Treatises and technical Texts on Shipbuilding

NADL

01.00 Introduction

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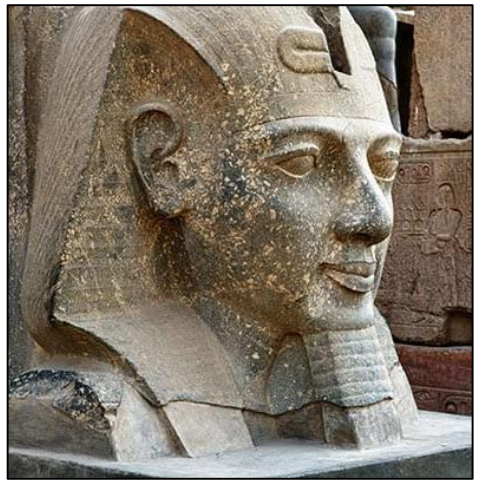
Ship Projects?



Ship descriptions are old. Patrice Pomey (1998) cites a letter from Ramses II (c. 1270 BCE) to a Hittite king, asking him to make a drawing of a vessel and build a copy.

Another text, from the 6th century, from Nabonidus, king of Babylon (556-539 BCE), says: “never yet have I constructed a ship –draw the design on the ground that I may see and build the boat.”

Ship Projects?

On peut invoquer dans ce sens deux textes écrits en akkadien qui n'ont encore jamais été utilisés dans le débat sur la conception des navires antiques. Ils sont cités dans un article très récent de D. Meeks (1997), derrière l'autorité duquel je me retranche. Le premier texte concerne une correspondance de Ramsès II (v. 1270 av. J.-C.) au roi hittite pour l'avertir de l'arrivée d'un navire égyptien dont les charpentiers hittites devront exécuter "un dessin" pour en construire une copie. Le deuxième texte, datant du règne de Nabonide, roi de Babylone (v. 555-539), emploie le même terme akkadien pour "dessin" : "never yet have I constructed a ship - draw the design on the ground that I may see (the design) and (built) the boat"[11]. On retrouve là le principe de la copie d'un modèle existant, mais il s'y ajoute ici l'exécution d'un "dessin". Tracé sur une tablette, comme le pense D. Meeks pour le premier texte, ou sur le sol comme l'indique le second, il ne peut s'agir que de quelque chose d'assez élémentaire, une sorte d'esquisse figurant sans doute des lignes essentielles du navire.
d'autres informations.

Pomey, Patrice, 1998. "Conception et Réalisation des Navires dans l'Antiquité Mediterranéenne" in Rieth, Eric, Technologies / Idées / Pratiques: Concevoir et Construire les Navires, Érès.

Ship dimensions and practical knowledge

The necessity to repeat good shapes must have been the driving source for shipwrights to develop means to record the ship curves.

Recipes for Noah’s Ark, or Sumerian king Ziusudra (Atrahasis), or Gilgamesh, exist and mention a round, rectangular or boat shaped vessel (in the Koran) with given dimensions.

Model at a 1:3 scale built from a tablet deciphered by Irving Finkel.

Early Technical Texts

Sometime around the 11th or 12th century AD skeleton first construction consolidated in Europe as the main way to build ships in the Mediterranean basin.

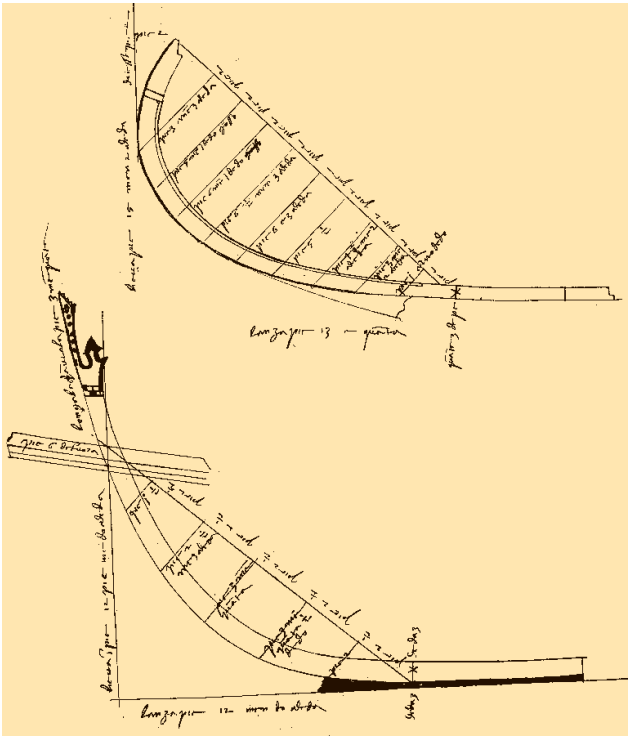
Eric Rieth (2004) reminds us that by the early 14th century (1318-20) we know that galleys were being built at Narbonne with molds (Sosson 1962).

Rieth, E. 2004. « Des mots aux pratiques techniques: gabarits et architecture navale au Moyen Age. » *Chronique d'Histoire Maritime* 56: 13–34.

Sosson, J.-P. 1962. « Un compte inédit de construction de galères à Narbonne (1318-1320). » *Bulletin de l'Institut historique belge de Rome* 34: 57-318.

