

Was the Ark a practical size?

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It is often assumed by those born into a technological society that people in ancient civilisations did not have the technical skills to build very large structures like Noah's Ark. This article demonstrates the substantial body of evidence from historical sources which confirms that the size of Noah's Ark is completely feasible.

SCEPTICS objecting to the size of Noah's Ark frequently point to smaller nineteenth-century timber ships that were unseaworthy due to their large size, such as the nineteenth-century American schooners *Wyoming* and *Great Republic*, two of the largest all-timber vessels ever built. It is claimed that the chronic leaking, warping and hull separation from which such ships suffered (despite reinforcement with iron bracing) proves the Ark could not have survived the Flood.

Though frequently compared with sailing ships, or even ships with steam engines, the Ark was actually a barge. Barges are not subject to the same stresses as sailing ships, such as the weight of sails and rigging, and are not subject to hull stresses caused by the wind bending the masts. The Ark did not have to carry the tremendous weight of cannon that burdened the timber ships with which it is often compared, nor did it have to deal with the weight and stresses of a steam engine or steam bilge pumps, or the rigours of sea travel (since it stayed within the Mesopotamian flood plain).

Ships or barges?

One of the largest wooden ships, the *Appomattox*, is often compared with the Ark. Measuring 97.2 metres long (319 feet), with a beam of 12.8 metres (42 feet), it had to be reinforced with steel bracing just to stay together, and was pumped continuously by steam bilge pumps due to constant leaking, as stresses on the hull caused the timbers to separate. Sceptics frequently point to this as an example of the vulnerability of wooden ships over 300 feet long, and argue that this demonstrates Noah's Ark could not possibly have been a practical vessel.

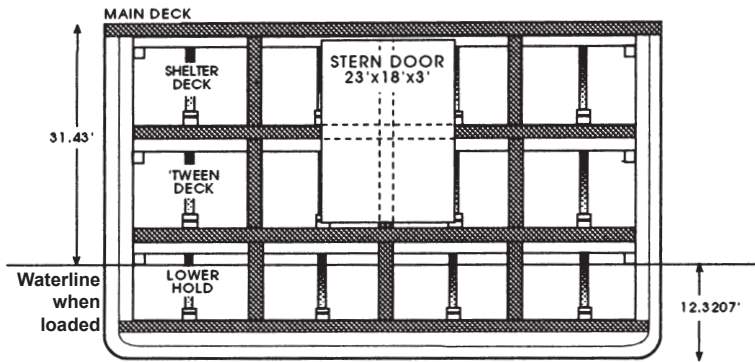
However, the *Appomattox* was designed completely differently from the Ark, being a steam-

powered ship, not a barge. It was also subjected to other stresses caused by having to tow a large unpowered barge behind it. This barge, the *Santiago*, is a far more relevant vessel with which to compare the Ark. Like the Ark, it was made entirely of timber, carrying no steel bracing, and was

not powered by either steam or sail. It was even larger than the *Appomattox*, 102.4 metres long (336 feet), with a beam of 14 metres (46 feet). Its service history (1899–1918) was over twice as long as that of the *Appomattox*, despite serving on the Great Lakes, notorious for their stormy conditions and unpredictable waters.

From as early as the seventeenth century, comparisons have been drawn between the Ark and various ancient vessels considered similar in dimensions and construction. Defending the practicality of the Ark, Walter Raleigh argued that it was smaller than a ship built in the reign of Hiero II of Syracuse (third century B.C.), and smaller than the giant fighting ship *Tessarakonteres* built by Ptolemy IV Philopater (third century B.C.).¹ The *Tessarakonteres* remained a common point of comparison to the Ark throughout the nineteenth century for Christian apologists, naval historians, nautical engineers and scientific journals.^{2,3,4,5}

1. "For [z] measuring the ark by the vulgar cubit, it did not exceed the capacity of that vessel built by Hiero of Syracuse, or the ship of Ptolemy Philopater." Raleigh, *The History of the World, Book 1*, in *The Works of Sir Walter Raleigh, Kt*, vol. II, p. 213 (1829).
2. "Ancient History boasts of many large vessels, which prove the possibility of the size of Noah's Ark . . . PLUTARCH, in his life of DEMETRIUS, relates that PTOLOMEY PHILOPATER constructed a galley, of the same length, with forty ranges or heights of oars, navigated by four hundred sailors, and four thousand galley slaves, which could contain three thousand fighting men on its decks." Radford, *On the Construction of the Ark, As Adapted to the Naval Architecture of the Present Day, &c.*, pp. 21-2 (1840).
3. "Mr. A. HENDERSON has communicated to the Institution of Civil Engineers a paper on 'Ocean Steamers', wherein he made some calculations respecting the comparative bulk of the most famous vessels of antiquity and of our own times. Thus, a ship constructed by



**Suggested cross-section of the Ark, showing its barge-like nature.
Reproduced from an article by Jack Glover in the *Testimony*,
August 1995, pp. 335-338.**

