

HULLS AND BARRELS: UNDERWATER ARCHAEOLOGY'S VITAL CONTRIBUTIONS TO THE HISTORY OF NAVAL TECHNOLOGY*

High on the list of underwater archaeology's significant contributions is the discovery of something we had been totally unaware of, that in the ancient Mediterranean world the standard way of assembling a hull was shell-first with edge-joined planking; this was true from at least the 14th century B.C. (Kaş wreck) down to the early centuries of the Roman Empire. By at least the fourth A.D. shipwrights began to move toward the frames-first technique (Yassi Ada 4th century wreck) and by the seventh A.D. this move was in full progress (Yassi Ada 7th century wreck). By 1000 A.D. the transition had been completed (Serçe Liman wreck), and from then on frames-first was to be standard throughout the western world.

Yet the frames-first technique need not have been an evolution from its predecessor. We know from hull remains found in northern Europe that it was used there in ancient times not only for river boats and barges but also seagoing vessels; there are indications that the Celts may have been its originators. It would seem that, after centuries of limited use in northern Europe, it gradually spread until by 1000 A.D. it finally drove the edge-joined technique, which had enjoyed a long life of two millennia or more, into oblivion.

By a curious coincidence another similar, important switch connected with naval technology took place at just about the same time. A second great contribution of underwater archaeology has been the revelation that, right up to the Middle Ages, the standard shipping container was the clay amphora. It then disappeared, replaced from the Middle Ages on, by the wooden barrel or cask. And the wooden barrel, just like the frames-first technique for assembling a hull, had long been in use in northern Europe. The pros and cons of the two types are clear. The amphora was cheap; it was made of cheap material and able to be cheaply produced in quantity. The barrel was expensive; it was made of costly material and required much highly skilled labor to produce. However, though barrels demanded a large initial outlay from a shipper, they paid for this cost by almost doubling the profits he could derive from a shipment. For the cheap amphora was enormously heavy and the expensive barrel comparatively light. Of the weight of a shipment of wine in amphorae, the containers accounted for 40%, the wine for 60%; in barrels, the containers accounted for but 10% and the wine 90%. For anyone with the cash to invest in barrels, it was clearly the container to use. Yet why was the switch made at this particular time? Historians of technology can offer no answer.

What of the pros and cons of shell-first edge-joined construction as against frames-first? The older technique was costly in labor, wasteful of wood, and limited the hull shapes that could be fashioned, but it produced a hull that was strong, durable, staunch and needed minimal caulking. The later required far less labor, involved far less waste of wood, and, moreover, permitted more varied hull shapes with a greater cargo capacity. But it produced a hull that was less staunch, and that had to be caulked.

Thanks to the excavation of the Serçe Liman wreck, we can pinpoint the date of the transition, 1000 A.D. But, as in the case of the switch from amphorae to barrels, the causes of the switch are obscure, although here historians of technology are willing to speculate. They do not attribute it purely to a shortage of labor, particularly of the skilled labor demanded by the

edge-joining of planks, nor a shortage of timber. They look to certain economic and political factors. Lynn White, foremost expert on the history of Mediaeval technology, cautiously suggests a connection with the great upsurge in maritime activity that took place in the Italian ports of Amalfi, Pisa, Genoa, and Venice during the tenth century; the frames-first technique put at their disposal vessels that could be built relatively quickly and required a smaller initial investment. Barbara Kreuz, author of numerous studies in Mediaeval naval matters, equally cautiously suggests that the Arabs may have been in good part responsible for the switch: needing to build fleets from scratch, they adopted the method best suited for doing so. A recent, detailed study by Richard Unger suggests that the centuries after 700 were marked by a shrinking of commerce, and the use of the cheaper frames-first vessel enabled shippers to survive these difficult times. When, in the second half of the 10th century, the volume of trade expanded dramatically, the speedier frames-first technique enabled shipyards to keep up with the demand for more and more vessels.

Whatever the answer, it is clear that the switch was a technological event of the highest importance, comparable to that in later centuries from wooden hulls to iron. And we owe our awareness of it totally to the findings of underwater archaeology.

Lionel Casson
New York University

* The above is an abstract of Professor Casson oral presentation.