

The Spanish Ships of the Oceanic Expansion. Documentation, archaeology and iconography from the 15th and 16th centuries

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The “space-race” embarked on by the peoples of the Iberian Peninsula somewhat over 500 years ago was similar, in many respects, to the present-day race to conquer outer space. Admittedly, their race took place on water whilst ours is in the air and theirs depended on a technology that, at the beginning of the scientific era, was largely empirical, whilst ours is the outcome of the most sophisticated technological and scientific processes. However, both constituted and constitute the technological cutting-edge of the time in which both were and are realities.

The means of handling and storing information have also changed considerably. At present, information is held in documents and data banks, both of which are durable and not at the mercy of human contingency. In the past such information resided in the minds of skilful master-builders and, though handed on from generation to generation by oral tradition, by shared working experience and by the empirical nature of the work, the low life expectancy of the times together with the rigid secrecy exercised by the guilds over their specialised knowledge made it virtually inevitable that such knowledge would not be recorded in any lasting way.

Only documents generated by embryonic Renaissance states record a certain limited part of the techniques and skills that enabled the people of the time to meet and overcome the many challenges of ocean travelling. This documentation is the means that allow us to come close to an overall understanding of the phenomenon. The thoughts and opinions expressed in them by well-informed contemporaries furnish us with the best criteria whereby we can approach, from various angles, the various characteristics, functional, morphological and structural, common to ships of the Iberian Peninsula in those distant times.

Archaeological findings from the period flesh out our knowledge of shipbuilding technology at that time in a way and with a detail that documents can rarely offer us. Thus, we have at our disposal two parallel sources of information which complement and comment on each other: one which gives us the broader picture, the other a more detailed one; one furthers an understanding of functional, typological, dimensional and morphological features, the other an understanding of structural, morphological and more detailed dimensional features.

Contemporary visual representations of ships provide a halfway house of sorts between the two approaches outlined above. However, their interpretation and understanding may raise difficulties since abstraction, simplification, stylisation, copying or imagination generally distorts such representations.

The basic problem facing the academic, who tries to understand naval technology, from a past going back four and five hundred years, is that of the scarcity, precariousness and dispersion of the information tools available to operate such a complex phenomenon.

On the one hand documentary collections are available which, although they result progressively more abundant from the 15th century onwards, are by nature generally more administrative and economic than technical. On the other hand, we have physical evidence, which, bit by bit, underwater archaeology provides. Moreover, he has at his disposal the heterogeneous iconography of the era, as well as the traditions accumulated in the carpentry workshops of the coast, and conserved more or less intact up to the present day.

Given the actual state of the question, it is not easy yet for the formulation of panoramic, global questions well adjusted to the many-sided reality of the issue. The reason may be found in the quantitative and qualitative deficiencies of the available information, and its unevenness, from which every one of our sources suffers.

Textual documents of a technical nature are scarce, and these, as well as the more abundant economic and administrative ones, have not yet been given the deserved attention by historians. Excavated Iberian shipwrecks from the age of geographic discovery hardly number two dozen, and of these only some have conserved significant remains of the vessel's structure; in any case they are a very small part of the thousands of Iberian naval vessels which plied the oceans during that historic period, which does not make their assignment to specific typology easy, a fact which hinders documentary completion, interpretation and rigorous reliable reconstruction. Iconography is another instrument seldom used as deciphering is not easy, given the diversity of its origins and the repeated practice of copying models through time, with the results being more and more stylised when not arbitrary. With respect to ethnographic testimony, which has survived in the last traditional coastal shipyards, the difficulty lies on distinguishing to which era corresponds each one of the solutions and strategies for shipbuilding that have been accumulated in them over the years, and which we contemplate today in the simultaneousness of the present.

The task which the naval construction researcher must face is a two sided one; on the one hand, we must critically analyse the question set by approximations carried out up to the present day, which we judge to be insufficient, and on the other hand cleanse and tune the methodological instruments with the aim of taking full advantage of the sources of information available, critically comparing one with the other, with the objective of avoiding the elaboration of distorted or impoverished visions of the rich and complex subject under study.

About the Spanish ships of the 16th century

Centring the problem on the Spanish case, although the quantity and characteristics of the various fleets that operated off its coasts are still unknown (except that related to the *Carrera de India*) (Chaunu, 1955-1960), there is evidence that clearly shows its great complexity (Casado Soto, 1988).

There were three basic functional groups to which the Spanish fleet of those days was connected: fishing, commerce and warfare, with the complementary and relevant addition of armadas, and exploration and colonization fleets. Each one of these functions was covered by ships of a specific typology, which was not an obstacle to nearly every kind of vessel operating complementarily more than one function. The need to be occupied in profitable enterprises for as long as possible throughout the year, as well as imperatives of a strategic nature, was the conditioning factor in this relative many-sidedness¹.

