BRILL

Journal of Egyptian History 6 (2013) 152–176

JOURNAL of EGYPTIAN HISTORY

brill.com/jeh

Ship Timber and the Reuse of Wood in Ancient Egypt*

Pearce Paul Creasman
University of Arizona
pcreasman@ltrr.arizona.edu

Abstract
Reuse of materials in ancient Egypt is neither a new nor novel concept. The ancient Egyptians reused a variety of materials and certainly any resource that had spiritual, ideological, or economic value that was available to them. Yet, reuse of certain raw materials has not been thoroughly examined, notably timber. This manuscript explores the modes, preferences and implications of wood use, specifically reuse, in Egypt's Pharaonic Period, using ship timber as the illustrative example. This synthesis suggests specific preferences for commodity consumption and conservation existed, revealing cultural and behavioral trends.

Keywords
reuse; economy; wood; timber; Egypt

* * * *

Introduction

Since timber was first exploited and manipulated, it has been an important commodity.[1] Throughout history, the restrictions of timber reserves have often dictated politics, military tactics, social relations, and economics.[2] In ancient

* The author is grateful for reflection on earlier drafts of this article by Noreen Doyle, assistance locating references by Steven Vinson, thought-provoking discussions with Jillian Gifford, and the advice of three anonymous reviewers.

1 Creasman, *Extracting Cultural Information*, 1–39; see Perlin (*A Forest Journey*) for an introduction to the history of wood use.

2 For example: "the control of and access to the timber resources of Macedon were . . . major factors influencing the political and military decisions of several other states during the Classical [Greek] period" (Borza, "Timber and Politics," 47); role of the forests in war and history: see Corvol and Amat (*Forêt et Marine*) and McNeill ("Woods and Warfare"); social relations: Mark Antony's gift of Cilician forests to Cleopatra VII as source for ship timber, ca. 36 B.C.E. (Strabo, *Geography*, 14.5.3); economics: see Meiggs's chapter titled "The Timber Trade" (*Trees and Timber*, 325–70) or

DOI: 10.1163/18741665-12340007

Egypt, as elsewhere, timber was valued for its broad utility and durability. Many texts indicate such commodities were held under the strict control of the king or his representatives.[3] Such control likely stemmed from the need to supplement the domestic timber supply with external sources, perhaps as early as the Predynastic Period.[4] Foreign enterprise of this magnitude would have been the king's prerogative likely due to expense, save for a minute fraction of the nobility. During the Old Kingdom wood was imported in great quantities, especially for use in ships.[5] The Palermo Stone relates that at least 62 (probably Nilotic) ships were constructed during the reign of Snefru, while a further 40 seafaring ships filled with cedar logs and at least 3 additional ships 100 cubits in length were brought back from the Near East, presumably Byblos;[6] the Khufu I vessel, discussed below, was built of more than 38 tons of imported cedar.[7] Through the Middle and New Kingdoms ship timber continued to be imported in similarly large quantities (for example, a military expedition employing 20 cedar-built ships is recorded at Beni Hassan in the tomb of Khnumhotep I, a noble in the service of Amenemhet I[8]) and stockpiled at royal dockyards.[9] The Egyptians' ability to import such timber seems, however, to have waned with the New Kingdom, if the *Report of Wenamun* is interpreted as reflecting the historical situation.[10] Like those of many other societies,[11] some rulers of Egypt, though certainly not all, recognized that maritime prowess (a necessity for a society tethered to the Nile) was dependent on access to the terrestrial products from which ships were made.[12]

Advances in propulsion and shipbuilding technologies during the Pre- and Early Dynastic Periods (*e.g.*, advent of the sail[13]) facilitated a marked increase

---

Horden and Purcell's economic and social analysis, especially the section titled "The Integrated Mediterranean Forest" (*Corrupting Sea*, 182–86).

[3] Grajetzki, *Two Treasurers*, 2–5; Janssen, *Commodity Prices*, 370–88, 539–62; Parkinson, *Voices*, 85; Wente, *Letters*, 59–88, especially nos. 77, 89, 99; but this interpretation may be the result of having almost exclusively royal documents from which to interpret the situation.

[4] Gale, *et al.*, "Wood," 349; Lewis "Timber and Nile Shipping," 138; Meiggs, *Trees and Timber*, 49–87.

[5] For the purposes of this discussion a "ship" is considered in the broad sense to include potentially any watercraft—boats, Nilotic, seafaring, *etc.*—that employed wood in their construction.

[6] O'Mera, *Palermo Stone*; *ARE* I, 65–6.

[7] Mark, "Construction," 133.

[8] Newberry, *Beni Hassan*, 84, pl. XLIV.

[9] Evidenced during the reign of Senwosret I (Simpson, *Papyrus Reisner*); see also Glanville ("Records of a Royal Dockyard") for New Kingdom evidence.

[10] Goedicke, *Wenamun*.

[11] For example, Lane, *Venetian Ships*, 217.

[12] Creasman, *Extracting Cultural Information*, 82–85 and "Further Investigation," 113–14.

[13] Huyge and Darnell, "EA 35324"; Vinson, "Seafaring," 2–3.

of maritime activity and productivity on the Nile. For example, a wooden boat is featured on the Narmer Palette (CG 14716). Whether the palette's content is political myth or history, the pharaoh had the resources to enforce his will across a united kingdom. Through numerous other such images, words, and deeds, it is apparent that the Egyptians understood that "nothing could equal a ship for carrying capacity and reasonable speed."[14] Since wooden ships displace water better than papyrus or reed craft, carry far greater capacity, and are more durable and more stable, they became the vessels of choice and "workhorses" of ancient Egypt.

So dominant was maritime life in the Egyptian worldview that the earth was imagined as floating on a universe of inert and dark primordial waters, known as *nw* or *nwn*.[15] It should not be surprising, then, that watercraft were an essential part of the burial ritual and contents since Egypt's first kings (and protokings).[16] Ships and boats proved so effective that both the Old and Middle Kingdoms passed without need for the wheel for transportation.[17]

There is, unfortunately, no reasonably reliable method to estimate how many wooden ships and boats plied Egyptian waters for any period. Consequently, there is no reliable estimate of the amount of wood and other resources required to build them. The archaeological record has, however, yielded physical evidence of watercraft. To date, for the entire pharaonic period, physical evidence of only 25 (possibly up to 30) vessels, either complete or fragmentary, has been discovered. Because of the relative scarcity of ship remains, it is critical to extract all of the data possible from their timbers.[18] Much of this evidence does not derive from (more or less) whole hulls, such as those interred with royal burials; ship timbers in secondary use are sometimes preserved in non-nautical contexts. As Russell Meiggs wrote, "Wood is among the most durable substances,"[19] and, as the following evaluation demonstrates, ancient carpenters took great advantage of this feature through regular reuse of the material.

It is generally assumed that quality timber for use in any application was at a premium for most of Egyptian history.[20] Wooden ships were resource-intensive constructions and represented an intensive individual use of timber

---

[14] Kemp and O'Connor, "Birket Habu," 101.

[15] Allen, *Genesis in Egypt*, 4–5; Wilkinson, *Gods and Goddesses*, 117.

[16] For example, the only known painted Predynastic tomb, Tomb 100 at Hierakonpolis, features numerous boats (Quibell and Green, *Hierakonpolis* II, pls. LXVII, LXXV).

[17] Partridge, *Transport in Ancient Egypt*, 76–77.

[18] Creasman, *Extracting Cultural Information*, 78–103.

[19] Meiggs, *Trees and Timber*, 302.

[20] Brand, "Reuse," 2; Deglin, "Wood Exploitation," 85; Gale, *et al.*, "Wood," 334; Mark, "Abydos BG 10," 119–22; Ward (*Sacred and Secular*, 15) disagrees; This assumption is largely untested and will likely remain in force until reliable proxy data (*e.g.*, tree rings) are assembled to provide a more holistic evaluation of the ancient environment.

because ships generally required large pieces of good-quality timber in large quantities. In a territory presumed to have a deficit of both quality and quantity of timber, the Egyptians would have been compelled to confront a challenge of supply. Reuse seems to have been the most prevalent solution, but the very nature of this practice makes reuse, in most cases, difficult to confirm.[21] When repurposed wood is discovered or suspected, original contexts other than watercraft must, of course, be considered. However, due to its distinct shaping, ship timber can be more readily identified in incidences of reuse than other previous applications and, consequently, provides a good case study for reuse of wood as a whole.

The discussion of the reuse of ship timber that follows is restricted to cases that can be confirmed as ship timber, or where a preponderance of evidence suggests a timber was at some point in its former use(s) employed in ship construction.