Early Technical Texts

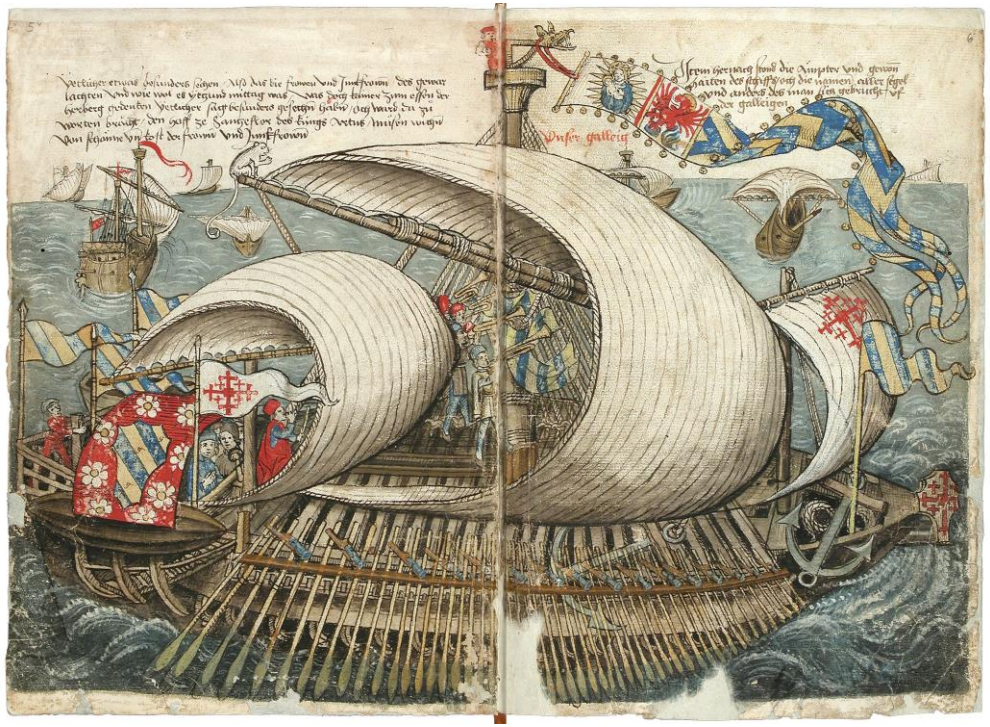
Predictability and the ability to repeat a good hull have been problems of all shipwrights since the time of the first dugouts.



Trombetta's manuscript, from the middle 15th century, shows the recording and plotting of curves with offsets.

Early Technical Texts

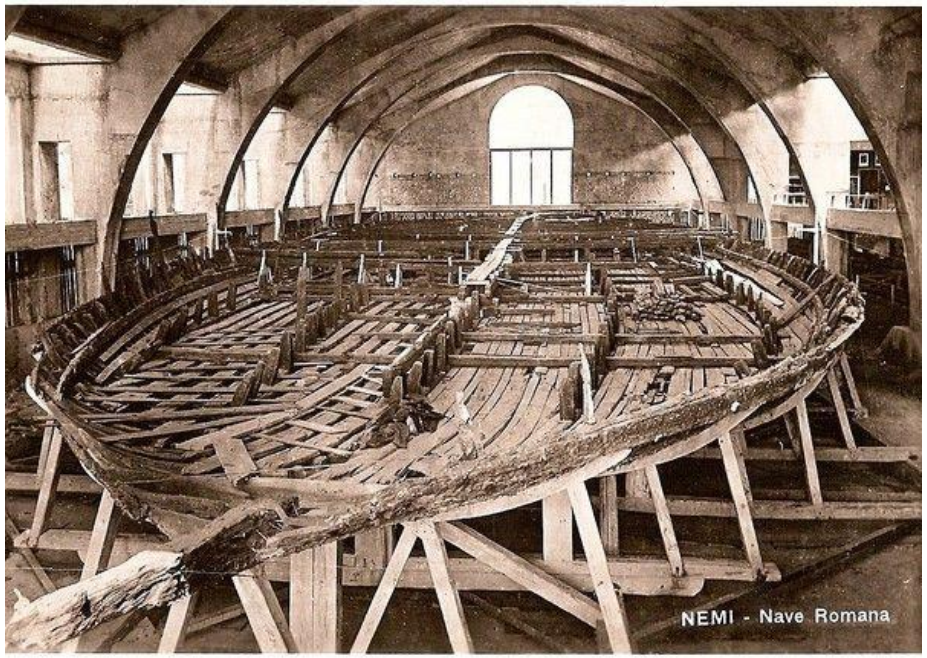
Royal control of shipping and naval affairs has made naval architecture a more or less important affair since the consolidation of the modern state in the late 15th century (monopolies of taxation and justice).



Schilderung einer Pilgerreise von Konstanz nach Jerusalem durch Konrad von Grünenberg, um 1487.

Early Technical Texts

More or less sophisticated recipes to build ships must have been in the minds of all shipwrights, since the beginning of shipbuilding. We know that Romans had different names for ship designers and shipbuilders. In the 15th century, however, we see the first recipes detailing shapes and dimensions of several types of ships.