Right from the Early Middle Ages fishing was practiced, not only on the traditional fishing grounds, but also in the seas of Ireland, France and Morocco, with medium-sized ships which, as such, were dedicated in summer to active commercial trading along the entire peninsular coast. From smallest to largest, the types of boats implicated in this work were: *bateles* and *barquias*, *chalupas* and *galeones abiertos*, *pinacas*, *chalupas con cubierta*, *zabras* and *carabelas* (Casado Soto, 1977). From the middle of Sixteenth Century the expedition pursuing cods and whales to Newfoundland involved also merchant galleons and *naos* (Husley, 1987)

Large-scale commerce took place using medium and large-sized ships, whose average tonnage criteria grew greatly throughout the 16th century. They were, still from smaller to larger, *caravelas*, *navíos*, *galeones*, *naos*, and very rare carracks. They covered the routes, or *carreras* of Flanders,

France or England, of Andalusia and Levant (the Mediterranean) and, of course, that of the Indies, the only one that has been well studied and known. To this we must add the inter-American routes built and strengthened throughout that century: that of the Islands-New Spain, that of the Islands-Tierra Firme, that of Peru-Panama, that of Mexico-Philippines, etc. (Casado Soto, 1998b).

With respect to warfare, we must strongly distinguish between two clearly defined areas, the Mediterranean and the Atlantic. In the first, the main enemy was Turkey, with its *berberís-cos*, to whom must be added on many occasions the French. The fleets which prepared themselves there relied on two kinds of ships, those specially designed for warfare in the inner sea, that is to say, *galeras* and small vessels of that type: *saetías*, *bergantines*, *fragatas*, etc., all of them propelled by oars or sails, and the strictly sailing ships originating from the Atlantic front of the kingdom, fundamentally Cantabrian *naos*, but also *carabelas* and *chalupas cubiertas*. On the Atlantic, on the contrary, the enemy up until the last decades of the 16th century was very diffuse and of a much lesser entity, practically reduced to small well-timed interventions of privateers and pirates. During the first half of the century, a satisfactory solution to this phenomenon of raids was the formation of small, well-armed squadrons for the vigilance of merchant fleets and the coasts. From the middle of the century onwards, and as a consequence of the growth in privateer activity, much larger warships of a new design were added to the squadrons of *carabelas* and armed *zabras*, such as those commissioned by Alvaro de Bazán under the name of *galeones* and *galeazas*. After the revolt of Flanders, and from the start of the intervention along the American routes of English privateers, the crown created permanent squadrons served by new kinds of warships, such as the *Armada para la Guarda de la Carrera de Indias*, the *Barlovento Armada*, The South Sea Armada and the Ocean Sea Armada. For these a new prototype of galleon was designed, as well as minor units called *galizabras* and *fragatas mancas* (Fernández Duro, 1895-1903; Olesa Muñido, 1968; Pazzis Pi Corrales, 1989).

The armadas and fleets created for the exploration and colonization of the new worlds incorporated into the Spanish monarchy, at first were made up of selections of ships taken from the available Atlantic fleets but, from the 1620's onwards, it was not unusual for ships to be purposely built for this, above all for the Spice expeditions, that is to say, to the Pacific Ocean.

Contemplating the panoramic outline which has just been exposed shows the high level of complexity reached by Spanish maritime activity during the first century of great European Geographic expansion: an aspect which was much more complicated still, if we take into account that it was not a static phenomenon, but a very dynamic and fast revolution, as a response to the changing circumstances which were occurring.

With respect to ships this was certainly so, as the existing typologies at the start of this period saw themselves subject to demands made by the new requirements, which forced important improvements in the strength of the ships, an increase in their cargo capacity and sailing performance. To this must be added the incorporation of new kinds of warship, faster, able to incorporate the enormous weight of the artillery and to transport safely the treasures of precious metals from the new mines discovered in Peru and Mexico.

The more or less spontaneous process of adaptation to this high level of complexity of traffic and functions, received a new impulse of rationalization and development controlled from the coming to power of Philip II. To the well-timed measures taken by the Crown since the era of the Catholic Kings, a political plan possessing great coherence was brought about and put into practice through the adoption of measures leading to the promotion of shipbuilding on all fronts (Thompson, 1976; Goodman, 1988; Casado Soto, 1999).

The legislative labour was remarkable. During the period of regency, in 1550, the decree for the Navigation to the Indies was proclaimed, completed with those of two years later, in which safety measures on ships were reformed and systematized. As king, between 1561 and

1564, he established regulations for navigation in convoy, through two annual fleets headed and escorted by two warships each. Furthermore, he put into force the mercantile regulations for the protection of Spanish shipbuilding and stipulated a whole pile of technical specifications leading to the improvement of ships and their safety.

