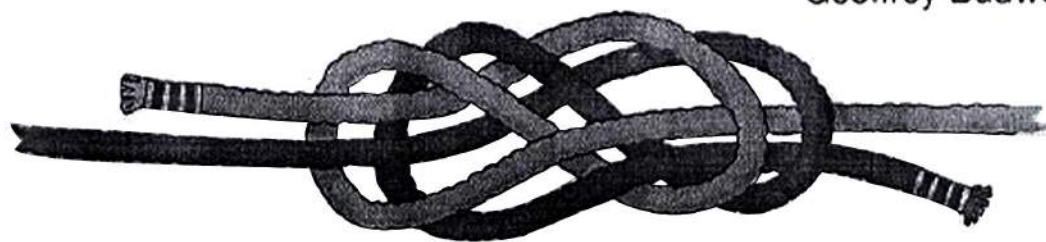


THE ULTIMATE BOOK OF EVERYDAY KNOTS

Geoffrey Budworth



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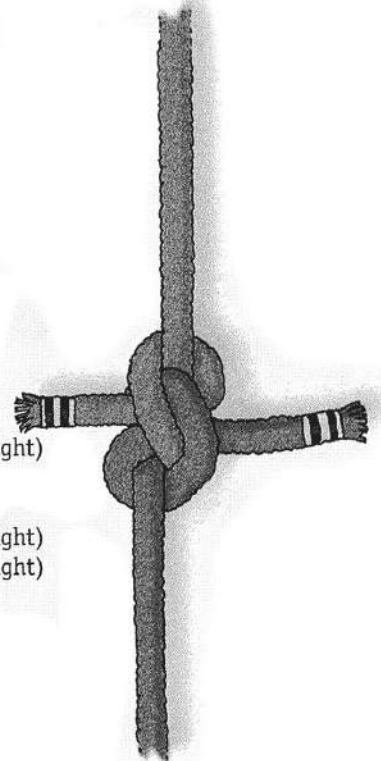
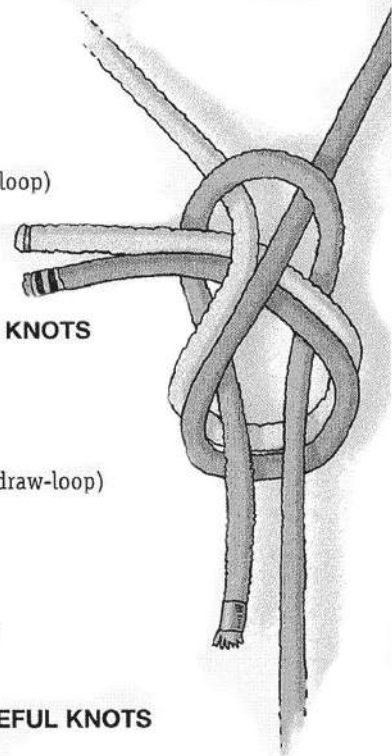
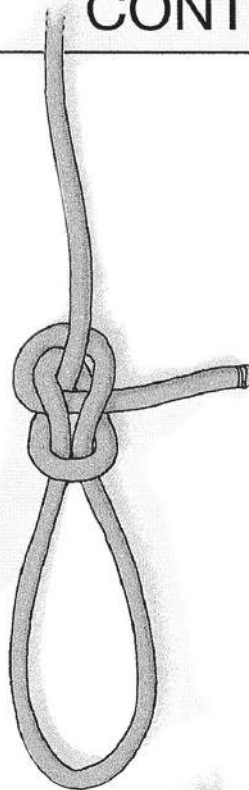
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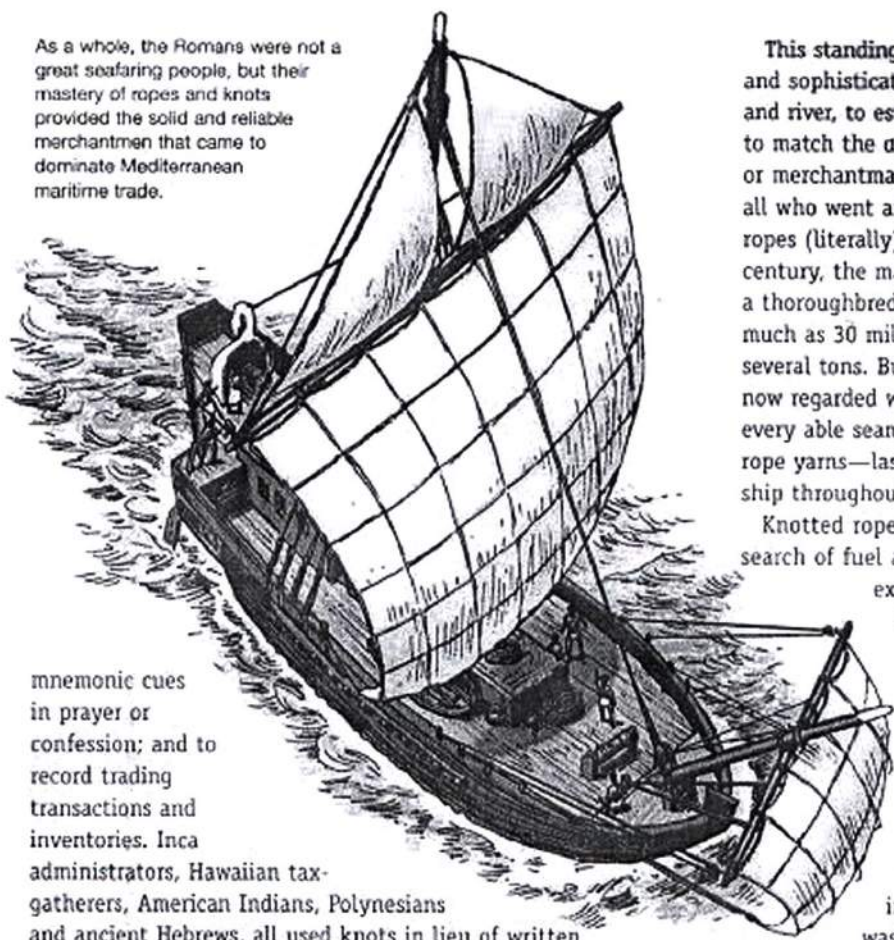
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As a whole, the Romans were not a great seafaring people, but their mastery of ropes and knots provided the solid and reliable merchantmen that came to dominate Mediterranean maritime trade.