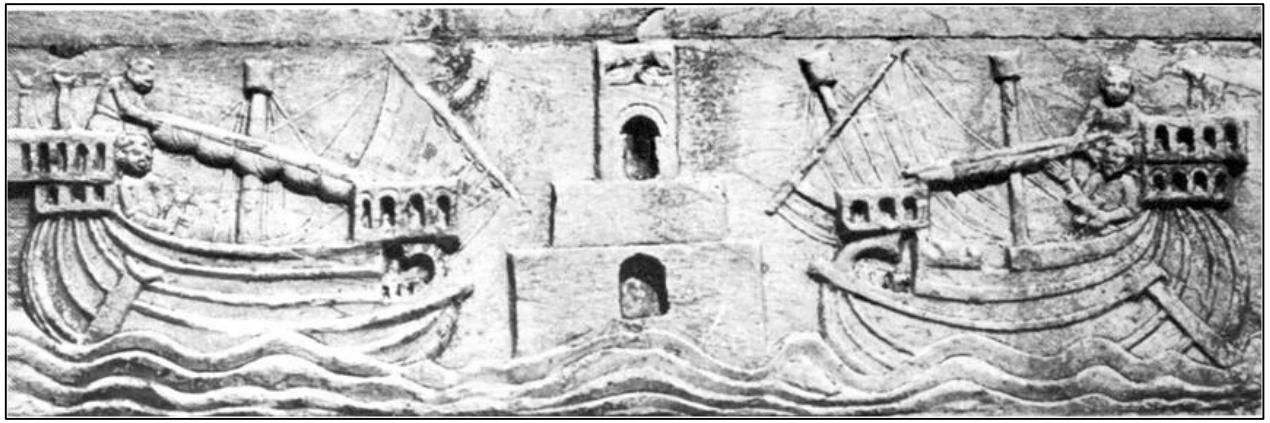
It is difficult to imagine that Caligula's floating palaces were not built from plans.

Early Technical Texts

The rise of commerce in the Renaissance made ships important assets for the Italian maritime republics. Shipwrights attained a certain social importance, at least in the 14th and 15th centuries.

Early Technical Texts

Following the crusades, the development of commerce and the transport of pilgrims, adventurers, and warriors to the Middle East placed a demand for space and speed on the shippers, thereby forcing the construction of ever larger and better vessels. This meant larger investments, larger risks, and more importantly, new designs.

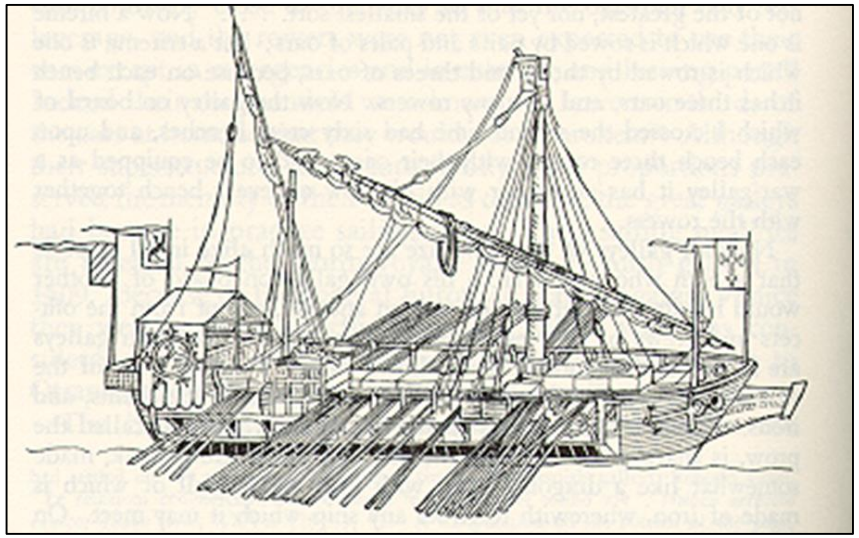


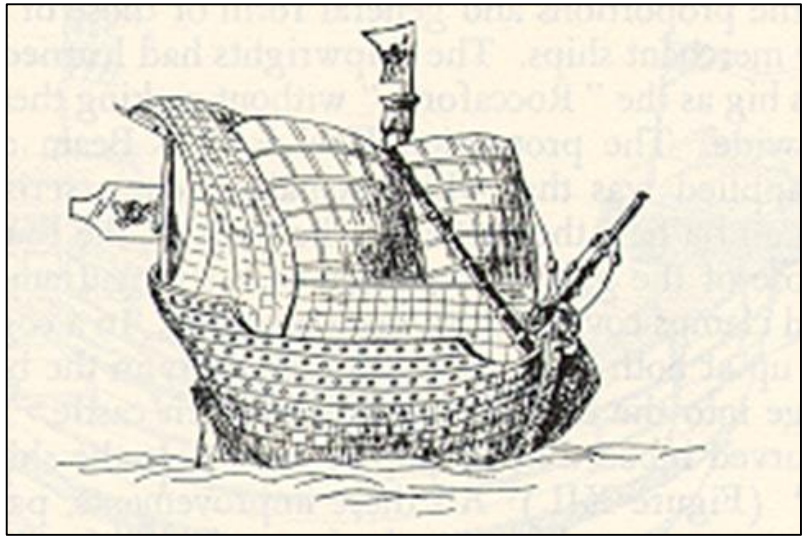
Early 1200s: Tower of Pisa and Biblia del Duque de Escalona (date?).

Early Technical Texts

Ships were divided into long and round, the first propelled by oars (galleys), and the second depending exclusively on sails for propulsion.

Traditionally, the bulk of the commerce overseas was carried out in round ships. However, as early as the 13th century, speed made it profitable for some valuable merchandises to be shipped in galleys.