He furthered the initiative in shipbuilding, intensifying the planting of oaks in the north, adjusting the “majority law” and the “bringing alongside” or annual prize to all ships of more than 300 tons, established the exemption of the sales tax to the buying of materials necessary for shipbuilding. To all this he added the creation of a capital fund for the concession of interest-free credit in shipbuilding, capital growing progressively throughout his reign, the only counterweight being that those ships which carried him should follow a set of requirements in proportions, strength, furnishings, and armament, which supposed considerable improvements and the incorporation of the latest designs along with experience.

He strengthened the rationalization processes which these technical measures involved, through the standardizing of the various meteorological systems used previously in Spain, and established a unique system for the measuring of hulls and calculation of capacity, culminating in a mathematical formulation much more advanced and efficient than any of those used in Europe at that time. He was also the first European monarch to establish the serial construction of ships for the armadas, applying the revised *galeon* prototype, in a process started by the twelve built in Deusto in 1568, the two of 1578, the nine built in Santander in 1583, the twelve in Santander and Bilbao in 1591, etc.

What has been shown up to here is in stark contrast to the opinion about Spanish ships spread through the greater part of historiographical bibliography in international circulation. If technological advantage is an unavoidable requirement for the acquisition and conservation of the hegemony and economical political and military preponderance, it is without a doubt that Spain had it throughout the 16th century. Due to this, the pejorative state of opinion with respect to its ships of that time is all the more surprising, something with such inconsistent basis that it does not stand up to well-documented criticism (Casado Soto, 1991a, 1998a).

The Iberian people were those who opened up the routes across the planet’s vast stretches of water, an advantage that enabled the availability of more resources than any other contemporary country of Europe to multiply the number of ships and diversify them. The Spanish Monarchy of the Renaissance built itself up to a great extent thanks to the ships that formed the technological vanguard of the Early Modern Era. At this level of historical understanding, and given the interest in Spanish naval technology that the shipwrecks now beginning to see light of day thanks to the activities of subaquatic archaeology has begun to stimulate, it seems necessary to embark on wider and more rigorous studies of those complex machines and of the part they played in the transformation of reality. The vast quantities of documents useful in this area, which the Spanish archives store, by far the richest in Europe at that time, make a strong incentive to promptly undertake the pending task. Only in this way will we be able to achieve a greater understanding, on a firm basis, of the most important changing instrument of that period in history, the ship. Only in this way will clear and reliable profiles of this technological fact be achieved, which ultimately appear in historical knowledge, questioning common previously established concepts.

It is necessary to undertake, through a more rigorous approach than those taken at present, the study of the disproportionate growth of activity in the Spanish shipyards, and their peculiarities; the adaptations, transformations and development of the diverse Spanish Atlantic fleets; the early rationalization of the processes of production and control; all this without forgetting the human settlements that played a chief part in the sudden change, the communities of men on the ocean’s edge who enjoyed the benefits provided by the expanding state, and suffered the inconveniences caused by the transformation of their country into the greatest European sea power.

Spanish documentation on the ships available to that country throughout the XV and XVI centuries is very diverse in nature and quantity according to the particular period under consideration.

Before the reign of the Catholic Kings (1474-1516) mention of ships in Castilian documents is infrequent and in any case never goes further than providing the name of the ships, their type and, exceptionally, in the case of a few dozen ships, their tonnage in terms of “barrels”. The restructuring of the Royal Chancellery carried out by the Catholic Kings along with their systemisation of municipal life resulted amongst other things in the conservation of many more documents than have come down to us from earlier times. Nevertheless, the general nature of these documents is similar to those that preceded them though by now we also begin to find accounts relating to fleets, papers dealing with expeditions being organised to America and details with regard to sailing routes to the New World (Fernández Duro, 1893; Fernández Navarrete, 1825-1837; Eberenz, 1975).

The reign of Charles V (1517-1556) saw the establishment and consolidation of the framework of a modern state that was characterised by an outward-looking and expansive foreign policy. As a result, the problems inherent in a modern state were formulated and a new set of controls and the kind of management techniques required dealing with them put in place (Haring, 1918; Pulido Rubio, 1950). The spin-off for the study of documents concerned with shipbuilding was on the whole beneficial: a much greater number of documents along with what we might consider the first treatises on shipbuilding and the first detailed records on the structure and dimensions of ships.

Philip II's long reign (1556-1598) can be considered as the period in which Spanish bureaucracy reached maturity. Thus, Philip's determination and unceasing labour made it the efficient instrument that brought about and held together a vast empire underpinned by its ships and by hand-written correspondence. In addition to the advances of the preceding reigns the King now becomes directly involved in naval affairs (Casado Soto, 1999). Throughout his long reign he brought to them a consistent approach that helped to solve the deficiencies of private initiative and stimulated the development of permanent structures capable of confronting both the logistic and the strategic challenges that he was faced with. Production of documents grew exponentially and the establishment of well-funded, well-staffed and well-appointed permanent archives guaranteed their conservation.

