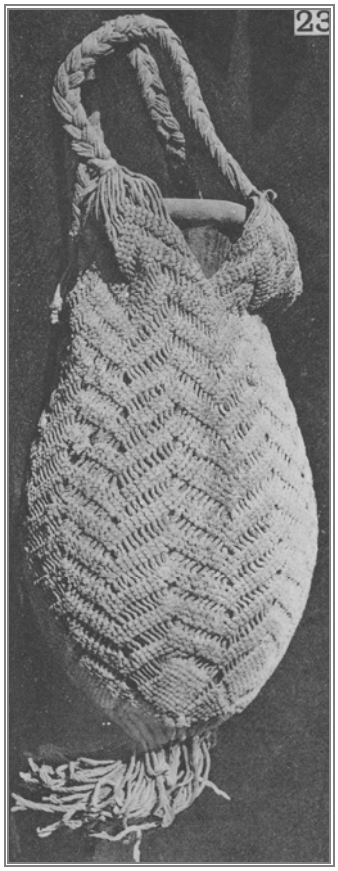

Figure 7. Jar with carrier net made with half knots, bearing strong parallels to Kerma netting, found in intact burial, Dra Abu el Naga.

render an object. An example of the manufacture of one such object, netting, is discussed below.

Netting

Egyptian netting was most commonly used in fishing and for carrying/holding objects, such as jars and beakers. Fishing and carrier nettings were usually made with different knots (fig. 5). Fishing nets (fig. 6) were exclusively made with mesh knots (Veldmeijer 2004; Wendrich 1999: 292 - 295), whereas carrier nets were made with overhand knots (Wendrich 1989: 182 - 184; 1996: 49 - 52; 1999: 204 - 205), reef knots (Veldmeijer 1999: 267 - 268, fig. 13-10; Veldmeijer and Roode 2004), and half knots (Veldmeijer and Roode 2004; Veldmeijer and Bourriau fc.), in addition to mesh knots (Veldmeijer and Roode 2004; Wendrich 1995: 77 - 78, fig. 41, pl. 42). The carrier net shown in Figure 7 was one of several included in the intact burial of a woman and child found by Petrie in 1908 at Dra Abu el Naga (Petrie 1909); these were constructed with half knots and bore strong parallels to the Kerma netting described by Reisner (1923). Knotless netting, a technique used for various objects ranging from carrier nets to sieves, is reported (Gourlay 1981a: 40 - 41, pls. II E, E, IV E, F; fig. 5D; Gourlay 1981b: 53; Schiaparelli 1928: 165, fig. 150; Veldmeijer 2005a; Wendrich 1998: 262 - 263; 1999: 290 - 291). "Sprang" netting (a particularly flexible form of netting) does not occur in Egypt before the Roman Period (Linscheid 2006).

Wendrich (1999: 293 - 294) has described in detail the production of netting made with mesh knots. First, a row of loops was knotted to a border string. A subsequent row of loops was then knotted to the first, and so on, using a netting needle (fig. 8). It should be noted that Wendrich's description focuses on mesh-knot netting constructed of knots having the same orientation per row, each row alternating in direction (cf. fig. 5B). Veldmeijer (2004: 103) suggests alternative production processes for netting with non-alternating rows or with variously oriented knots. The knotting of reef-knot netting differed slightly: although the net was constructed from either left to right or right to left, the knots were oriented horizontally rather then vertically as they were in mesh-knot netting (Ashley 1993: 65; Veldmeijer and Roode 2004: 12 - 13). Alternatively, reef-knot nets may also have been manufactured by pulling hitches, which involved a netting needle (Veldmeijer and Roode 2004: 12 - 13). Finally, handles, weights, and floaters were tied to the net when appropriate.

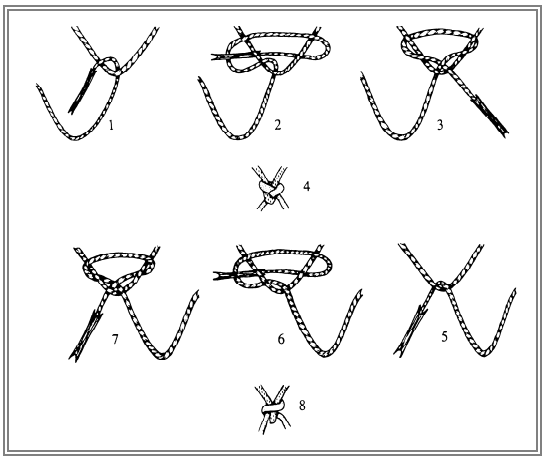

Figure 8. The sequence in which netting knots were tied: equally oriented mesh knots followed by mesh knots oriented in the opposite direction.

The production of fishing nets was depicted in Egypt as early as the Old Kingdom. Well-known examples include the depictions of net makers in the Middle Kingdom tombs of Beni Hassan (Newberry 1893: pl. XIII). The essential task of fishing-net repair was also depicted in some Old Kingdom tombs. An example from the New Kingdom can be found in the tomb of Paheri (Tyler and Griffith 1894: pl. IV).

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Figure 3. The manufacture of linear cordage by the hand-rolling method. Photo courtesy of Nessim Henein (1988: 188: pl. 46a).

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Figure 7. Jar with carrier net made with half knots, bearing strong parallels to Kerma netting, found in intact burial, Dra Abu el Naga. Copyright of the Petrie Museum of Egyptian Archaeology, University College London.

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