Disassembly for Future Use: Ritual Storage (Boat Burials)

Between 1952 and 1954, excavations at the pyramid of Khufu at Giza revealed two sealed pits, only one of which was excavated at the time.[22] It was found to contain over 1,000 cedar planks (some up to 22 m in length) with curious cuts and strategic lashing holes, determined to be the timbers from a dismantled ship. Under the direction of Ahmed Youssef Moustafa, five attempts made over the course of 14 years resulted in the reconstruction of "Khufu I" to its present state, approximately 43.5 m (84 cubits) long.[23]

The reconstruction process was aided by the realization, during the fourth assembly attempt (1964–67), of correspondences among 1,131 marks, representing 650 different hieratic signs, on the timbers (Fig. 1). These signs facilitated the correct placement of each timber,[24] providing, in effect, a set of ancient (re)assembly instructions for the disarticulated timbers.

Most of the joinery among the timbers was accomplished through means that allowed the hull to be deconstructed without destruction, "a deliberate goal of pharaonic shipbuilders":[25] unpegged mortise-and-tenon joints and ligatures. Each hull plank was joggled (Fig. 2), that is, created with notches that

---

[21] Brand ("Reuse," 2–4) explores the general motivations for reuse, including economic considerations and "pious recycling," but focuses on monumental stone.

[22] The second pit, containing a vessel known as "Khufu II," is currently undergoing examination by Waseda University; see Institute of Egyptology, Waseda University, "Khufu's Second Boat" and Yoshimura and Kurokochi, "Second Boat of King Khufu."

[23] Jenkins, *Boat Beneath*, 59–110.

[24] Lipke, *Royal Ship*, 82, 86 figs. 54–55; Mark, "Construction," 146.

[25] Creasman and Doyle, "Overland Boat Transportation," 16.

Fig. 1 Assembly marks indicating general location (quadrant) and specific location (paired timbers). Courtesy Paul Lipke Collection (photo by S. More).

Fig. 2 Joggled scarf joint of Khufu I (author's photo); Inset: joggled strakes of Khufu I. (courtesy Paul Lipke Collection).

interlock with those of its neighbors. Shipbuilders cut relatively shallow mortises into the edges of planks to receive tenons.[26]

Elaborate systems of lashings, some temporary for the duration of the construction process and others permanent, characterize the remainder of the joinery. Thousands of V-shaped transverse lashing channels received more than a mile (1.6 km) of rope.[27] The rope ran through the channels from one side of the hull to the other, typically over timbers or battens that covered the seams, presumably to make them watertight.

Although the assembly marks strongly suggest that the timbers were joined at some point prior to their burial, and some have interpreted evidence on the battens as indication that the vessel was actually used on the water,[28] Samuel Mark proposes otherwise. He argues that the hull was never fully constructed and its frames were recycled from another vessel(s). Lacking the quality evident elsewhere in Khufu I, the frames (internal structural components that, in Egyptian shipbuilding methods, are a later part of the construction process) fit poorly into the hull and might have been pressed into service because the boat was incomplete when the time came to bury it.[29]

Nonetheless, the accomplishment achieved by Moustafa and his team indicates the success of the ancient shipwrights: the Khufu I vessel represents the least transformative category of timber reuse, reassembly *in toto*.

Disassembly for Future Use: Non-Ritualistic Storage

At present, three sites where the ancient Egyptians stored timbers from secular watercraft have been located along the Red Sea coast: Ayn Soukhna (dating from the Old Kingdom through New Kingdom), Wadi el-Jarf (near Zarafana; Old Kingdom), and Mersa/Wadi Gawasis (near Safaga; Old Kingdom through New Kingdom).

All are characterized by long, narrow storage galleries cut into cliffs near the shore. At each site, varying amounts of timbers with clear nautical associations have been found in or near these galleries. For example, Wadi el-Jarf yielded a frame (colloquially termed a "rib") and a timber that appears to be from a rudder, in addition to fragments from beams made of Lebanese cedar (*Cedrus*

[26] Ward, *Sacred and Secular*, 50.
[27] Ward, *Sacred and Secular*, 46.
[28] Abubakr and Mustafa, "Funerary Boat," 15.
[29] Mark, "Construction," 148–50 and "New Data," 27.

libani), other pieces of wood, and rope, indicating that pieces of dismantled boats were likely stored here.[30]

The southernmost of the three sites, Mersa/Wadi Gawasis, was used as a seasonal harbor for maritime excursions to the land of Punt. Numerous disarticulated ship timbers, or parts thereof, were found within the galleries.[31] Detailed ongoing analysis of the wood debitage will provide for increased understanding of the context of discard and recycling that took place at naval repair/way stations.

Workers cleaned, prepared, discarded, or recycled planks in rock-cut galleries.[32] Pieces of wood debitage from ancient repairs were identified in the typical Egyptian style: red paint outlining areas that needed to be removed from planks, typically because of shipworm damage.[33] Removal of the damaged area of wood would not have been necessary unless the wood was to be reused in some fashion, nautical or otherwise. Presumably, stock not used on site for repairs would have been returned to workshops on the Nile along with the disarticulated ships. Hull and deck planks found at the site have numerous, and in some cases overlapping, mortises, indicating that they had already been repurposed.[34] Because the finds at Wadi Gawasis do not represent a single vessel, but rather parts of several, one can reasonably conclude that these are indications of intensive, repetitive, discard and reuse.[35]

This contrasts with the finds of timbers in two of the galleries at Ayn Soukhna. These yielded large quantities of rope and wood, representing timbers from two distinct ships, each of which would have measured between 13.5 and 15 m in length.[36] At this site, used as a harbor for pharaonic expeditions to the Sinai and occupied from the Old to New Kingdoms, the timbers were intentionally and carefully laid out, bound in groups, and stored elevated from the ground, similar to the packing of the Khufu I timbers.[37] The wooden planks feature both pegged and unpegged mortise and tenon joinery, L-shaped mortises, doubled mortises (discussed below), and cylindrical mortises with

---

[30] Tallet, "Ayn Sukhna and Wadi el-Jarf," 152, 166–67 figs. 18–20; Tallet and Marouard, "Early Pharaonic Harbour," 42; Tallet, "Wadi el-Jarf."

[31] For a summary of the ship finds from field seasons 2001–05, see Ward and Zazzaro, ("Ship Evidence") for ship-related finds and, for other wood, Gerisch, *et al.*, ("Other Wood").

[32] Ward and Zazzaro, "Pharaonic Seagoing Ships," 30–31; Bard and Fattovich, *Mersa/Wadi Gawasis 2009–2010*, 32–33.

[33] Ward and Zazzaro, "Pharaonic Seagoing Ships," 33, 38, 40.

[34] Ward and Zazzaro, "Pharaonic Seagoing Ships," 31.

[35] Ward and Zazzaro, "Pharaonic Seagoing Ships," 34; Bard and Fattovich, *Mersa/Wadi Gawasis 2009–2010*, 35.

[36] Pomey, "Pharaonic Sea-going Ship," 6; Tallet, "Ayn Sukhna and Wadi el-Jarf," 150.

[37] Pomey, "Bateaux d'Ayn Soukhna," 9; Creasman and Doyle, "Overland Boat Transportation," 16; Tallet, "Ayn Sukhna and Wadi el-Jarf," 150–51, 160 fig. 10.

treenails: evidence distinctive of seagoing ships, stored between expeditions.[38] Ironically, the timbers were intentionally burned in antiquity, likely to *prevent* them from further reuse.[39]

An ambiguous case potentially referring to a timber storage arrangement can be found in Papyrus BM 10383 (3.1–7), a fragmentary account of a dispute over ownership of a mast.[40] An unnamed merchant associated with a man named Thuithui reported seeing a mast which was somehow in the charge of a prince. Thuithui, who was of high enough rank to be "with Pharaoh," ordered the mast to be given to the merchant; the prince refused and did not release the timber until the king interceded. Subsequently, the merchant placed it—presumably for storage—"behind(?) this fortification-wall of the temple" (3.7). It is worth noting that storage of boat equipment appears at least once in the iconographic record. In Theban Tomb 178, dating to the reign of Ramesses II, rudders from sacred barges are laid in the store-rooms of the Temple of Amun at Thebes.[41]

Reuse in Other Watercraft

As noted above, Mark suggested that the frames of Khufu I were not originally created for that hull. He suggests timber reuse in another, earlier nautical context, as well. The University of Pennsylvania-Yale Expedition to Abydos, led by David O'Connor, discovered fourteen First Dynasty boat graves. Partial excavation conducted on one burial, BG 10, yielded a hull with planks "lashed together with leather straps fed through lashing channels."[42] Observing that BG 10 appears structurally weak, Mark proposes that the shipwrights constructed these vessels in their burial pits from thinner, recycled planks no longer valuable for other functional projects; the innovation and skill of the shipwrights was capable of conserving scarce supplies of wood.[43] The partial excavation revealed overlapping multiple lashing features, which support this interpretation. Although it remains to be proven through complete excavation, current evidence suggests serial reuse. Other hulls present more definitive evidence of the reuse of ship timber in the construction of new watercraft.