Most of the state documentation from these three reigns, covering a century and a quarter, is stored in the General Archive of Simancas (Plaza Bores, 1980), in the province of Valladolid, the General Archive of the Indies in Seville (Peña de la Cámara, 1958) and, to a lesser extent, in some of the manuscript collections of the Royal Academy of History, the National Library and the National Historical Archive, all in Madrid. Further documentation of a general and private nature can be found scattered throughout different regional and local archives close to the coast as well as in some judicial institutions such as the Burgos Consulate or the Royal Chancellery of Valladolid. Other useful documentary sources are to be found amongst papers held in those aristocratic houses whose members held responsibility posts in commanding or organising naval fleets and expeditions.

The documents that are of greatest interest for the understanding of naval construction are the treatises and memorials dealing with the raw materials, dimension and tonnage of ships and the building contracts and accounts relating to ships ordered by the Crown. Of the above the scarcest are the first, though many are published and available to students of the subject.

- 1536, Alonso de Chaves: *Espejo de Navegantes* (Castañeda, Cuesta and Hernández, 1983, p. 209-223).
- 1560, ca., President Visitador: *Papeles* (Casado Soto, 1988, p. 265-270).
- 1568, Domingo de Busturria: *Memorial* (Casado Soto, 1998a, p. 362-363).
- 1570, ca., Rodrigo Vargas: *Apuntamiento* (Casado Soto, 1988, p. 271-274).
- 1575, Juan Escalante de Mendoza: *Itinerario de Navegación* (Escalante de Mendoza, 1985, p. 39-45).
- 1581, Cristobal de Barros y otros: *Discusión de prototipos de galeón* (Casado Soto, 1988, p. 294-375).
- 1587, Diego García de Palacio: *Instrucción Náutica* (García de Palacio, 1944, fols. 88-109).
- 1611, Tomé Cano: *Arte para fabricar, fortificar y aparejar naos* (Cano, 1964)

These writings and a number of others as yet unpublished are very diverse and influenced greatly by the experience and profession of their authors. Some of them are genuine shipwrights and others administrators, people who sailed in the boats or else mere theoreticians. Thus, without diminishing the value of any of these documents, their relative merits should be taken into account to get a true picture, all the time bearing in mind that the opinions and views expressed by such a mixed collection of authors might not tally with the physical reality of the ships under consideration. It is often the case, for instance, that when we compare these treatises with detailed documentation which enables us to build up a truer statistical picture, we find we get a much clearer idea of the dimensions of different types of ships and that these are sometimes at variance with those described in the treatises (Casado Soto, 1988, p. 186-224).

The dimensions and tonnage of ships, of which we have been able to gather more than five hundred, are of special interest in this respect in spite of the fact that they relate to ships hired out to the Crown to form part of their fleets. This suggests that these ships had been selected from the available pool according to certain criteria such as that they had been recently built, that they were larger, stronger or that they were more suitable for war. Nevertheless, the relative abundance of these documents and the quality and detail of the information they offer render them the best instrument available for an objective understanding of the definition and the peculiarities of the different types of ships then in existence and, in turn, allow us to assess with a greater or lesser degree of accuracy how far contemporary treatise writers differed from reality.

Building contracts, normally to be found in collections of notarial protocols in regional archives, also constitute a particularly rich source alongside other contracts for the supply of naval provisions (Barkham, 1981). The problem here lies in the incomplete nature of the series of protocols of the 16th century, in the relative scarcity of these types of documents and in the fact that they are widely dispersed amongst a great variety of other documentation.

Accounts of the series of ships built and paid for by the Crown are another very rich source of additional information, providing us not only with the terminology and dimensions for each component of the ship but also with the origins of the material and provisions as to the way in which work in the dockyards was organised (Rahn Phillips, 1986).

The collection of administrative documents generated by the organisation of the fleets furnishes us with valuable information on their functional, morphological and structural characteristics. Especially important here are the details of how ships could be commandeered and refitted and how crews were paid and also the description of actions in which they were involved. Of special interest are the inventories of what the ships carried. These documents were drafted when responsibility for a ship changed hands and they contain exhaustive descriptions not only of the hull, masts, yards and sails but also of the other artefacts on board as well as the utensils, tools and lading necessary to the functioning of the ships and the well-being of the crews.

There exists one more documentary source not used so far in the study of naval shipbuilding. These are the “impressions” on ships and fleets drawn up by experts, at the express command of the King, his ministers or on individual initiative and of which Spanish archives hold a good number².

This panorama would remain incomplete, however, if we did not take into account the world of fishermen, a world that, to a large extent, provided the technical and human infrastructure that made possible the most ambitious projects. The codes which governed their association and other documents relating to their guilds provide valuable information on the small and medium-sized ships in which they worked and carried on an extensive coastal trade. A consequence of the disarticulation of guilds in the middle of the nineteenth century is that these documents are widely dispersed in local collections and archives.