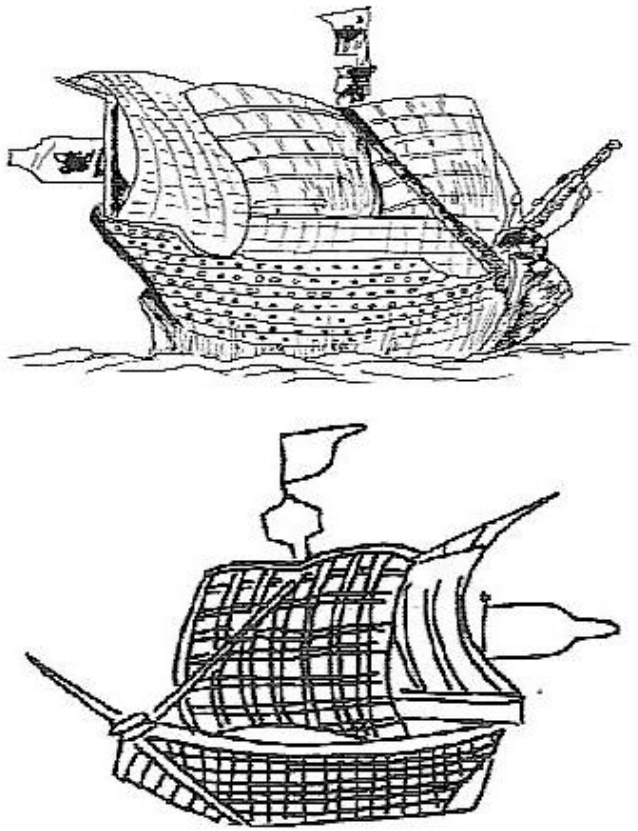


Early Technical Texts

By the late 13th century these galleys had grown in length and beam, had castles built over the stern for the accommodation of wealthy passengers and were mainly sailed, the oars only used to get in and out of harbors, an advantage that could save several weeks in the overall time of a round voyage to the Levant.

Round ship and galleys, late 1200s. Teruel.

Early Technical Texts



1367 Pizzigani map.

In the early 14th century economical recession, as well as piracy, pushed the Italian shippers to adopt smaller vessels rigged with the old Roman square sail, which were easier to handle and much cheaper since they required less sailors.

Early Technical Texts

The Black Death (1347-1350) brought about a redistribution of wealth and a concentration of land in the hands of fewer people. The price of land fell and labor became more expensive. The diminution of population allowed more resources for all, and the surplus was partly invested in trade.

Early Technical Texts

To the Italian merchant cities, the 14th Century brought money, literacy, and political and economical sophistication. Education became essential for the survival of any merchant, investor, or banker. The Mediterranean trade required accounting skills, a sound knowledge of law, currencies, and unit systems.

Early Technical Texts

Genoa’s influence in the Mediterranean was greatly affected by the rise of Venice, on the eastern coast of the Italian peninsula, and the network of trading cities under Venetian protection.

War of Chioggia (1378-1381). Undated painting.

Early Technical Texts

After a bitter dispute, in the late 14th century Venice emerged as the most powerful of the Italian maritime republics in the Eastern Mediterranean, while Genoa kept control of a large share of the Western Mediterranean commerce.

Early Technical Texts

The Venetian arsenal became a sophisticated industrial organization, and by the mid 15th century scholars were invited to input their theoretical knowledge into the shipbuilding industry.

Early Technical Texts

Shipwrights acquired some social status, shipbuilders – divided into three guilds: sawyers, caulkers and oar makers – were allowed to organize.

Mid-13th century. Façade of the Basilica of San Marco, Venice.