mnemonic cues in prayer or confession; and to record trading transactions and inventories. Inca administrators, Hawaiian tax-gatherers, American Indians, Polynesians and ancient Hebrews, all used knots in lieu of written accounts. The rosary and the abacus probably evolved from knotted cords.

Knots also acquired symbolic connotations. Superstitious folk believed they could cure (warts, for example) or kill. Charlatans were tried for bewitching the gullible by means of knot sorcery, and the Greek philosopher Plato (c.428–347 BC)—in his *Laws*—decreed death as the proper penalty for such a crime.

The growth of maritime knots

The medieval Venetians maintained a firm maritime grasp upon their widespread empire with a naval fleet, rigged from a massive ropewalk building, through the open-mouthed architectural gargoyles of which newly made rope spewed directly into the hands of the dockside riggers. There is, of course, an undeniably strong association between boats and ships and knots. Once crude dug-out canoes and rafts had grown too big and heavy to haul from the water between trips afloat, some kind of anchor or mooring line was needed. The earliest sailing ship required stays and shrouds to brace and support its single mast, with extra ropes to raise and trim its crude square-sail.

This standing and running rigging became ever more complex and sophisticated as voyages grew more venturesome. From lake and river, to estuary, sea and ocean, knots evolved in versatility to match the demands made upon them. Deep-sea fisherman or merchantman, coastal smuggler or pursuing revenue officer, all who went afloat for whatever reason, had to know the ropes (literally) and the knots to tie in them. By the 18th century, the masts and spars of a lumbering 74-gun warship or a thoroughbred racing China tea clipper, strained under as much as 30 miles (48 kilometers) of rope rigging that weighed several tons. But this epoch of commercial and naval sail—now regarded with a nostalgia that (quite wrongly) assumes every able seaman had fingers like marlinespikes and hair like rope yarns—lasted barely 150 years. For every knot tied aboard ship throughout the last millennium, another was tied ashore.

Knotted ropes enabled miners to probe the deepest caves in search of fuel and ores deep underground; traders and explorers to trek on foot and with pack animals over and through desert, mountain range and jungle, in search of trade and treasure. Knotted cordage bucketed water up from wells and created the blocks-and-tackles with which stone masons built pyramids and ziggurats, castles and cathedrals. With knots British longbows were victoriously strung against whosoever was deemed to be the enemy at the time; church bells could be rung in alarm or celebration; kites might be flown; washing hung out to dry. While surgeons refined their suturing techniques, circus performers thrilled audiences with ever more daring feats on trapeze and tight-rope.