---

38 Pomey, "Pharaonic Sea-Going Ship," 5; Tallet, "Ayn Sukhna and Wadi el-Jarf," 150.

39 Pomey, "Pharaonic Sea-Going Ship," 5.

40 Peet, *Tomb-Robberies*, 124–25.

41 Wreszinski, *Atlas*, pl. 75a; Doyle, *Iconography*, 136 fig. 6–67, 137. Another possible example: Amarna rock-cut tomb 14 (May), where boat propulsion equipment appears to be stored on the quay-side (Kemp and O'Connor, "Birket Habu," 105).

42 O'Connor, *Abydos*, 193; Ward, *Sacred and Secular*, 39–41.

43 Mark, "Abydos BG 10," 107–10.

The "Dahshur boats," so named because these five intact boats were buried at Senwosret III's pyramid complex, provide additional evidence of ship timber reuse in subsequent watercraft. Only four of the boats are known to exist today: two in Cairo (CG 4925 and CG 4926), and one each in the collections of the Carnegie Museum of Natural History, Pittsburgh and the Field Museum of Natural History, Chicago, each measuring approximately 10 m in length.[44] It has been argued, based on certain interpretations of the joinery, that these hulls may have been constructed as life-sized models intended only for burial,[45] and, on account of the apparently poor quality of wood, writers have deemed them "wretched"[46] and "ill-conceived."[47] These criticisms are inaccurate,[48] as is their assessment as models. It seems more likely that these were in fact functional, load-bearing watercraft, possibly used in some aspect of the king's funerary passage and thus inappropriate for continued use by the living.[49]

Construction of each boat required 6 to 8 tons of raw timber (imported cedar), equating to roughly 20 trees.[50] Given the cost associated with importing such resources (approximately 100 trees total for these small boats), it should not be surprising that the boats were largely built from reused timber. As early as 1913, George Reisner observed that CG 4925 was "made for the most part of wood which has been used once before."[51] Closer examination of the Cairo Dahshur boats revealed that at least 60 percent of the planks have evidence of having been repurposed at least once; 85 percent of the mortise joints were reused and most have no mates in adjacent planks. The percentage of reuse is probably much greater, but the state of preservation and absence of some timbers prevents a complete analysis.[52]

Reuse was prevalent in the Dahshur boat now in Pittsburgh as well. Cheryl Ward noted the presence of "old mortise-and-tenon joints" in "at least one beam" and that its deck planks were "probably manufactured from wood trimmed away during plank shaping or perhaps from old timbers."[53] The present author's preliminary observations of the Dahshur boat in Chicago agrees with Ward's observations and suggests a consistency in the above patterns of

---

44 Ward, *Sacred and Secular*, 83–102; Creasman, *et al.*, "Ground-Penetrating Radar"; Creasman, "Further Investigation"; Creasman, *et al.*, "Exploratory Geophysical Survey," 386–88.

45 Patch and Haldane, *Pharaoh's Boat*, 41; Creasman, "Further Investigation," 119.

46 Jenkins, *Boat Beneath*, 84.

47 Landström, *Ships of the Pharaohs*, 90.

48 Steffy, *Wooden Ship Building*, 33; Creasman, "Further Investigation," 113.

49 Creasman, "Further Investigation," 120–23; Creasman, *et al.*, "Ground-Penetrating Radar," 516.

50 Creasman, *Extracting Cultural Information*, 64, 95–102; Ward, *Sacred and Secular*, 96.

51 Reisner, *Ships and Boats*, 86–87.

52 Creasman, "Further Investigation," 113.

53 Patch and Haldane, *Pharaoh's Boat*, 40; Haldane, *Hull Construction*, 224; Ward, *Sacred and Secular*, 98.

reuse, but no thorough recording of its timbers exists to date, despite that this boat is the best preserved of the group.

Although some examples of reuse are minor, such as two beams near midships of CG 4926 with peg holes that do not match the deck planks,[54] shipbuilders occasionally went to extreme lengths to derive additional use(s) from a timber. Some unmated mortises (mortise without a match in the adjacent timber and thus non-functional) in CG 4926 are overlapping and stacked up to five across on a single hull plank only 7.5 cm wide. In one case this reflects at least three previous uses or attempts at use (Fig. 3).[55] The discovery of "double" or "paired" mortises that have so far only been found in *seafaring* ship timbers[56] allows for the possibility of a further form of reuse in the Cairo Dahshur boats: seafaring ship timber returned to the valley and later employed in the construction of a Nilotic craft.

Further, Reisner noted that some of the "prior use" mortises had been filled with wood or plaster.[57] In some cases this "filling" was a tenon left in place when the timber was removed from its previous use (Fig. 4). When dismantling a hull, shipbuilders would have sawn through the tenons joining the planks, often leaving tenon-halves *in situ*. In other cases plaster was used to fill breaches in the wood. Plank C3 of CG 4925 has mortises that pass through it entirely, inboard to outboard, piercing the hull.[58] The location of this plank is significant: in the central strake, effectively its "backbone." Holes in the bottom of a boat are undesirable, yet the motivation to reuse these timbers overrode this fundamental concept.

It seems that dockyards maintained stores of old and used timbers, perhaps like those used to construct the Dahshur boats. The late Nineteenth Dynasty model letter preserved in Papyrus Anastasi IV, 7/9–8/7, refers to "cedar planks left over from the divine bark that is here in the store-house at *Rsnw*,"[59] although it is not clear that these planks had been actually used for the bark; they might have been "left over" (*spy.t*) from its construction and thus remained unused. An earlier document, dating to the reign of Thutmose III (Papyrus BM 10056.14.12–15.1), associated with the New Kingdom harbor *Prw-nfr*, records the following transaction:

---

54 Creasman, *Extracting Cultural Information*, 98.

55 Creasman ("Further Investigation," 113, fig. 10) previously interpreted this to represent at least five previous iterations, but based on evidence since recovered from Mersa/Wadi Gawasis and Ayn Soukhna, it now seems likely that this represents only three previous reuses, these being of the paired or double mortise variety now associated with seafaring ship construction.

56 Ward and Zazzaro, "Pharaonic Seagoing Ships," fig. 5.

57 Reisner, *Ships and Boats*, 86.

58 Creasman, *Dahshur Boats*, 42–43 fig. 19.

59 Vinson, "On *Îry.t*," 158; *cf.* Caminos, *Late-Egyptian Miscellanies*, 159–60.

First month of Inundation, 16th day; given to the cabin-maker
Amenhotep son of Sekhmet(?)hetep for the ship of
Chief workman Tity, from the old(?) *nʾyw*-planks
of (*sic*) deal, /////-plank of 11 1/2 cubits . . 1 Total 6[60]

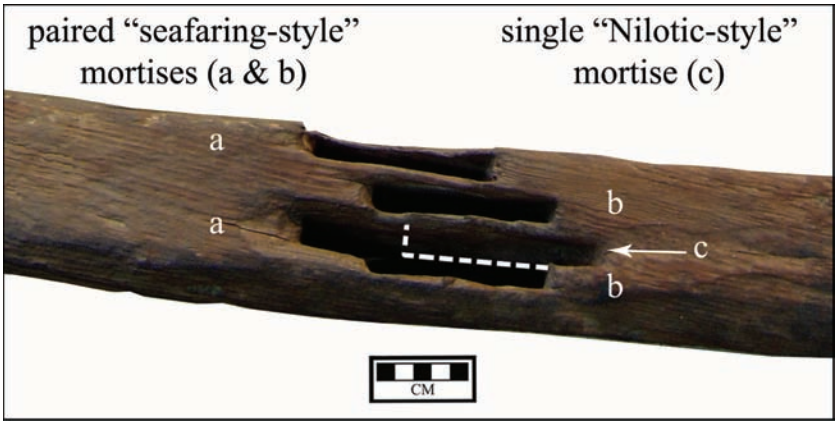

Fig. 3 Evidence of multiple reuses: mortises stacked five across, representing at least three previous iterations; CG 4926, courtesy Egyptian Museum, Cairo (author's photo).