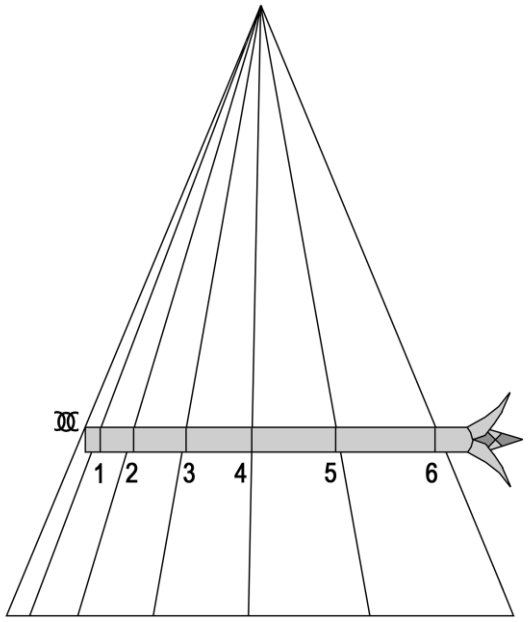
Early Technical Texts

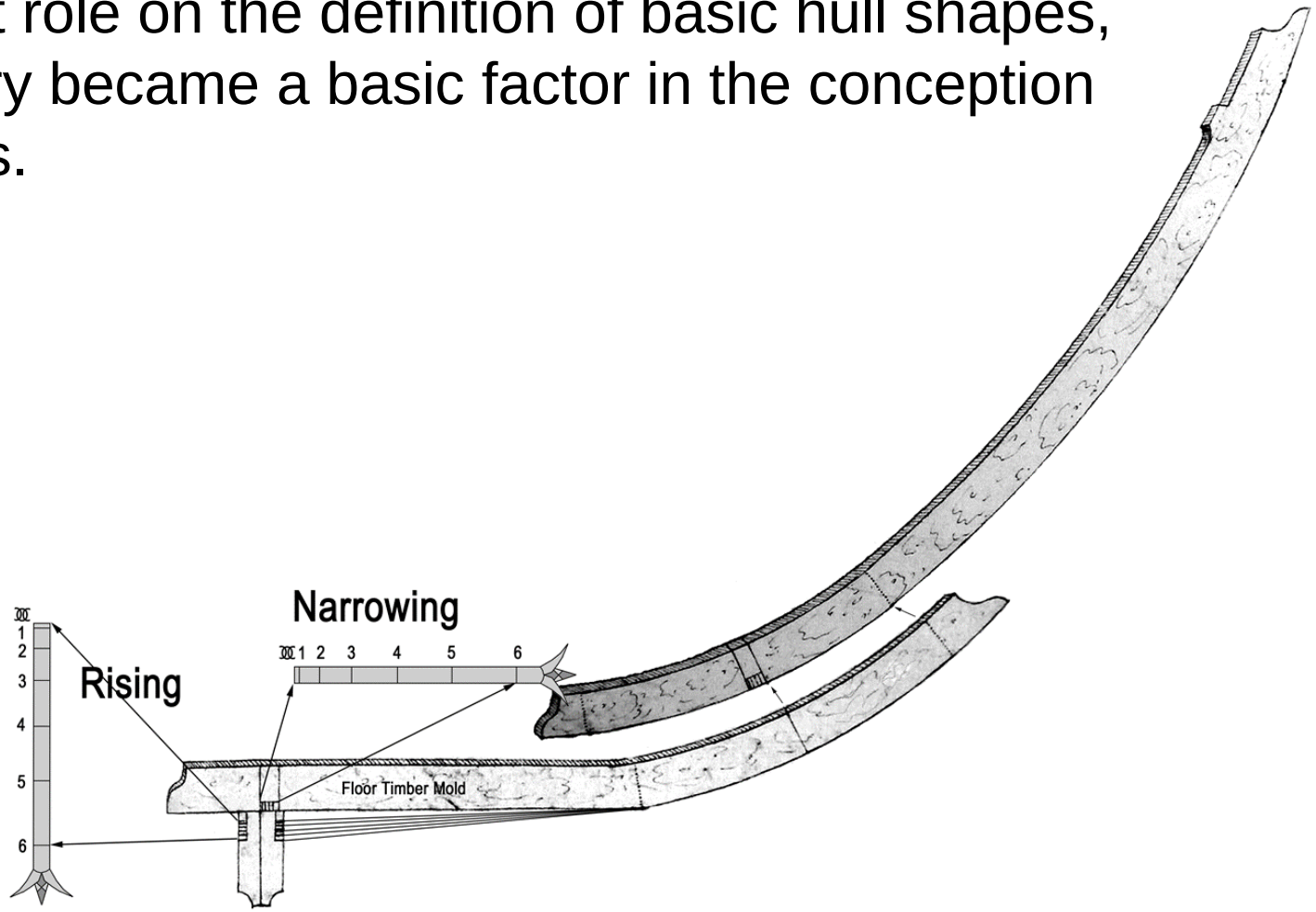
Shipwrights never achieved, however, any social status when compared with religious, military, or civil architects. Shipbuilding remained a practical trade until the 17th century.

Cathedral of Milan, started in the late 14th century and partially completed by the early 15th century. Work continued until the 19th century.

Early Technical Texts

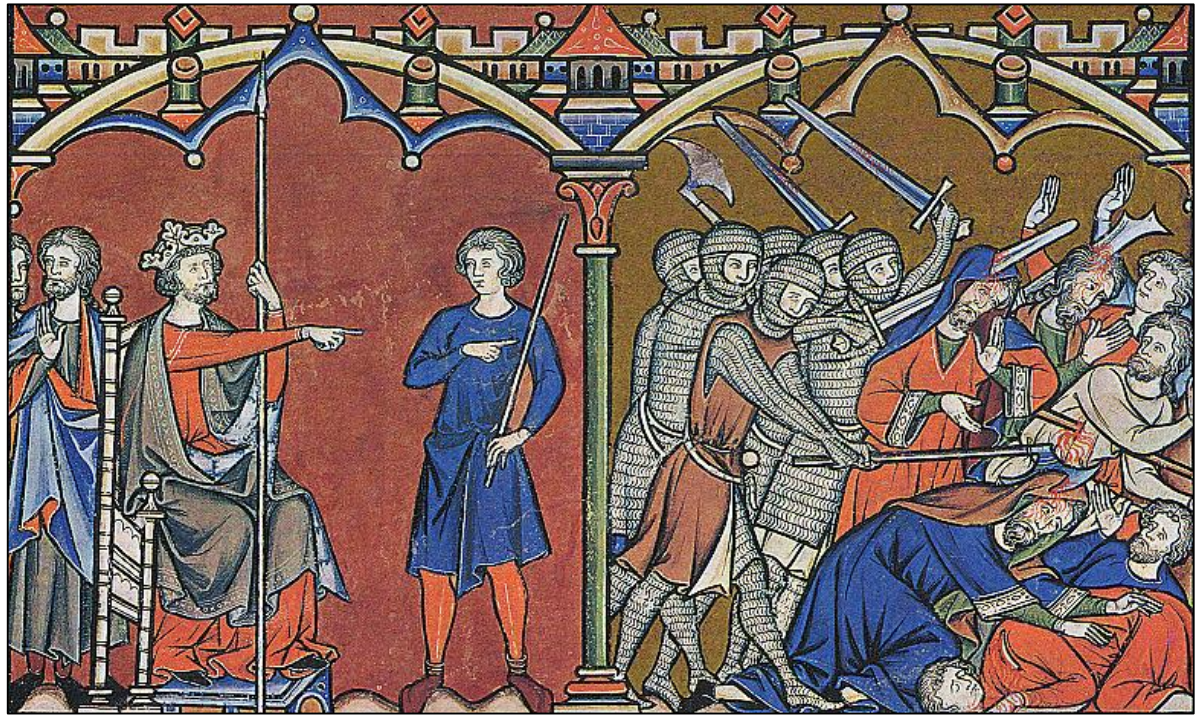
Geometry played an important role on the definition of basic hull shapes, and throughout the 16th century became a basic factor in the conception and construction of large ships.