Bookbinders, cobblers, millers, butchers and shopkeepers of every kind, all employed a knot or two peculiar to their callings. So did farmers and falconers and steeplejacks: Weavers, their seemingly ramshackle looms worked by judiciously placed knotted linkages, joined broken yarns with a weaver's knot. Artful poachers made their own nets, since to buy them might alert the local magistrate. A rabbit net a yard (1m) high could be a hundred times as long, but it had to be light and small enough to carry concealed when out prowling. So they used lightweight threads—even silk (for birds).

Cennino Cennini (born c. AD 1372) wrote: "To make the perfect [artist's] brush take the bristles from a white hog, then tie them onto a stick using a plowshare knot." Five hundred years later the British Army ordered that: "...the greatest pains should be taken by the instructors to see that their men can make each of the knots here described in all situations." (*Instruction in Military Engineering—Vol. I*, 1st January 1870).

CORDAGE CONSTRUCTION

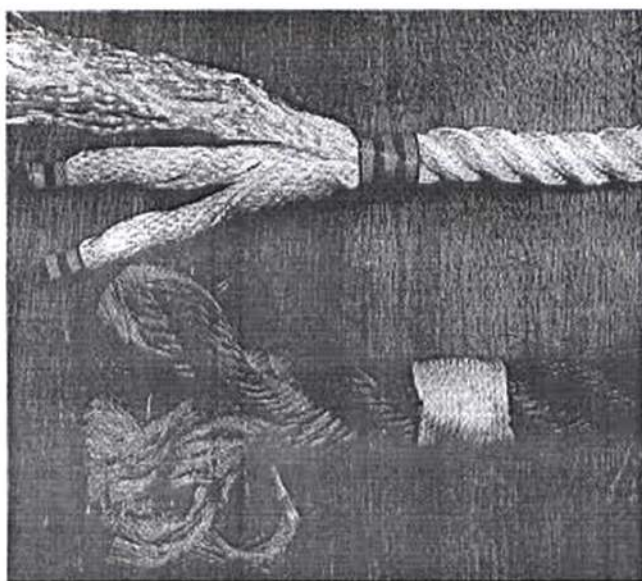
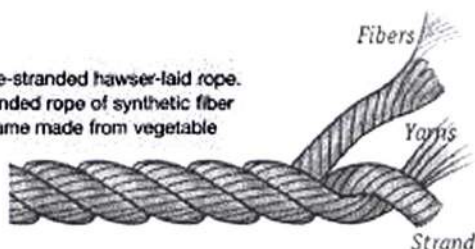
Strictly speaking the term rope only applies to cordage over 0.39 in (10 mm) in diameter. Anything less than this is referred to collectively as *small stuff*, which may be (in descending order of size) cord, spun yarn or twine. Small stuff of domestic quality is familiarly known as string or thread. Any rope with a particular function is a line (washing line, tow-line, guy-line, mooring line).

Ropemaking

The basic element of most synthetic cordage is a long extruded monofilament, which is a continuous fiber of uniform diameter and circular cross-section, larger than 50 microns (0.002 in). An alternative is the multifilament, which is a cluster of very fine synthetic fibers, each less than 50 microns. A batch of either mono or multifilaments is spun right-handed (clockwise) by machine to create a long yarn and a number of these right-handed yarns are next spun together in the opposite direction, left-handed or counter-clockwise, to create an individual strand. Finally a trio of these left-handed strands is then laid

Figure 1

The traditional three-stranded hawser-laid rope. Below: a three-stranded rope of synthetic fiber and, bottom, the same made from vegetable material.



up right-handed (clockwise again) to make a traditional three-stranded or hawser-laid rope, known simply as a hawser (figure 1). It is all of this accumulated twist and counter-twist, imparted during manufacture, that causes the components of a rope to cling together and is responsible for its characteristic geometry, strength and flexibility. Right-handed rope is sometimes referred to as Z-laid and left-handed rope (a rarer commodity) as S-laid.

Catering to the nostalgic preference of some customers to handle hairy rope, cordage manufacturers all have at least one product that recaptures this quality in synthetic materials. They achieve this by deliberately chopping extruded filaments into short staple lengths, to roughly replicate natural fibers, and then spinning and laying them up in the usual way. Some of these ropes and cords, are even colored and given brushed matt finishes, to resemble hemp, jute, etc. They look the part in TV and film historical costume dramas, or as part of the decoration of a nautical theme bar, yacht club or restaurant. They may even be used, with care, to re-rig classic wooden ships, as long as the shortcomings of such cordage are borne in mind.

Plaited

For a rope of gigantic size—such as a mooring line for a supertanker—four pairs of large strands may be interwoven to end up as a plaited eight-strand cable (figure 2). This type of construction is not only flexible for crews to handle on deck, but it is comparatively easy to splice to an anchor chain.