Historical evidence of large ships

Historians recognise a number of ancient large ships comparable to the Ark as genuine vessels:

- **1480 B.C.**⁶ An obelisk barge built in Egypt for Queen Hatshepsut, 95–140 metres long (311–459 feet), 32 metres wide (104 feet);⁷ a wall relief shows it carrying two obelisks end to end, indicating a length well over 100 metres.⁸
- **c. 200 B.C.** The *Thalamagos*, a large pleasure barge built by Ptolemy IV Philopater, 114 metres long (377 feet),^{9,10,11,12,13} described by the Greek historian Athenaeus.¹⁴
- **c. 200 B.C.** The *Tessarakonteres*, a warship built for Ptolemy IV Philopater, 128 metres long (420 feet),^{15,16,17,18} described by the first-century Roman historian Plutarch.¹⁹
- **c. 200 B.C.** A timber warship described by the

Ptolemaeus Philopater was 420 feet long, 56 broad, and 72 high from the keel to the prow, and it was manned by 4,000 rowers, 400 servants, and 2,820 marines. It was estimated, therefore, that this vessel had a tonnage of 6,445 tons, builder's measurement, and an external bulk of 830,700 cubic feet. Noah's ark would have a tonnage of 11,905, and a bulk of 1,580,000 cubic feet" Timbs, *The Year-Book of Facts in Science and Art*, p. 42 (1854).

4. "A ship was constructed for Ptolemy Philopater, which was 420 feet long, 56 feet broad, and 72 feet deep, and of 6,445 tons burthen." Van Rensselaer (ed.), *The Presbyterian Magazine*, vol. IV, p. 93 (1854).
5. "By old law, the tonnage of Noah's Ark was 11,905 tons, and calculated on this estimate, her external bulk would be about 1,580,277 cubic feet; the ship built 2,000 years ago at Alexandria, by Ptolemaeus Philopater, 6,445 tons." *Report of the Twenty-Fourth Meeting of the British Association for the Advancement of Science*, p. 154 (1855).

6. Late Bronze Age.
7. Estimates vary depending on interpretations of the historical evidence.
8. Even estimates made on the basis that the obelisks were carried side by side have ranged between 84 and 95 metres. Landström, *Ships of the Pharaohs* (1970).
9. "It was over 300 feet long." Casson, *Ships and Seamanship in the Ancient World*, p. 342 (1995).
10. "... well known from historical sources." Robert, *Text and Artefact in the Religions of Mediterranean Antiquity*, p. 347 (2000).
11. "Athenaios does not indicate his sources for the second ship [the *Thalamagos*], but it must have been an eye-witness or a person

who obtained measurements and other details from a contemporary." Sarton, *Hellenistic Science and Culture in the Last Three Centuries B.C.*, p. 121 (1993).

12. "These tours, which were announced in advance, were occasions for pomp and ostentation, though it is uncertain whether the sovereigns made use of the famed forty-bank ship built for Ptolemy IV, a veritable floating palace whose huge size and limited manoeuvrability confined its use to brief excursions on Lake Mariut or the canal leading to Canopus." Chauveau, *Egypt in the Age of Cleopatra: History and Society Under the Ptolemies*, p. 43 (2000).
13. "Athenaeus 5.204e-206d. It was a catamaran, like Ptolemy's other showpiece, the 'forty' (110-11) above. It was over 300 feet long, 45 wide at the broadest point, and towered 60 over the water." Casson, *Ships and Seamanship in the Ancient World*, p. 342 (1995).
14. *The Deipnosophists*, Book 5 (2nd-3rd centuries A.D.).
15. "Toward the end of the third century B.C., Ptolemy IV built a Brobdingnagian 'forty' but this was intended for display not action." Casson, *Ships and Seamanship in Ancient Times*, p. 98 (1994).
16. "For a discussion of the large polyremes in the Hellenistic navies, and of the largest ship produced by this naval arms race (a 'forty' built by Ptolemy IV), see CASSON, 1971, pp. 103-16, and 137-40." Murray, *Octavian's Campsite Memorial for the Actian War*, p. 116 (1989).
17. "There was, however, one final, futile effort made by Ptolemy IV of Egypt in the last quarter of the third century B.C.—some 50 years after the heyday of the big warship. This was a 'forty-er' (in Greek, *tessarakonteres*), a description of which was written up by Callixenus of Rhodes. . . ." Landels, *Engineering in the Ancient World*, p. 152 (2000).
18. "Athenaios (5.203e-204d) tells us that it was 420 ft long, 57 ft wide, 72 ft high, and manned by 4,000 rowers, 400 sailors, and 2,850 soldiers." Bugh, *The Cambridge Companion to the Hellenistic World*, p. 276 (2006).
19. Plutarch, *Life of Demetrius*, chapter 43, sections 5-6; Plutarch notes that the ship was too large for practical use as a warship.