Early Technical Texts

After the fall of the Western Roman Empire Europe endured period of economic and demographic decay. This decadence induced an almost complete amnesia where sciences are concerned.



Early Technical Texts

Around the 12th century, following the slow social and political boost of the Carolingian organization of the 8th to the 10th centuries, there was a period of cultural development characterized by the appearance of the Gothic style of architecture.

West façade of Saint-Denis (started in the 12th century), before the dismantling of the north tower (c. 1844 – 1845)

Early Technical Texts

The 9th and 10th centuries were a Golden Age in the Islamic World and some of its knowledge, wisdom, and culture slowly filtered into Europe.

Early Technical Texts

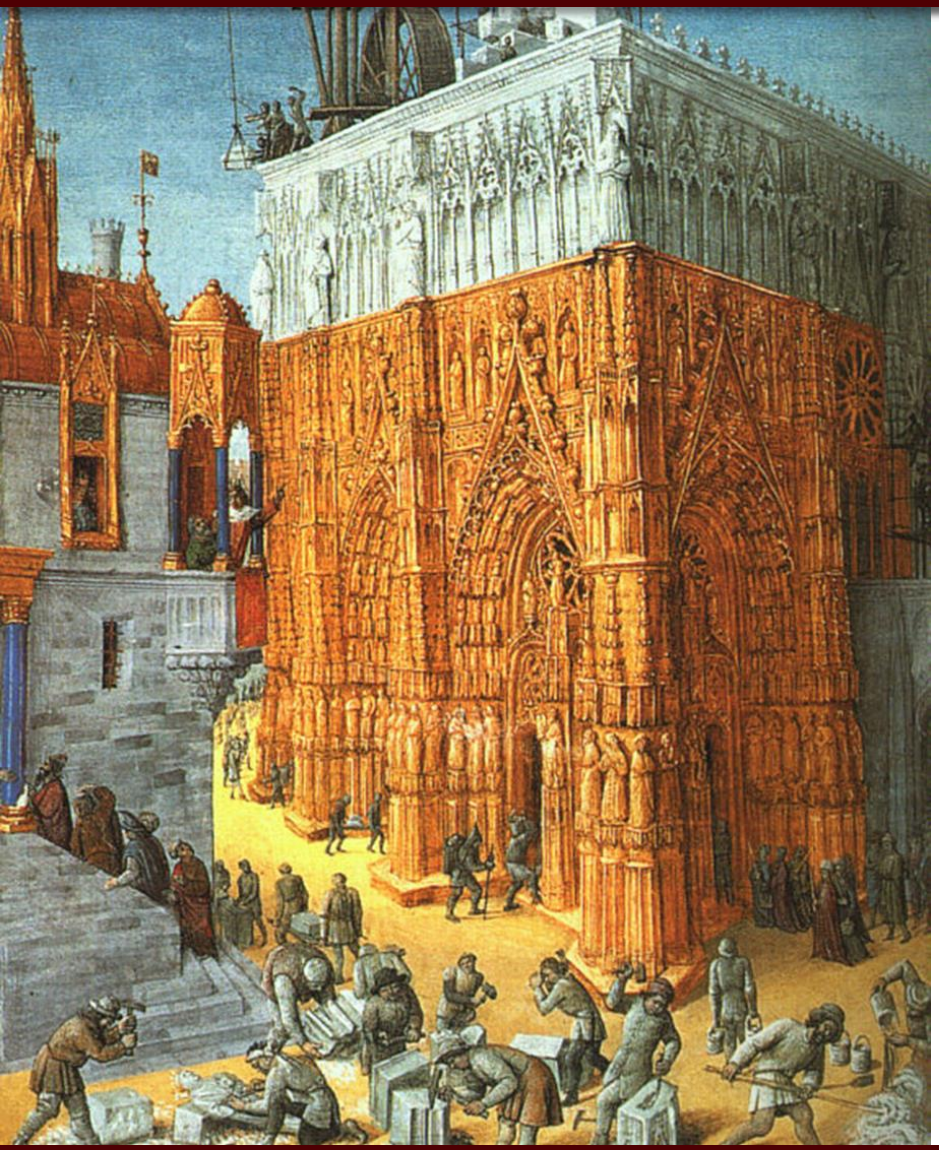
Around AD 976 Hindu-Arabic notation was introduced in Spain (*Codex Vigilanus*), but Europeans opposed its generalized use would until the 15th century.

Early Technical Texts

From the 12th century onwards, the development of commerce pushed the development of banking, and some progress in mathematics.

The Moneylender and his Wife (1514), Louvre.