Fig. 4 Half-tenon, sawn during ancient ship breaking and left in place during reuse; CG 4926, courtesy Egyptian Museum, Cairo (author's photo).

[60] Glanville, "Records of a Royal Dockyard (Part 1)," 115.

The word "old" here is *ỉs* (with a questionable determinative), glossed by Stephen Glanville as having the additional shade meaning of "already used, secondhand."[61] Even disregarding this specificity, the scribe clearly meant to distinguish these timbers from others also made of *ꜥš* ("deal," coniferous wood).[62] It is worth noting, too, that these timbers did not come from the "storesheds which are in the lake" often referred to throughout these records.[63] Although Glanville believed that this referred to a harbor or, more likely, a "dock,"[64] actual wet storage, with timbers kept in a pond,[65] would have been desirable to season new timbers, preventing them from checking and cracking while keeping them supple enough to be initially worked. Wet storage would not have been the practice for "old" timbers that had already been worked and were being stored for subsequent use(s).

Reuse of Ship Timbers for Burial Linings, Coffins, and Other Wooden Objects

During late nineteenth century excavations at a cemetery at Tarkhan, W.M. Flinders Petrie recovered numerous wooden planks lining burials. As this work predated the discovery of virtually the entire current corpus of ship timbers, Petrie surmised that these First Dynasty planks, with V- and L-shaped lashing channels, were building material from portable wooden houses, giving an appearance of paneling.[66] The published record makes clear neither from which grave they derived nor the function of each plank, whether roofing of the burials or coffin material. Later, but still prior to the discovery of Khufu I, H. Frankfort proposed an entirely different cause for the lashing channels, one that now seems prescient: "The most natural explanation of the Tarkhan boards is, evidently, that they represent valuable raw material salvaged from wrecked or disused Nile craft which was unsuitable for use in furniture for the living by reason of the holes but that served well enough for coffins."[67]

---

61 Glanville, "Records of a Royal Dockyard (Part 2)," 22 n. 50.

62 For the seminal discussion of this term, see Loret, "L'arbre âch." Exactly what *nḫyw*-planks are remains unclear; Jones (*Glossary*, 170 III.80) says "kind of timber for a boat(?)."

63 *E.g.*, Glanville, "Records of a Royal Dockyard (Part 1)," 115 (P. BM 10056.15.14).

64 Glanville, "Records of a Royal Dockyard (Part 2)," 11 n. 9.

65 The use of timber ponds was so effective that it was common in European and American shipbuilding until the nineteenth century C.E., when iron and steel began to overtake wood as the primary building materials.

66 Petrie, *et al.*, *Tarkhan*, 24.

67 Frankfort, "Monumental Architecture," 343.

It can reasonably be supported that these planks (and possibly others from Tarkhan, such as a recently published wooden lid in the collections of the Petrie Museum, PMAN 3785[68]) were repurposed and reused boat timber. In his analysis,[69] Steven Vinson concluded that "at least three of them appear to be the remains of one or more boats of the First Dynasty."[70] The planks bear suggestive resemblance to the deck planks from the Twelfth Dynasty Dahshur boats, including the appearance of multiple occasions of reuse.

Walter Emery's excavations at Saqqara, which located First Dynasty boat graves,[71] revealed three undisturbed subsidiary burials of sacrificed servants with wooden elements (Tomb 3500, subsidiary burials 1–3).[72] Beneath layers of bricks and reed mats, planks covered the tops of the tomb and also lined internal faces. Like the planks from Tarkhan, these were not virgin timbers when used to construct the burial. Vinson cites them as examples of Early Dynastic timbers with parallels to the "constructional features" seen in the Tarkhan planks, without suggesting that these might have derived from a nautical context.[73]

Although difficult to see in published photos, the planks lining Tomb 3500 sub-burial 3 appear also to have lashing and joinery marks similar to that of the roof timbers, comparable to those seen in burials at Tarkhan.[74] The timbers of sub-burial 2 are likewise suggestive of an original nautical context.[75] The one roof timber left in place for the photograph appears to have, in three locations, V-shaped lashing channels that resemble those in sub-burial 3, as well as those of the Tarkhan planks.[76] Additional sub-burials at the site, such as those associated with Tomb 3506, might contain boat timbers as a primary construction material, but published evidence is lacking.[77]

In what might be the most apropos case of ship timber reuse, the irregularly shaped panels of wood forming the front portion of a Middle Kingdom coffin on display in the Egyptian Museum, Cairo (CG 28096) have distinctive shape and joinery (Fig. 5) visible near the base, despite the exterior being painted dark yellow and the interior being stained white. Information from the 1915

---

68 Picton and Pridden, *Unseen Images*, PMAN 3785.

69 Vinson, *Boats of Egypt*, 39–81.

70 Vinson, *Boats of Egypt*, 40; Ward (*Sacred and Secular*, 31–9) agrees.

71 Emery, *Great Tombs* II, 138 and *Great Tombs* III, 42, 49, pls. 44, 66–68.

72 Emery, *Great Tombs* III, 104.

73 Vinson, *Boats of Egypt*, 70.

74 Emery, *Great Tombs* III, pl. 122.

75 Emery, *Great Tombs* III, pl. 121c.

76 See Vinson, *Boats of Egypt*, 62–64 figs. 19–21.

77 Emery, *Great Tombs* III, 41–42, pl. 45–49; the timber in the boat graves was too degraded to be recovered at the time of excavation.

Fig. 5 Front of the coffin of the fleet commander Nakht, on display; CG 28096, courtesy Egyptian Museum, Cairo.

expedition that found the coffin at Bersha seems to remain unpublished and there is little information describing the coffin. It is known to have belonged to Nakht, a fleet commander.[78] The uniquely shaped planks closely match timbers found in the Cairo Dahshur boats.[79]

A search through the Lacau's *Catalogue General of Sarcophages Anterieurs au Nouvel Empire* provided no specific indication that ship timber was being used as coffin-building material during the New Kingdom. Since that work was printed in 1903, this does not preclude the possibility (likelihood?) that evidence may have gone overlooked. Irregular radiocarbon dates obtained from wood from two Twenty-First Dynasty coffins from the Theban necropolis, one in the Metropolitan Museum of Art (25.3.2A–B) and the other in the Brooklyn Museum (08.480.1.A–B), indicate the use of old wood, some of it possibly dating back as far as the Middle Kingdom,[80] so precedent from a period only slightly later than the New Kingdom exists.

The thrifty nature of the Egyptian craftsmen (or their clients) is evident in the reuse of wood even for smaller funerary objects. The bases of several wooden models from Tomb 10A at Bersha have recesses and mortises that serve no purpose for the models.[81] No apparent attempts were made to fill them with plaster or otherwise disguise them. In their basic form, the bases

78 Lacau, *Sarcophages antérieurs au Nouvel Empire*, 72.

79 See Creasman, *Dahshur Boats*, 48 (planks S1-1, S1-3, P1-1, P1-3) 91.

80 Weinstein, "Radiocarbon." It should be noted that "old" wood in this context does not necessarily require that the timber be reused. Michael Schiffer's "Old Wood Problem" is an important phenomenon to consider. If a coffin is shaped from the inner rings of a large tree, or if the radiocarbon samples were taken from inner rings, resultant dates would be older than the construction or felling event. Ideally, tree-ring and radiocarbon samples are best secured from the outermost rings, directly under bark.

81 Freed and Doxey, "The Djehutynakhts' Models," 152, 157 fig. 117, 159 fig. 118, 161 fig. 120, 163 fig. 123, 125 fig. 165.

bear a strong resemblance to deck planks of boats, though planks were a common form for a variety of wooden applications.

When repurposed wood is discovered or suspected, original contexts other than watercraft must, of course, be considered. In the records of the tomb robberies that occurred during the Twentieth Dynasty, the confessing robbers sometimes mention they set fire to the coffins and doors they have plundered for their precious metal ornamentations.[82] In another incident, a witness reported seeing an inner coffin in the possession of thieves, who included a priest; the thieves seemed to claim that, while theirs, the coffin (the material of which is not stated) had "belonged to some great person."[83] Parts of coffins made of ebony are recorded among the loot with which certain robbers were caught.[84] These pieces (*kp*; lit. "head") were probably inlays, not boards,[85] especially as other *kp* listed were made of ivory.