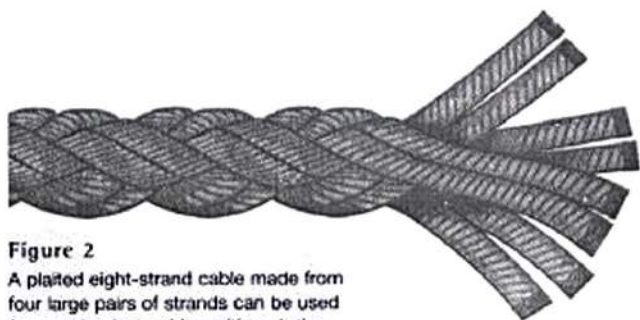


Figure 2

A plaited eight-strand cable made from four large pairs of strands can be used for mooring large ships, although the photograph below shows a much smaller, domestic version.



Braided lines

Only when the use demanded it (for flag halyards, sash cords in windows, ship's log-lines) was vegetable cordage braided.

In contrast, most synthetic cordage products are braided as opposed to laid (in strands). Braided ropes consist of an outer sheath of either 8 or 16 interwoven batches of yarns enclosing a number of core or heart yarns. These core yarns may simply run parallel through the middle of the rope (figure 3), or be hawser-laid (figure 4), or plaited (figure 5). This robust and versatile construction is known as sheath-&-core ("kernmantel" in some climbing publications) or braid-on-braid. There are even ropes with three layers, an outer sheath that encloses an inner sheath which surrounds the core (figure 6).

Braided lines not only combine strength and flexibility but incorporate other desirable features. For example, it is possible to have a nylon heart (for resilience) with an extensible Terylene sheath (to resist abrasion); or a Terylene heart of unyielding toughness, with a fluffy matt polypropylene outer sheath for comfortable handling.

All cordage—braided or laid—that is tightly tensioned during the manufacturing process is referred to as hard-laid. It will be durable but somewhat stiff (at least when new).

Figure 3
Parallel core braid rope and photographic example below.



Figure 4
Hawser-laid core braid rope.

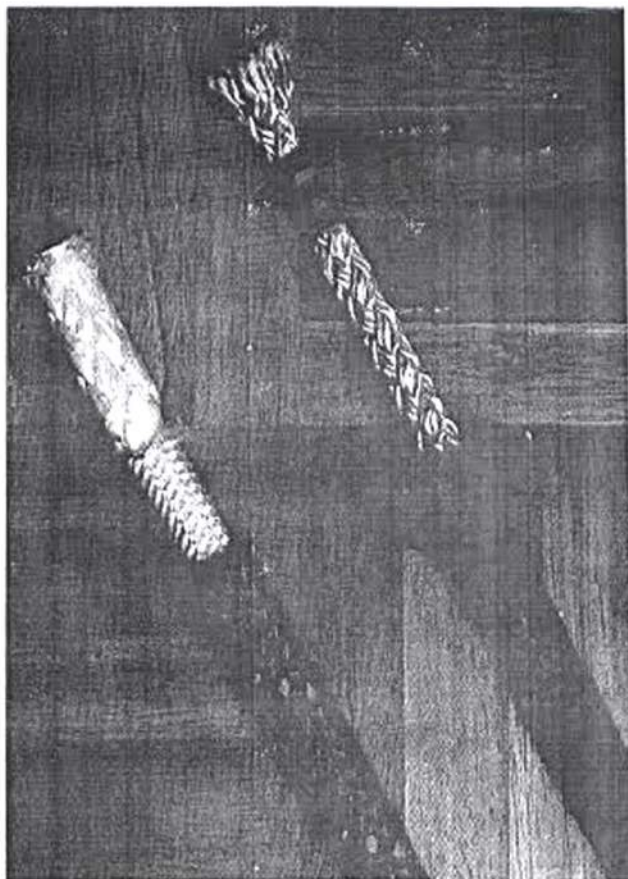


Figure 5
Plaited core braid rope and, in the picture above, (right).



Figure 6
Three-layered core braid rope and, in the picture above, (left).



A reduced tension during manufacture results in a more flexible line that is said to be soft-laid.

Cordage never came cheap, Ropemaking used to be a labor-intensive craft, dependant upon the importation of raw materials from distant lands subject to fluctuations in trade brought about by uncertain global conditions (including wars). Frugal users bought their rope second-hand (or stolen) and, when eventually it was too old for further work, it would be

GETTING STARTED