first-century Greek historian Memnon of Heraclea,²⁰ 100 metres long (300 feet).^{21,22,23,24,25,26}

- **First century.** The 'Nemi Ships', two timber barges built for the Roman Emperor Caligula, 70 metres long (229 feet), 18 metres wide (60 feet).^{27,28,29}
- **First century.** A large cargo barge built for Caligula, used to transport an obelisk from Egypt to Rome, 104 metres long (341 feet), 20.3 metres wide (66 feet).³⁰

Basic technology

The successful wooden ships of this size required nothing more sophisticated than such timber technology as mortise and tenon joinery, tension cables (called 'hogging trusses'), and bulkheads or internal bracing, such as transverse lashing and lateral or longitudinal strength beams. In some cases, only three out of these five techniques were used, whereas Noah's Ark demonstrably used at least four of these techniques.

Noah was a Mesopotamian, who would have used contemporary Mesopotamian construction techniques, meaning the Ark would have used mortise and tenon joinery, longitudinal strength beams, tension trusses and hogging trusses, just like other ships built in the Bronze Age. In Mesopotamia, copper was used from before 3500 B.C. to make hammers and nails, adzes, chisels, axes, and drill bits; mortise and tenon joinery was used from at least the same time, while timber boats using sails and copper nails appear as early as 3500 B.C. Egyptian inscriptions as early as the reign of Khufu I (2589–2566 B.C.) show ships built with internal bracing techniques such as lateral and longitudinal strength beams, and transverse lashing. Longitudinal strength bulkheads are found in the Egyptian Middle Kingdom era (between 1991 B.C. and 1648 B.C.), showing that this technology was used from a very early date in the Ancient Near East.

Early superbarges

While only the obelisk barge of Hatshepsut is chronologically proximate to the Ark, these vessels prove that premodern societies were capable of building timber ships far larger than even their Industrial Age counterparts. It can be proved that the technology used by these cultures was capable of building such large vessels.

Importantly, these ships were built using the same construction techniques used in the Early and Middle Bronze Ages, including mortise and tenon joinery and a 'hull first' construction

method, rather than the 'frame first' construction method used by later Western maritime engineers.

Even more significant is Caligula's 'Giant Ship', mentioned previously. It had six decks, displaced between 7,000 and 8,000 tons, and carried a crew of 700–800. It was built using the same construction method as the two pleasure barges (the 'Nemi Ships'). The dimensions of this ship are not contested, since its physical remains have been found at Port Claudius in Italy (near Rome International Airport), where it was sunk and filled with stones to create a foundation for the port's lighthouse.

Prior to this discovery, mention of superbarges in Roman historical literature (such as Pliny the Elder) had been dismissed as either legend or wild exaggeration. Not only was it considered impossible to build such a large vessel from timber, it was also considered impossible that the Romans had the technology necessary for such an achievement. But the physical evidence overturned these preconceptions.

It became clear that the simple maritime techniques known not only by the Romans but also by the Ancient Near East in the Early Middle Bronze Age were more than enough to construct seagoing vessels larger than any Western timber ship up to the mid-nineteenth century. Even more startling is the fact that this superbarge of Caligula's was a reliable seagoing vessel, unlike

20. Memnon, *History of Heracleia*, Book 13, quoted in Photius, *Myriobiblon*, Book 9, chapter 8, section 5 (ninth century).
21. Morrison, *Long Ships and Round Ships: Warfare and Trade in the Mediterranean 3000 B.C.*, p. 46 (1980).
22. Meijer, *A History of Seafaring in the Classical World*, pp. 136-7 (1986).
23. Casson, *Ships and Seamanship in the Ancient World*, p. 149 (1995).
24. Morrison & Gardiner, *The Age of the Galley: Mediterranean Oared Vessels since Pre-Classical Times*, p. 76 (1995).
25. Paine, *Warships of the World to 1900*, pp. xiv, 93-94 (2000).
26. Hattendorf, *The Oxford Encyclopaedia of Maritime History*, vol. 1, p. 76 (2007).
27. White, *Medieval Technology and Social Change*, p. 105 (1966).
28. Casson, *Ships and Seamanship in the Ancient World*, p. 210 (1995).
29. "The gigantic Lake Nemi ships of the early 1st century A.D." McGrail, *Boats of the World: From the Stone Age to Medieval Times*, p. 157 (2004).
30. "Atop one of these was erected a lighthouse that used as its foundation the giant ship that had been built to transport the obelisk of Heliopolis from Egypt to Rome under the reign of Caligula." Aldrete, *Daily Life in the Roman City: Rome, Pompeii and Ostia*, p. 206 (2004).

many nineteenth-century timber ships over 90 metres long (295 feet). It is therefore clear that the technology required to build a timber ship

the size of Noah's Ark was already available long before the nineteenth century, and had been used to construct vessels almost as large as the Ark.