Proper boards were obtained by dismantling several elements of a temple, probably the Ramesseum, as described on the *verso* of Papyrus BM 10053.4.1–5.5.[86] Although "decaying" wood in a temple structure might be replaced,[87] this was clearly a case of theft. Three boards were obtained from one of the temple floors (4.7, 4.15–17); others were taken from doors (4.9, 4.14) and a doorframe (4.12). Even shrines (4.11, 4.18, 4.23, 5.5) and a statue (4.20–21) were "cut up" for their wood. Some of the wood was recorded as having been given to carpenters (some specifically identified as temple personnel) to be made into presumably less identifiable boards (4.12, 4.15, 4.21, 4.23). The records cite other wood being given to individual scribes (4.7, 4.9), priests (4.19), or military officers (4.14). Two other times, troop captains received (re)finished boards from the carpenter (4.11, 4.12). What happened to the wood thereafter is also in some instances recorded. In one case, a scribe named Sedi provided a shrine of conifer wood to a scribe of the army named Oner, who had written to him requesting it (4.20–22); it is not clear whether this shrine was stolen from the temple with the intent on obtaining its timber or if it was constructed from stolen timbers. Another "scribe of the royal records" sold wood from a shrine (5.5). Perhaps most interestingly, the aforementioned Sedi also gave four conifer wood boards from a temple floor to Teherer, wife of a divine father named

---

[82] *E.g.*, Peet, *Great Tomb-Robberies*, 49, 61, 118.

[83] Peet, *Great Tomb-Robberies*, 152; see Peet (*Great Tomb-Robberies*, 152 n. 71) noting difficulties with the syntax and thus the meaning of this passage.

[84] Peet, *Great Tomb-Robberies*, 89, 92.

[85] Peet, *Great Tomb-Robberies*, 100 n. 13.

[86] Peet, *Great Tomb-Robberies*, 112–22; Weinstein, "Radiocarbon," 591.

[87] *E.g.*, the replacement of wooden pillars in the "house" of Amun with ones of stone during the reign of Merenptah (*ARE* III, 268–69 §625).

Hori. The boards were given to a carpenter named Ahauty, who made them into Teherer's inner coffin (4.15–17).

That the culprits did not set fire to the wood perhaps indicates that these thieves, unlike their tomb-robbing counterparts, were trying to maximize their gain: having stripped the gold and other precious materials from the wooden architecture, they did not want to waste the base material either. There was also, obviously, a market for such "fenced" wood, as there was for illicitly obtained gold, silver, and other commodities. This active black market for timber existed despite that supplies of local woods (completely suitable for coffin construction, if less grandiose or prestigious than imports), would have been readily and legally available, obtainable even to those lower on the socioeconomic scale.[88] Given the volume of wood involved in shipbuilding, there can be no doubt that some ship timber found its way into both secondary (legal) and black (illicit) markets.

Two sets of records give accounts of private (and public) timber holdings. The earliest of these is an "account of wood" in the papyri of Hekanakht (V vs. 1–10).[89] Some of these items are simply "pieces of wood" (*ḫt*), sometimes with the species specified. One is a "cabin of willow" (*ṯ3rt nt ṯrt*) "equivalent to 60 planks," another is a large acacia beam (*šnḏt s3w ꜥ3*), and yet another is a mast (*ḫt-ṯ3w*), described as "in the forecourt." Whether the mast was stored there for use aboard a boat that Hekanakht, a wealthy farmer, may have owned, or it was simply another timber in a stockpile of wood for other purposes is unknown.

Several accounts of Ramesside date[90] list conifer wood (as well as leather and reeds) found in private homes and temples in certain districts of Memphis. Some of the objects are, at least by implication, repurposed. Wooden objects of a maritime nature inventoried include frames (*wg3*; *e.g.*, P. BN. 209 rt. 2,8), planks/planking (*ỉswt*; *e.g.*, P. BN. 209 rt. 2,12, P. BN 210.B vs. 2), "support beams" (*s3mꜥkt*; P. BN 209 rt. 3,6), stemposts (*bnbn* [P. BN. 209 rt. 2,10] or *bnbn.t* [P. BN. 209 rt. 2,6]), masts (*ḫt-ṯꜥw*; P. BN 209 rt. 2,4), oars (*wsr*; P. BN 209 rt. 5, 5), and a rudder (*ḥmyt*; P. BN 211 rt. 1,7). Masts, oars, and rudders may have been the equipment of boats owned by these individuals, kept securely at home. Beams

---

[88] For the prices and availability of wood (including ship parts, carrying poles, and similar objects) at Deir el Medina during approximately this same time period, see Janssen (*Commodity Prices*, 370–88; for coffins specifically 209–39), Cooney ("Informal Workshop" and *Cost of Death*). The relative value of wood in general was quite low in the Middle Kingdom, ranking higher than bone but lower than fabric (Richards, *Society and Death*, 110–11 fig. 28). Imported woods such as cedar would rank higher.

[89] Allen, *Heqanakht Papyri*, 19, 57–58, pl. 42–43; James, *Hekanakhte Papers*, 54, 61–62; Goedicke, *Studies in the Hekanakhte Papers*, 96–97.

[90] Spiegelberg, *Rechnungen*; K*RI* I, 263:1–267:18, 271:5–281:13; K*RITA* I, 219–22, 225–30.

and stemposts, being securely built into the structure of a boat, are not of the sort of elements one would anticipate a boat-owner needed to keep under the extra security of home, or as spares for repair.

In the inventories, a few masts and beams—but no other timber type—are referred to as "new" (*mꜣwy*; P. BN 211 rt. 1, 21; P. BN. 211 rt. 2, 1; P. BN 212 rt. 2,2). No timber is referred to as "old," but it is difficult to explain a stempost and frames at an estate as anything other than timbers that had been previously part of (or made for) a boat, given their unique shapes and dimensions. Furthermore, why make the distinction of "new" for some items if not to contrast with the implied "old" or reused nature of others?

The function these timbers were serving, or intended for, at the time of the inventory is almost never specified. Leaving aside the possibilities of spare equipment, an apparent exception in this regard might be two references to wood "for chairs(?)" stored in the Domain of Amun (P. BN 209 rt. 5, 13–14). Two items in P. BN 209 may contain an indication of the purpose for which the pieces were intended *after* the inventory. This lengthy document begins its list with a 22-cubit-tall mast indicated as "1 item for (*n*) a transport boat (*mnš*)" (P. BN 209 Rt 2, 4).[91] From another house, a "(stem?)-post" (*bnbn.t*) nine cubits long specified as "for (*n*) Hat, Chief Craftsman of the Estate of Menpehtyre" (*i.e.*, Ramesses I), was belatedly given an annotation "for (*r*) work on the door (*sbꜣ*)" (P. BN 209 rt. 2, 6; 2, 6a).[92] It seems that at least some ship timbers were acquired for reuse in buildings.

The owners of the private houses at which the timber is found vary in their professions and social status: lieutenant of infantry, members of the army, and naval and dockyard personnel (*e.g.*, standard-bearer of the ship [P. BN 211 rt. 2, 21; P. BN 211 vs. 1, 17], soldier/marine of the ship [P. BN 209 rt. 3,18, 3,20], transport-ship crewman [P. BN 211 rt. 2,19], agent of the docks [P. BN 209 rt. 4,20]). Others included a variety of scribes, priests, merchants, and a gardener. Even the highest members of society—the royal family and the vizier—as well as temples were subjected to these inventories. Some individuals owned only a timber or two, but a few had more extensive stocks. Aia son of Inena, a transport-ship crewman attached to the Estate of Seti I, yielded five items of planking, each 16 or 17 cubits in length (P. BN 211 rt. 2,20), and the estate of the vizier Nebamun at least 8 (and more likely 9 or more) items (P. BN 213 vs. 1,3–5). That many of these people had professions directly related to watercraft is perhaps not surprising; they would have had easiest access to the stores in the dockyards. How anyone came to possess these timbers is not recorded.

---

[91] *KRI* I, 263:5.4.

[92] Perhaps the wood was needed for Seti I's Memphis building program (see Brand, *Monuments of Seti I*, 146–50, 350–53).

Inventoried and conscripted ship timber would likely have been put to use in a variety of applications, including those described below.

Reuse of Ship Timber in Earth Construction and Temporary Structures

Several recent excavations have revealed ship timber used in earth construction. Much of the wood found at Wadi/Mersa Gawasis had been put to structural use.[93] At various phases of occupation, timbers (and other debris) were used to provide a gallery/cave with a level surface, a wooden entry ramp, and reinforcement for its entrance.