Archaeology

Undersea archaeology now stands on the same footing as archaeology on land thanks to the technological advances made after the Second World War. The interest, originally centred on wrecks of the classical era to be found in the Mediterranean (Bass, 1972), soon shifted to more northern European waters and to those off the American continent (Bass, 1988). For a little over three decades studies have been carried out on the remains of ships originating in the Iberian Peninsula found off the coasts of all the oceans but especially in the Caribbean and its vicinity. These, together with discoveries of Spanish wrecks in European and Asian waters, have brought about a renewal of interest in Spanish naval architecture during the period of maritime expansion that gave rise to the modern era (Steffy, 1994; Delgado, 1997).

As far as we know, ten reasonably preserved Spanish wrecks from the 16th century have been discovered. These are scattered over the shores of Europe, America and Asia whilst there are also similar numbers of less significant wrecks which have left no traces of their wooden structure, including those sunk around the British Isles³ at the time of the Armada of 1588.

In the chronological order that experts have assigned to them, the following wrecks provide useful information on naval shipbuilding.

The Molasses Reef Wreck

Discovered in the old Bahama Channel in 1980. 1982 saw the beginning of excavations on the mound left by its ballast, Part of the ship consisting of six strakes and the remains of 22 ribs were revealed. Its guns, culverins and arquebusses date the ship to the first third of the 16th century (Oertling, 1982; Keith et al., 1984; Oertling, 1989a; Keith and Simmons, 1985).

The Highborn Cay Wreck

Discovered in 1965 on the Bahamas Grand Bank. Artillery pieces (bombards, culverins, double culverins) were recovered from it, also anchors. 1983 saw the beginning of excavations on the wreck and studies were made of its central section and the heel of the mast. Again the wreck would appear to date from the first third of the 16th century (Smith, Keith and Lakey, 1985; Oertling, 1987, 1989b).

The Saint John Wreck

Discovered off the Great Bahama in 1991. The following year excavations were begun. Three bombards, eight culverins and breechloaders along with sizable quantities of Spanish ceramic ware were salvaged. There are also remains of the hull (Smith, 1993, p. 204-205).

The Cattewater Wreck

Discovered in Plymouth, South Devon, in 1973. Five years of excavation have resulted in abundant salvage material of all kinds, artillery pieces similar to those found on Spanish ships in the Caribbean and significant remains of careen (Redknap, 1984).

The 1554 Fleet

Three ships belonging to this year's fleet were first uncovered during the 1948 dredging operation of Padre Island in Texas. Stripped by treasure hunters, 1967 saw an attempt to salvage one of the three ships of which a section of the keel attached to the stern-post remains (Arnold III and Weddle, 1978; Rosloff and Arnold III, 1984).

The Bahía Mujeres Wreck

Discovered in 1958 off the coast of Yucatán, Mexico. Canons and anchors salvaged. Rediscovered in 1984, plans were made of the wreck and parts of the hull were identified (Keith and Smith, 1985).

The Red Bay Wreck

Discovered in 1978 during prospecting for whale fisheries off the coast of Labrador, Canada. Excavations were carried out very conscientiously and provided an abundance of material and the most sizable hull portion of any Spanish ship of that century. The wreck has been identified as that of the *San Juan* that foundered in 1565. Two other wrecks alongside small boats and sloops have also been discovered in the immediate vicinity (Parks Canada - *Research Bulletin*. N.º 125 (1980); 163 (1981); 194 (1983); 206 (1983); 240 (1986); 258 (1987). Ottawa.

The Western Ledge Reef

Discovered in 1964. A number of artillery pieces salvaged. Archaeological excavation began in 1989. The outline of the boat is preserved along with the heel of the mainmast. An abundance of ceramic ware and arms identify it as a Spanish ship of the last half of the 16th century (Watts, 1993).

The San Diego Wreck

Sunk off Manila in 1600 after successfully defending the Philippines from a Dutch attack. Discovered in 1991, excavation was begun immediately. The complete outline of the ship is preserved at a depth of 50 metres. It was built in Cebú of local timber by the Spaniards following building techniques developed on the Spanish Cantabrian seaboard (Desroches and Goddio, 1994).

The Emmanuel Point Wreck

A Spanish ship sunk off the coast of Florida in 1560 whose remains were discovered in 1992. The first two campaigns have allowed a salvage of 15% of the wreck and have permitted experts to date it as the oldest ship discovered off the coast of this State (Smith et al., 1995) (11).

In the published plans and dimensions of these wrecks similarities and differences exist in the careen of the boats. The similarities may be attributed to the majority having been built in the shipyards of the Cantabrian coast and the differences to the passage of time between their respective dates of construction as well as to their probably being different types despite the fact that most of the wrecks are merchant ships.