Early Technical Texts



Meanwhile, the development of cities, the construction of castles, churches, monasteries, and palaces required large investments and demanded skilled architects and builders.

Early Technical Texts

By the 12th century monasteries became centers of learning, and harbored scholars and copyists who devoted their attention to Arab literature, the only repository of classical knowledge, and an available bridge to the much older and much more sophisticated Eastern civilizations that had by then fully embraced Islam.

Claustrum sine armario est quasi castrum sine armamentario.

Early Technical Texts

The gothic revolution of the 12th century brought these learning centers to the city, and many cathedrals became schools.

Early Technical Texts

The rise of a rich class in the cities spurred the development of a new architecture. Palaces were intended to show an harmonious mix of wealth, sophistication, and power.

Early Technical Texts

The 12th century saw a true Renaissance of the interest for arts and sciences, but mostly, for literature and the study of Classic authors.

Abū Bakr Muhammad ibn Zakariyyā al-Rāzī (854–925 CE), *Recueil des traités de médecine* translated by Gerard of Cremona, second half of 13th century.

Early Technical Texts

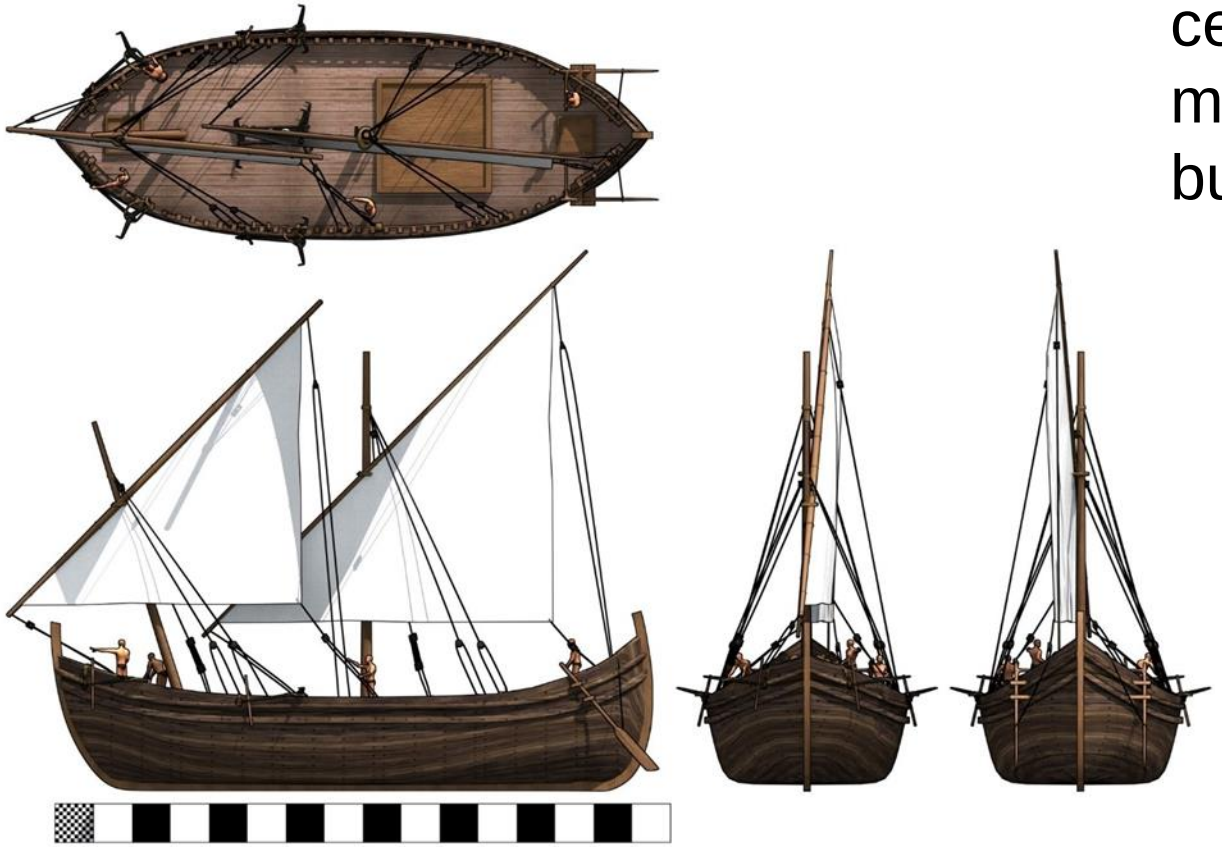
In the 12th and 13th centuries Europe was, however, rural, poor, illiterate, and violent.

Early Technical Texts

Villard de Honnecourt (b.1225 – a.1235) left us a book with notes that constitutes a window into the practice of late medieval architecture.

http://classes.bnf.fr/villard/

Early Technical Texts



The ships of the 12th and 13th centuries are small and crude, mostly when compared with the buildings of this period.

Early Technical Texts

It was not until after the Black Death (1347-1350) that ships started changing and growing in size. By then, long-sea ships also started to evolve non-local typologies, more related to the modes of commerce they were designed for than to local shipbuilding traditions.

11th century Serçe Limani

15th century cocca.

Early Technical Texts

In the 14th century many ships adopted a square sail, changed clay containers, like pots or amphorae, for barrels, side rudders for a central rudder, and placed a second mast, with a lateen sail, to the stern of the main mast.