Reusing timber in this manner seems to have been a common occurrence, as cargo boats would be ideal sources once unloaded. For example, acacia beams likely from ships "mortised and cut as if for a wooden object which was later broken up" were found in the Twenty-First Dynasty ramp by which Mentuhotep I's temple at Deir el-Bahri was dismantled.[94] Other beams of the same description and date, and even a fragment of coffin, were used to shore up the stone ceiling of the royal tomb at the temple.[95]

Elsewhere, more extensive constructions made use of wood from boats. At the Twelfth Dynasty occupations at Lisht, more than 90 timbers of local acacia and tamarisk were discovered positioned as tracks or foundations to facilitate the construction of the pyramid of Senwosret I; interestingly, the outboard face of each plank was positioned facing upward.[96] They derived from one or more large freight vessels that likely aided in the construction of the pyramid, delivering materials from upriver.[97] Ship timbers were similarly used to construct a ramp for the pyramids of Amenemhat I at Lisht[98] and Senwosret II at Lahun.[99]

The rock quarry at the pyramid complex of Senwosret II at Lahun provides another example. Here again, ship timbers were used for a slipway or timber track to haul heavy items. Despite there being "no obvious wear on the tops," Petrie interpreted these as the surface of the ramp.[100] Although ship timbers

---

93 Ward and Zazzaro, "Pharaonic Seagoing Ships," 28; Ward and Zazzaro, "Maritime Archaeology," 14.

94 Arnold, *Temple of Mentuhotep*, 28, pl. 21b; see also Naville, *Deir el-Bahari*, 26.

95 Naville, "Excavations at Deir el-Bahri," 3, pl. iii.8 and *Deir el-Bahari*, 48; Arnold, *The Temple of Mentuhotep*, 38.

96 Haldane, "Lisht Timbers"; Arnold, *Building in Egypt*, 86–89 figs 3.38–40; Ward, *Sacred and Secular*, 107–10.

97 Haldane, *Dashur Boats*, 102; Ward, *Sacred and Secular*, 124–28.

98 Arnold, *Building in Egypt*, 87, fig. 3.37.

99 Petrie, *et al.*, *Lahun* II, 12, pl. xiii; Arnold, *Building in Egypt*, 90, 92 fig. 3.44; Ward, *Sacred and Secular*, 108, 109 fig. 53.

100 Petrie, *et al.*, *Lahun* II, 12, pls. 8, 13, 15.1–3, 25A.8.

may have been employed in just this way at Wadi el-Jarf,[101] at Lahun it is far more likely that these were elements of internal construction (*e.g.*, frames), as seen at the other sites.[102] Since a rudder (termed an "oar" by Petrie) was found buried in the ground nearby, it further suggests the ramp timbers' previous use in at least one ship.[103]

This was not the end of the utility for these timbers. Petrie records that "three of the best were selected and brought away, the others were used up in the removal of the granite coffin of Paramessu at Gurob. They would in any case be used sooner or later for firewood by the natives."[104] Similarly, the fifth Dahshur boat may have also met this fate.[105] Fuel for fire, even millennia later, presumably represents the ultimate stage in a timber's useful life,[106] unless the charcoal is utilized by modern scientific analyses, such as radiocarbon or tree-ring dating.

Conclusions

Contrary to Enrichetta Leospo's implication that reused wood is synonymous with poor quality,[107] ships of all functions and purposes incorporated reused material (even grandiose ships, such as Khufu I). Such timbers were reused in an array of contexts over a vast span of time. This survey demonstrates the Egyptian proclivity for repurposing ship timber was a matter of practicality. In ancient Egypt, then, it seems reuse was the rule rather than the exception, despite the timber quality. There are perceptible patterns of use that conserved wood. For example, timbers used for earth construction and temporary structures known to date have all been identified as local woods, reflecting an awareness of cost and relative value.[108] Both desirable imports and the more obtainable local woods were reused, often. However, little discernible order of

---

101 Tallet, "Wadi el-Jarf Site," 81–83, fig. 9.

102 Arnold, *Building in Egypt*, 86.

103 Petrie, *et al.*, *Lahun* II, 12, pls. 8, 15.6.

104 Petrie, *et al.*, *Lahun* II, 12.

105 Creasman, *et al.*, "Ground-Penetrating Radar," 517.

106 The records from Deir el-Medina preserve no evidence for the reuse of timbers as firewood (Janssen, "Woodcutters," 25–26), and, ordinarily, the remains of burned wood would not retain traces of any original use. The calcined timbers from Ayn Soukhna—which were not ordinary firewood—are an obvious exception.

107 Leospo, "Woodworking," 127.

108 Wadi Gawasis is a significant exception. In the case of this Red Sea coastal site, cedar brought there was for the construction of seagoing ships was the most or perhaps even only timber readily available at the outpost.

preference is apparent. That is, it does not seem that there was an overt or overriding set of priorities for timber use, or by whom they were used (*e.g.*, the best timbers reserved for royal ships/constructions, next best timbers for nobles, and so on down the social and functional ladders). In most cases, the overriding factor was availability, thus the desire for inventories: to be able to recall the appropriate timber when needed.

Unfortunately, little is known about the various supply networks, outside of direct royal/state acquisition. Legal secondary and illicit secondary markets existed, but how the (re)distribution of timber, whether new or old, imported or local, was accomplished, through either governmental or private channels, is simply not known at present. The degree to which access to commodities were regulated is a matter of debate. As Ben Haring has pointed out, "The relative importance of government and market and the ways in which these were interrelated seems to dominate the present discussion of ancient Egyptian economy."[109]

Who had the authority to determine that timbers were unsuitable (or unneeded) for further use in the dockyards? How did it pass between owners? Was such timber bought and sold, or was it a commodity that required a personal acquaintance with dockyard or naval personnel to obtain? Was it difficult for a private person to obtain suitable timber at various periods? Does reuse in "high-profile" contexts, such as the Dahshur boats, which went so far as to put timbers fully penetrated by old mortises below the waterline, indicate scarcity of a resource, thrift, or an attempt to associate the object—and thus the owner—with some prestigious watercraft from the past?[110] Surviving written records give us only narrow glimpses of what was surely an everyday occurrence.

No account records from the private construction of ships are known, although because privatized maritime trade existed at least as early as the First Intermediate Period and flourished by the New Kingdom, it seems reasonable to conclude that a market for the necessary materials would similarly have developed. Reuse could be expected to play an active role in this market, perhaps as prevalently as in the construction of royal vessels.

Further complicating matters, the corpus of physical ship timbers result from various forms of intentional disposal. Knowing a boat will be buried or timber discarded, would a shipbuilder be inclined to use the premium timbers, or rather reserve those for operational watercraft with a longer life? The discovery and analysis of a dockyard or of timbers from ships or boats that suffered

---

[109] Haring, "Economy," 11.

[110] Noreen Doyle, personal communication; *cf.* Brand, "Reuse," 3, regarding reuse of stone thus motivated.

catastrophic loss (*e.g.*, shipwreck), as opposed to planned loss (*e.g.*, burial, repair) will be critical to developing a holistic understanding of reuse.

The purposes to which old wood was put varied considerably, no doubt more than can be readily detected in the record. In many cases—hypothetically, a tool handle carved from the stock of an oar, for example—there would be no trace of the original object. Other instances surely remain, unnoticed or unpublished. Researchers examining either wooden artifacts or features with wooden elements should be alert to the possibility of reused timber. Most immediately, as has long been recognized, the presence of such material complicates radiocarbon dates.[111]

Wood derived from archaeological contexts contains valuable information that extends beyond its last use in antiquity. As more attention is given to the reuse and repurposing of timber, to understanding of the methodology by which it was worked, used and chosen, and to understanding of the systems of exchange through which it passed during its useful life, more knowledge will be gained.

Abbreviations

AJA	*American Journal of Archaeology*
AJSL	*American Journal of Semitic Languages and Literatures*
ARE I	J.H. Breasted. *Ancient Records of Egypt: Historical documents from the earliest times to the Persian conquest*. Vol. I: The First through the Seventeenth Dynasties. Chicago: University of Chicago Press, 1906.
ARE III	J.H. Breasted. *Ancient Records of Egypt: Historical documents from the earliest times to the Persian conquest*. Vol. III: The Nineteenth Dynasty. Chicago: University of Chicago Press, 1906.
BBf	*Beiträge zur ägyptischen Bauforschung und Altertumskunde*
BMSAES	*British Museum Studies in Ancient Egypt and Sudan*
CRE 12	*Current Research in Egyptology, 2011: Proceedings of the Twelfth Annual Symposium, Durham University, March 2011*, eds. H. Abd El Gawad, N. Andrews, M. Correas-Amador, V. Tamorri, and J. Taylor.
EAO	*Égypte, Afrique et Oriente*

[111] Schiffer, "Old Wood Problem," 13–19; Weinstein, "Radiocarbon"; radiocarbon dates from the Khufu II vessel exhibit this problem, consistently dating a century older than the usual accepted range for Khufu's reign (Nonprofit Institute of the Solar Boat, "Project Introduction 2," http://www.solarboat.or.jp/projects04_e.html).