The remains of the hulls owe their preservation to having been buried under the ships' ballast. We are dealing therefore with an essential but limited part of the structure composed, in

most cases, of a length of keel, a number of frames and, with luck, of the keelson and the step of the mast. Under exceptional circumstances, the sternpost has also been preserved. The Red Bay Wreck constitutes a unique case to date in that a substantial part of the sides of the boat along with the upper stern and decks have been preserved.

The timbers of these ships have reached us in a precarious state of equilibrium with their marine environment. They have lost a substantial amount of their constituent substance, cellulose and a great deal of their original shape. The remains are soft and spongy and lie flat on the seabed. All the same we are no longer dealing with speculations or theoretical reconstruction but with real physical remains salvaged from the past that offer us valuable information on specific technical solutions and on the actual dimensions of different parts of ships.

The importance of these findings should not, however, blind us to the fact that they constitute a limited sample of the thousands of Spanish ocean-going ships that sailed the seas of the world during the first period of European geographical expansion.

The difficulties posed in reaching a correct interpretation, let alone a reconstruction, of these ships has served as a stimulus to English and French speaking researchers who, over the recent years, have taken an interest in the Naval Architecture of the Iberian Peninsula and, more specifically, of that of Spain. A minority of these researchers have gone directly to Spanish Archives for their research as have a number of freelancers paid by treasure-hunters. Nonetheless, in general, information obtained from primary sources has been limited to inventories and lists of ship equipment and, occasionally, to reports of salvage attempts following on the sinking of the boats.

As to the problems posed by naval construction in its strictest sense, most of the work published has stuck closely to the information provided by the three or four 16th century treatises on shipbuilding published a century ago, to the evidence derived from the wrecks themselves and to the somewhat speculative interpretation of a heterogeneous collection of visual representations of ships of that time (Casado Soto, 1988-1998).

Iconography

There is no doubt that contemporary visual representation of the kind of ships we are studying is of the greatest interest for the information they can give us. However, visual representations, though they might appear a ready source of material, can be highly deceptive. There are many reasons why, in the majority of cases, interpretation is neither easy nor obvious.

In the first place it is often difficult to date the image, either because information is missing or else because, as became common practice from the time of the Renaissance and the spread of printing, artists copied previous models while often simplifying and stylising or distorting them in the process.

The general practice in drawings, engraving and painting was to reproduce ships without specifying what type they belonged to. References to dimensions are totally absent and scale does not provide much help since little attempt is made to match this with other objects or figures in the depiction.

Distortion by the artist, either of the proportions of the ship as a whole or of individual features is not the norm, nor can we place much trust in the depiction of technical features either in their number, shape or relative sizes.

The majority of artists and copyists who produced “artistic” depictions of ships were people with little experience of the sea and not unduly concerned with giving an accurate technical rendering of their subjects which generally came second to aesthetic or artistic considerations.

This applies to the great majority of visual representation that was produced with an artistic aim in mind (paintings, murals, drawing, engravings) or with a decorative one (illustrations on chart and maps).

A separate mention should be made of a group of images that are little known and seldom referred to by specialists. These are relief carving on stone in the three Spanish provinces — Cantabria, Vizcaya and Guipuzcoa — where most of the ships, which sailed the Spanish trade routes in the 16th century were constructed. There are almost two dozens of these images representing ships of different types and many of them are executed with an admirable attention to detail (Santana, 1996).

However, there are other images of ships of the period we are considering which come to us from the treatises on shipbuilding and technical manuals. These unfortunately rare examples, which could be regarded as of a technical nature, are normally drawn on paper and very occasionally given a wash treatment. They can be divided into two groups: those where the drawings are geometric and meticulous and those done freehand and with less care.

Nor can it be said that the Spanish World was prodigal in these productions – quite the opposite. Only two of the treatises so far available to us are accompanied by some kind of drawing or engraving (Escalante de Mendoza, 1575; Garcia de Palacio, 1587) and freehand drawings of technical aspects of naval construction are extremely rare⁴.

In Appendix II of this study we shall give two very illustrative examples of how too care-free a use of apparently reliable visual representations can lead to confusion.

To sum up, we can bring this section to a close by proposing that a disciplined approach to visual representations should be made before any attempt to decode them and use them as a reliable source of information about naval shipbuilding in the past is carried out. This requires knowledge of the circumstances under which the image was made and, if possible, of its author and of his professional background and skill. The date of execution should be ascertained with the greatest possible degree of accuracy and also it must be established whether the image is an original rendering or a copy. The next step involves making synchronic and diachronic comparisons with other images from the same cultural background and with others from more recent and more distant periods, matching up parallel information from documents and archaeology and finally, establishing the image in its true context.