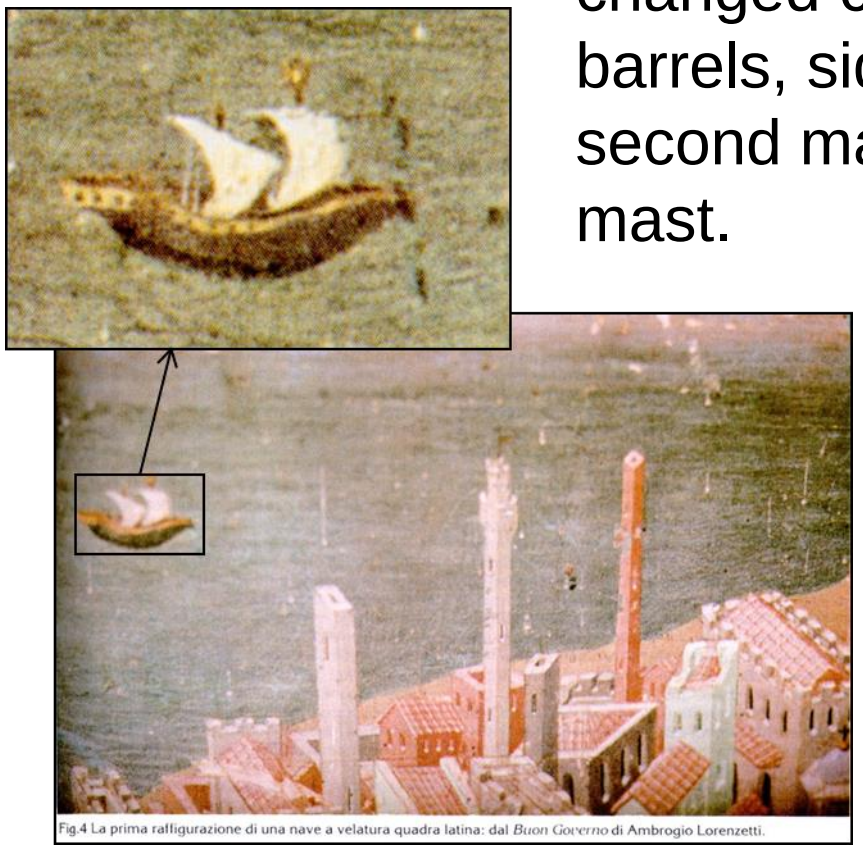
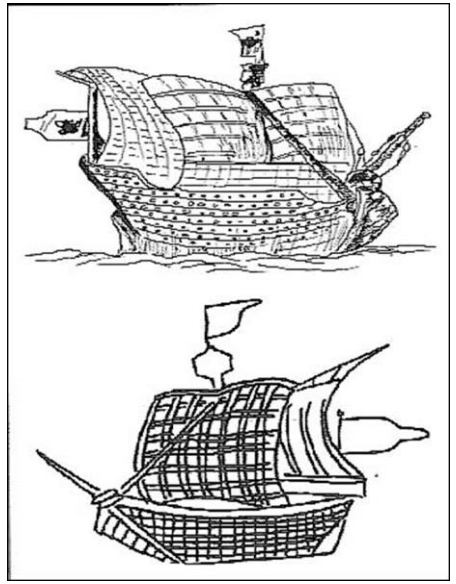
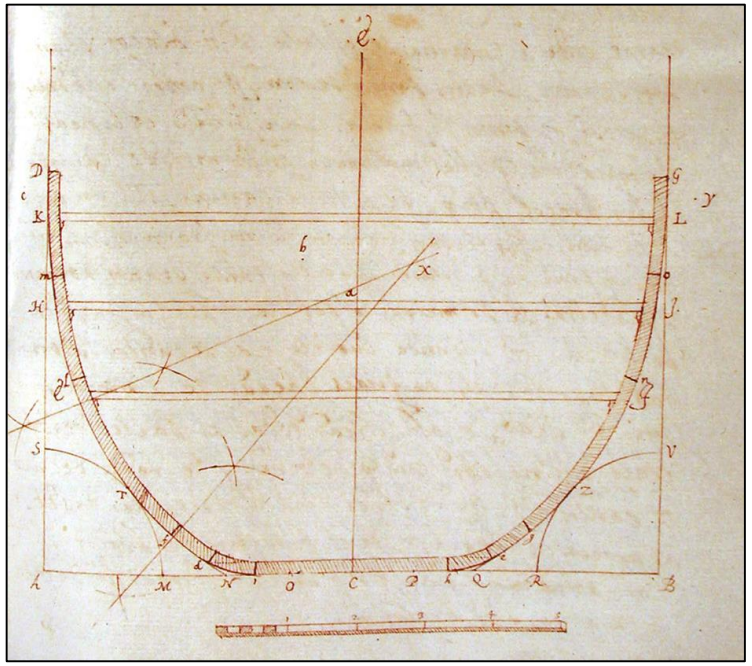


Fig.4 La prima raffigurazione di una nave a velatura quadra latina: dal *Buon Governo* di Ambrogio Lorenzetti.



Early Technical Texts

Although naval architecture was not informed by scientific principles until the 18th century, towards the end of the 16th century shipwrights started using geometric techniques to define midship sections, and the narrowing and rising of ship's bottoms fore and aft.



João Baptista Lavanha, c. 1600, Portugal.

Early Technical Texts

By the late 1500s several persons felt the need to write treatises or notebooks on shipbuilding. This course is about them.