IJNA *The International Journal of Nautical Archaeology*
JAEI *Journal of Ancient Egyptian Interconnections*
JAS *Journal of Archaeological Science*
K*RI* I K.A. Kitchen. *Ramesside Inscriptions: Historical and Biographical I*. Oxford: Blackwell, 1975.
K*RITA* I K.A. Kitchen. *Ramesside Inscriptions Translated and Annotated: Translations I: Ramesses I, Sethos I and Contemporaries*. Oxford: Blackwell, 1993.

Bibliography

Abubakr, A.M. and A.Y. Mustafa. "The Funerary Boat of Khufu." *BBf* 12 (1971): 1–16.

Allen, J.P. *Genesis in Egypt: The Philosophy of Ancient Egyptian Creation Accounts*. New Haven: Yale Egyptological Seminar, 1988.

———. *The Heqanakht Papyri*. New York: Metropolitan Museum of Art Egyptian Expedition, 2002.

Arnold, D. *Building in Egypt: Pharaonic Stone Masonry*. New York: Oxford University Press, 1991.

———. *The Temple of Mentuhotep at Deir el-Bahari*. New York: Metropolitan Museum of Art Egyptian Expedition, 1979.

Bard, K.A. and R. Fattovich. *Mersa/Wadi Gawasis 2009–2010*. Accessed November 15, 2012. http://www.archaeogate.org/egittologia/article/1331/1/mersawadi-gawasis-2009-2010-final-report-by-kathryn-A-B.html.

Borza, E.N. "Timber and Politics in the Ancient World." *Proceedings of the American Philosophical Society* 131 (1987): 32–52.

Brand, P. *The Monuments of Seti I: Epigraphic, Historical, and Art Historical Analysis*. Leiden: Brill, 2000.

———. "Reuse and Restoration." In *UCLA Encyclopedia of Egyptology*, Los Angeles, ed. W. Wendrich, accessed November 28, 2012. http://www.escholarship.org/uc/item/2vp6o65d. UCLA: UCLA Encyclopedia of Egyptology, Department of Near Eastern Languages and Cultures, 2010.

Caminos, R.A. *Late-Egyptian Miscellanies*. London: Oxford University Press, 1954.

Cooney, K.M. *The Cost of Death: The Social and Economic Value of Ancient Egyptian Funerary Art in the Ramesside Period*. Leiden: Nederlands Instituut vor het Nabije Oosten, 2007.

———. "An Informal Workshop: Textual Evidence for Private Funerary Art Production in the Ramesside Period." In *Living and Writing in Deir el-Medine: Socio-historical Embodiment of Deir el-Medine Texts*, eds. A. Dorn and T. Hofman, 43–55. Basel: Schwabe Verlag, 2006.

Corvol, A. and J.-P. Amat. *Forêt et Marine* (*Forêt et Marine: Paris, 10–13 septembre 1997*). Paris: L'Harmattan, 1999.

Creasman, P.P. *The Cairo Dahshur Boats*. M.A. Dissertation. Texas A&M University, 2005.

———. *Extracting Cultural Information from Ship Timber*. PhD. Dissertation. Texas A&M University, 2010.

———. "A Further Investigation of the Cairo Dahshur Boats." *JEA* 96 (2010): 101–123, pl. II.

Creasman, P.P. and N. Doyle. "Overland Boat Transportation during the Pharaonic Period: Archaeology and Iconography." *JAEI* 2.3 (2010): 14–30.

Creasman, P.P., D. Sassen, S. Koepnick, and N. Doyle. "Ground-Penetrating Radar Survey at the Pyramid Complex of Senwosret III at Dahshur, Egypt, 2008: Search for the Lost Boat of a Pharaoh." *JAS* 37.3 (2010): 516–524.

Creasman, P.P., B. Vining, S. Koepnick, and N. Doyle. "An Exploratory Geophysical Survey at the Pyramid Complex of Senwosret III at Dahshur, Egypt, in Search of Boats." *IJNA* 38.2 (2009): 386–399.

Deglin, F. "Wood exploitation in ancient Egypt: where, who and how?" *CRE* 12 (2011): 85–96.

Doyle, N. *Iconography and the Interpretation of Ancient Egyptian Watercraft*. MA Dissertation. Texas A&M University, 1998.

Emery, W.B. *Great Tombs of the First Dynasty II*. London: Egypt Exploration Society, 1954.

———. *Great Tombs of the First Dynasty III*. London: Egypt Exploration Society, 1958.

Frankfort, H. "The Origin of Monumental Architecture in Egypt." *AJSL* 58 (1941): 329–358.

Freed, R. and D.M. Doxey. "The Djehutynakhts' Models." In *The Secrets of Tomb 10A: Egypt 2000 BC*, eds. R. Freed, L.M. Berman, D.M. Doxey, and N.S. Picardo, 150–177. Boston: Museum of Fine Arts Publications, 2009.

Gale, R., P. Gasson, N. Hepper, and G. Killen. "Wood." In *Ancient Egyptian Materials and Technology*, eds. P.T. Nicholson and I. Shaw, 334–371. Cambridge: Cambridge University Press, 2000.

Gerisch, R., A. Manzano, and C. Zazzaro. "Finds: Other Wood and Wood Identification." In *Harbor of the Pharaohs to the Land of Punt: Archaeological Investigations at Mersa/Wadi Gawasis, Egypt, 2001–2005*, eds. K.A. Bard and R. Fattovich, 165–188. Naples: Università degli Studi di Napoli "L'Orientale," 2007.

Glanville, S.R.K. "Records of a Royal Dockyard at the time of Tuthmosis III: Papyrus British Museum 10056 (Part 1)." *ZÄS* 66 (1931): 105–121.

———. "Records of a Royal Dockyard of the Time of Tuthmosis III: Papyrus British Museum 10056. Part 2: Commentary." *ZÄS* 68 (1932): 7–41.

Goedicke, H. *The Report of Wenamun*. Baltimore and London: The Johns Hopkins University Press, 1975.

———. *Studies in the Hekanakhte Papers*. Baltimore: Halgo, 1984.

Grajetzki, W. *Two Treasurers of the Late Middle Kingdom*. BAR International Series 1007. Oxford: Archaeopress, 2001.

Haldane, C.W. *Ancient Egyptian Hull Construction*. PhD Dissertation. Texas A&M University, 1993.

———. *The Dashur Boats*. MA Dissertation. Texas A&M University, 1984.

———. "The Lisht Timbers: A Report on Their Significance." In *The Pyramid Complex of Senwosret I. The South Cemeteries of Lisht III*, ed. D. Arnold, 102–112. NY: MMAEE, 1992.

Haring, B. "Economy." In *UCLA Encyclopedia of Egyptology*, Los Angeles, ed. W. Wendrich, accessed November 28, 2012. http://escholarship.org/uc/item/2t01s4qj. UCLA: UCLA Encyclopedia of Egyptology, Department of Near Eastern Languages and Cultures, 2009.

Horden, P. and N. Purcell. *The Corrupting Sea: A Study of Mediterranean History*. Malden, MA: Blackwell Publishing, 2000.

Huyge, D. and J.C. Darnell. "Once More British Museum EA 35324." *GM* 225 (2012): 71–74.

Institute of Egyptology, Waseda University. "Khufu's Second Boat." Accessed 17 December 2012. http://www.egyptpro.sci.waseda.ac.jp/e-khufu.html.

James, T.G.H. *The Hekanakhte Papers and Other Early Middle Kingdom Documents*. New York: Metropolitan Museum of Art Egyptian Expedition, 1962.

Janssen, J. *Commodity Prices from the Ramessid Period: An Economic Study of the Village of Necropolis Workmen at Thebes*. Leiden: Brill, 1975.

———. "The Woodcutters." In *Woodcutters, Potters and Doorkeepers: Service Personnel of the Deir el-Medina Workmen*, eds. J. Janssen, E. Frood, and M. Goeck, 1–28. Egyptologische Uitgaven 17. Leiden, Nederlands Instituut voor het Nabijue Oosten, 2003.

Jenkins, N. *Boat Beneath the Pyramid*. New York: Holt, Reinhart, Wilson, 1980.