Information derived from visual representations, alongside that originating from archaeology and documentation should be considered as distinct instruments that provide us with clearly differentiated components of knowledge. These can be then matched up against one another to highlight the discrepancies as much as the similarities. For this reason, it is important not to confuse lightly these different approaches. On the contrary, each approach must be treated as a discrete item and the specific methodology of each must be respected. Furthermore, depending on the density, quality and reliability of the information brought to us by each of the approaches, greater or lesser authority must be attributed to the three of them.

Conclusion

Spaniards were driven toward experimenting with newer and improved formulae for shipbuilding so as to respond to the changing demands placed on them by ocean navigation and the ever-growing size of ships. Numerous solutions were made possible and structures, dimensions and shapes evolved. A systematic search through an ever growing and more complex collection of sources gives clear evidence of this evolution. No longer is it admissible to draw on two or three treatises and a dozen or so basic sizes when we are conscious that there existed hundreds

if not thousands of different sizes and tonnages, along with dozens and dozens of reports, contracts, accounts and informed opinions waiting to be pulled out of the archives.

At this stage of the 20th century, we cannot approach a subject so complex and polyfacetic as the vanguard of technological innovation, a period as rich in its way as ours is today in its multifacetedness and dynamism, from a reductionist point of view. If we do so, we run the risk of oversimplifying our subject to such an extent as to make it unrecognisable.

Therefore, in our opinion, we should undertake the study of technological realities by means of the most appropriate processes suited to the multiform material that is the subject under investigation. This entails refining and differentiating among the tools used in carrying out the researches. In other words, it means going deeper into the subject and modifying our methodology to achieve more complete and accurate results.

What we are saying is not that we should shed any of the instruments of research presently available to us but that, on the contrary, we should make more efficient use of each one of them. Methodological procedure should become more complex, nuanced and efficient to match the high level of sophistication and wide range and variety of the object of our scrutiny: the ship in its temporal and spatial dimension.

APPENDIX I

Something about the quality of the Spanish ships in the 16th century

On another occasion I have attempted to demonstrate that the historically poor opinion of Spanish ships has a two-fold origin. Firstly, the scant interest shown by Spanish historians in the study of this technological fact which is of such importance to the understanding of the history of their country and, secondly, the failure of the Spanish Armada of 1588 which, for so long, was one of the commonplaces of Protestant political propaganda before becoming part of an exalted national mythology (Casado Soto, 1998a).

Even though historical writing of the past few decades has largely dispelled this myth of victory by the English David over the Spanish Goliath⁵, the matter of the ships themselves still gives rise to opinions not accurately based on concrete facts (Martin and Parker, 1988).

Research carried out in archives has allowed us to establish that many of the ship reported in books as lost, did, in fact, sail in subsequent armadas and never ceased to draw their pay (Casado Soto, 1988).

The Armada of 1588 was, in fact, a naval force made up of ships from the different European traditions of shipbuilding then in existence, some of them Crown property, others hired by Philip II for the occasion. Furthermore, the function of the fleet was more in the nature of troop transport and the object was to ferry over the Spanish troops from Flanders. The fleet was not, therefore, envisaged primarily as an attacking force. Hence, most of its components were large merchant ships from a sufficiently broad provenance to furnish us with a comparative study of their handling.

Among the 137 ships that sailed from Corunna on 18th July 1588, there were boats built in the three important shipbuilding regions with distinct naval traditions: the Mediterranean, the Cantabrian coast and the North Sea. Only half of them were Spanish and these were not the largest since their tonnage amounted to only 42% of the total. The predominant type was the cargo ship; a total of 75 vessels those that had once had mishaps or were left out for other reasons had been withdrawn. These large cargo vessels were of three types according to their region of origin: *naos* of the Spanish kind, *carracas* from the Mediterranean and *urcas* of English, Flemish or German construction.

Each of these types can be considered the quintessence and most representative of their various shipbuilding traditions. Since each was the most numerically representative of its type, it is possible to make an objective comparison of the behaviour of the different naval building techniques in a given situation.

Nowhere else do we get such comparative circumstances, nowhere else do we find a functional sample of different European types of shipbuilding traditions in maritime conditions which test them all equally.

The ships sailed for a minimum of two months before putting into port. The last six weeks of their voyage saw them buffeted by storms, hurricanes and heavy seas as they went round the British Isles to return to their Spanish bases. The high winds destroyed rigging and sails, splintered masts and blew away spars. The heavy swells opened leaks in the hulls that the sailors at the pumps, despite manning them round the clock, found almost impossible to deal with.

From 21st September onward, the bulk of the *Armada* began to reach ports in Spain. Of the cargo vessels, twenty-one were missing in the numbers and proportions shown in the table below.