Jones, D. *A Glossary of Ancient Egyptian Nautical Titles and Terms*. London: Kegan Paul, 1988.

Kemp, B.J. and D.B. O'Connor. "An Ancient Nile Harbour: University Museum Excavations at the 'Birket Habu.' " *IJNA* 3 (1974): 101–136.
Lacau, P. *Catalogue Général des Antiquités Égyptiennes du Musée du Caire Nos. 28087–28126 Sarcophages antérieurs au Nouvel Empire* II. Cairo: IFAO, 1906.
Landström, B. *Ships of the Pharaohs*. New York: Double Day, 1970.
Lane, F.C. *Venetian Ships and Shipbuilders of the Renaissance*. Baltimore, MD: The Johns Hopkins University Press, 1934.
Leospo, E. "Woodworking: Furniture and Cabinetry." In *Egyptian Civilization*: *Daily Life*, ed. A.M. Donadoni Roveri, 120–159. Turin: Electa, 1987.
Lewis, N. "On Timber and Nile Shipping." *Transactions of the American Philological Association* 91 (1960): 137–141.
Lipke, P. *The Royal Ship of Cheops*. BAR International Series 225. Oxford: Archaeopress, 1984.
Loret, V. "Quelques notes sur l'arbre âch." *ASAE* 16 (1916): 33–51.
Mark, S. "The Abydos BG 10 Boat and Implications for Standardization, Innovation, and Timber Conservation in Early Dynasty Boat-Building," *JEA* 98 (2012): 107–126.
———. "The Construction of the Khufu I Vessel (c. 2566 BC): A Re-Evaluation." *IJNA* 38.1 (2009): 133–152.
———. "New Data on Egyptian Construction Methods in the Khufu I Vessel (c. 2566 BC) from the Paul Likpe Collection." *IJNA* 40.1 (2011): 18–38.
McNeill, J.R. "Woods and Warfare in World History." *Environmental History* 9 (2004): 388–410.
Meiggs, R. *Trees and Timber in the Ancient Mediterranean World*. Oxford: Clarendon Press, 1982.
Naville, E. *The XIth Dynasty Temple at Deir el-Bahari* I. EEF Memoir 28. London: Egypt Exploration Fund, 1907.
———. "Excavations at Deir el-Bahri." In *Archaeological Report 1906–1907*, ed. F. Ll. Griffith, 1–7. London: Egypt Exploration Fund, 1907.
Newberry, P.E. *Beni Hassan*. Vol. 1. London: Kegan Paul, Trench, Tubner & Co., 1893.
Nonprofit Institute of the Solar Boat. "Project Introduction 2: Results of Analysis of Wood." Accessed December 24, 2012. http://www.solarboat.or.jp/projects04_e.html.
O'Connor, D.B. *Abydos: Egypt's First Pharaohs and the Cult of Osiris*. London: Thames and Hudson, 2009.
O'Mera, P.F. *The Palermo Stone and the Archaic Kings of Egypt*. La Canada, CA: Paulette Publishing Co., 1979.
Parkinson, R.B. *Voices from Ancient Egypt: An Anthology of Middle Kingdom Writings*. London: British Museum Press, 2001.
Partridge, R. *Transport in Ancient Egypt*. London: Rubicon Press, 1996.
Patch, D.C. and C.W. Haldane. *The Pharaoh's Boat at the Carnegie*. Pittsburgh: Carnegie Museum of Natural History, 1990.
Peet, T.E. *The Great Tomb-Robberies of the Twentieth Egyptian Dynasty*. Hildesheim: G. Olms, 1977.
Perlin, J. *A Forest Journey: The Role of Wood in the Development of Civilization*. New York: W.W. Norton & Co., 1989.
Petrie, F., G. Brunton, and M.A. Murray. *Lahun* II. London: British School of Archaeology in Egypt, 1923.
Petrie, W.F., A.G.A. Wainwright, and A.H. Gardiner. *Tarkhan I and Memphis V*. London: School of Archaeology in Egypt, 1913.
Picton, J. and I. Pridden. *Unseen Images: Archive Photographs in the Petrie Museum I: Gurob, Sedment and Tarkhan*. London: Golden House, 2008.
Pomey, P. "Les bateaux d'Ayn Soukhna: les plus viex vestiges de navires de mer actuellemente connus." *EAO* 64 (2011): 3–12.

———. "A Pharaonic Sea-Going Ship of the Middle Kingdom (c. 2000 BC) from Ayn Soukhna." In *Between Continents: Proceedings of the 12th International Symposium on Boat and Ship Archaeology, 12–16 October 2009, Istanbul Turkey*, ed. N. Günsenin, 5–6. Istanbul: Pera Museum, 2009.

Quibell, J.E. and F.W. Green. *Hierakonpolis* II. London: Bernard Quaritch, 1902.

Reisner, G.A. *Models of Ships and Boats. Catalogue Général des Antiquités Égyptiennes du Musée du Caire Nos. 4798–4976 et 5034–5200*. Cairo: IFAO, 1913.

Richards, J.E. *Society and Death in Ancient Egypt: Mortuary Landscapes of the Middle Kingdom*. Cambridge: Cambridge University Press, 2005.

Schiffer, M.B. "Radiocarbon Dating and the 'Old Wood' Problem: The Case of the Hohokam Chronology." *JAS* 13 (1986): 13–30.

Simpson, W.K. *Papyrus Reisner*. Vol. 2, *Accounts of the Dockyard Workshop at This in the Reign of Sesostris I*. Boston, MA: Museum of Fine Arts, 1965.

Spiegelberg, W. *Rechnungen aus der Zeit Setis I circa 1350 v. Christ mit anderen Rechnunen des Neues Reiches*. Strasbourg: Trübner, 1896.

Steffy, J.R. *Wooden Ship Building and the Interpretation of Shipwrecks*. College Station, TX: Texas A&M University Press, 1998.

Tallet, P. "Ayn Sukhna and Wadi el-Jarf: Two Newly Discovered Pharaonic Harbours on the Suez Gulf." *BMSAES* 18 (2012): 147–168. http://www.britishmuseum.org/research/publications/online_journals/bmsaes/issue_18/tallet.aspx.

———. "The Wadi el-Jarf Site: A Harbor of Khufu on the Red Sea." *JAEI* 5.1 (2013): 76–84.

Tallet, P. and G.Marouard. "An Early Pharaonic Harbour on the Red Sea Coast." *EA* 40 (2012): 40–43.

Vinson, S.M. *Boats of Egypt Before the Old Kingdom*. M.A. Dissertation. Texas A&M University, 1987.

———. "On *Îry.t*, 'Bulwark,' in P. Anastasi IV, 7/9–8/7." *ZÄS* 124 (1997): 156–162.

———. "Seafaring." In *UCLA Encyclopedia of Egyptology*, Los Angeles, ed. E. Frood and W. Wendrich, accessed November 29, 2012. http://www.escholarship.org/uc/item/9d93885v. UCLA: UCLA Encyclopedia of Egyptology, Department of Near Eastern Languages and Cultures, 2009.

Ward, C. *Sacred and Secular: Ancient Egyptian Ships and Boats*. Philadelphia: University Museum, 2000.

Ward, C. and C. Zazzaro. "Evidence for Pharaonic Seagoing Ships at Mersa/Wadi Gawasis, Egypt." *IJNA* 39.1 (2010): 27–43.

———. "Finds: Ship Evidence." In *Harbor of the Pharaohs to the Land of Punt: Archaeological Investigations at Mersa/Wadi Gawasis, Egypt, 2001–2005*, eds. K.A. Bard and R. Fattovich, 135–63. Naples: Università degli Studi di Napoli "L'Orientale," 2007.

———. "Maritime Archaeology." In *Mersa/Wadi Gawasis 2010–2011*, eds. K.A. Bard, R. Fattovich, and C. Ward, 13–14. Accessed December 7, 2012. http://www.archaeogate.org/storage/15_article_1506_1.pdf.

Weinstein, J.M. "Radiocarbon and Some Ancient Egyptian Thievery." *AJA* 88.4 (1984): 591–2.

Wente, E. *Letters from Ancient Egypt*. Atlanta: Scholars Press, 1990.

Wilkinson, R.H. *The Complete Gods and Goddesses of Ancient Egypt*. London: Thames and Hudson, 2003.

Wreszinski, W. *Atlas zur altägyptischen Kulturgeschichte* I. Geneva: Slatkine.

Yoshimura, S. and H. Kurokochi. "Brief Report of the Project of the Second Boat of King Khufu." *JAEI* 5.1 (2013): 85–9.