Spanish Armada merchant ships built on the Atlantic Spanish seacoast compared to those built in the North Sea and the Mediterranean

MERCHANT SHIPS IN THE ARMADA AND LOSSES

Type of ship	Ships involved		Losses			
	N.º	Tonnage	N.º	%	Tonnage	%
Naos (Cantabrian Seaboard)	25	13,155	4	16	2,649	20
Urcas (North Sea)	27	11,160	11	41	6,212	56
Carracas (Mediterranean)	13	8,893	8	62	5,473	61

It is clear from these figures that the *naos* built on the Cantabria seaboard survived the extreme conditions they encountered much more successfully than ships built in other regions of Europe. Losses were a mere four ships, which in percentage terms equal a third of the North Sea *urcas* and a quarter of the Mediterranean *carracas*. In terms of tonnage losses of Northern Spanish built ships came to merely a third of losses sustained by other types.

In view of these results it is worth reassessing the commonly held opinions of the seaworthiness of Spanish ships at this historical period. In fact, such revised and satisfactory results for the Spanish shipbuilding industry are hardly surprising: a country which, at that time, was the leading country in Europe and whose empire was essentially a maritime one could hardly have achieved its aims with less seaworthy vessels.

APPENDIX II

How iconography can be misleading

This section covers two significant examples of mistaken interpretations of visual representations of ships. Both have their origins in early engravings, one produced at the end of the 15th century and the other in mid 16th century.

In both cases, the consequences of such misinterpretations have been substantial. Both have distorted the understanding of the types of ship most common in the naval expansion of Spain throughout the world's oceans at the beginning of the modern era.

The first error is related to perhaps the most famous of all ships: the *Santa María*, the *nao* that was the flagship of Columbus' expedition to discover the New World. However the mistake also has a bearing on all the Cantabrian *naos* during the Era of Discovery, since this kind of boat belonged to the basic, primordial type which not only explored and entered all the oceans of the planet but also opened up new trade routes and linked together all the world's continents.

The second error concerns the other important type of ship developed by Spain at that time: the galleon.

This was seen as the warship of the time par excellence, the ship that escorted the treasure fleets from the Indies, the ship that ensured that enemy boats could not capture Spanish treasure.

Both errors have in common the fact that the original visual representations that gave rise to them were widely published. Indeed these images were the ones most frequently reproduced and they achieved a wide circulation amongst the discerning public of the time.

The "Oceanica classis" colombina (Figs. 1 to 7)

One of the earliest Latin editions of the well-known "Columbus Epistle" which made known the discovery of the New World throughout Europe, the Basle edition of 1493, incorporated several wood block prints that illustrated the text (Sanz, 1958). One of these prints shows a high-waisted ship included in the cartouche "Oceanica Classis" which for centuries has been used as a realistic representation of the *Santa María nao*.

What follows is a brief summary of the vagaries undergone by the original image from the charts drawn up in the 16th century to the paintings, engravings, tapestries, books and other illustrations that have come down to our time over the past five centuries.

Twenty years after the original illustration of the Columbian Epistle came off the press, Martin de Waldseemüller reproduced a copy of the "Oceanica Classis" in a sheet he produced for the Strasbourg edition of Ptolemy's "Geographia" (Waldseemüller, 1513).

Soon after this, it was used by an unknown artist who painted the altar piece of the Casa de la Contratación in Seville, the centrepiece of which is the much reproduced "Our Lady of Mariners" and a lateral is dedicated to Saint Elmo. The artist used copies of the woodblock in both paintings: one in the centrepiece at the feet of the Virgin and the other in the arms of the Saint (Puente Ojea, 1900; Ruiz del Solar, 1900).

In our own times, the 19th and 20th centuries, the same image has been used on innumerable occasions to illustrate the history of Spain, of America, of the Age of Discovery and in many world histories. It has also figured in paintings, frescoes, drawings and other visual media produced for commemorative purposes. As an example of these last we draw attention to a contemporary tapestry at present in the Alcazar of Seville.

For more than thirty years it has been pointed out that the ship illustrating the Colombian Epistle is not an ocean-going boat, as labelled, but a Mediterranean *carraca* built along Venetian lines. It is, in fact, an exact copy of the ship reproduced in one of Vernhard Von Breydenbach engravings in *Peregrinationes in Terram Sanctam*, published in Maguncia in 1486 which depicts the Venetian enclave of Motona (present day Mothoi), a harbour on the south-west coast of the Peloponnese and a port of call for pilgrims on their way to the Holy Places⁶.

The only difference between the images is that in "Columbus Epistle" it is reproduced facing the wrong way round, a common occurrence in old reproductions of engravings when printed on paper and the image on the new sheet is copied in the original position.

There is not the slightest doubt that the craftsman that illustrated the Epistle drew, like many illustrators at that time and today, on what he had at hand, regardless of the accuracy and obliv-



FIG. 1 – *Chart of Colon*, Basle, 1493.

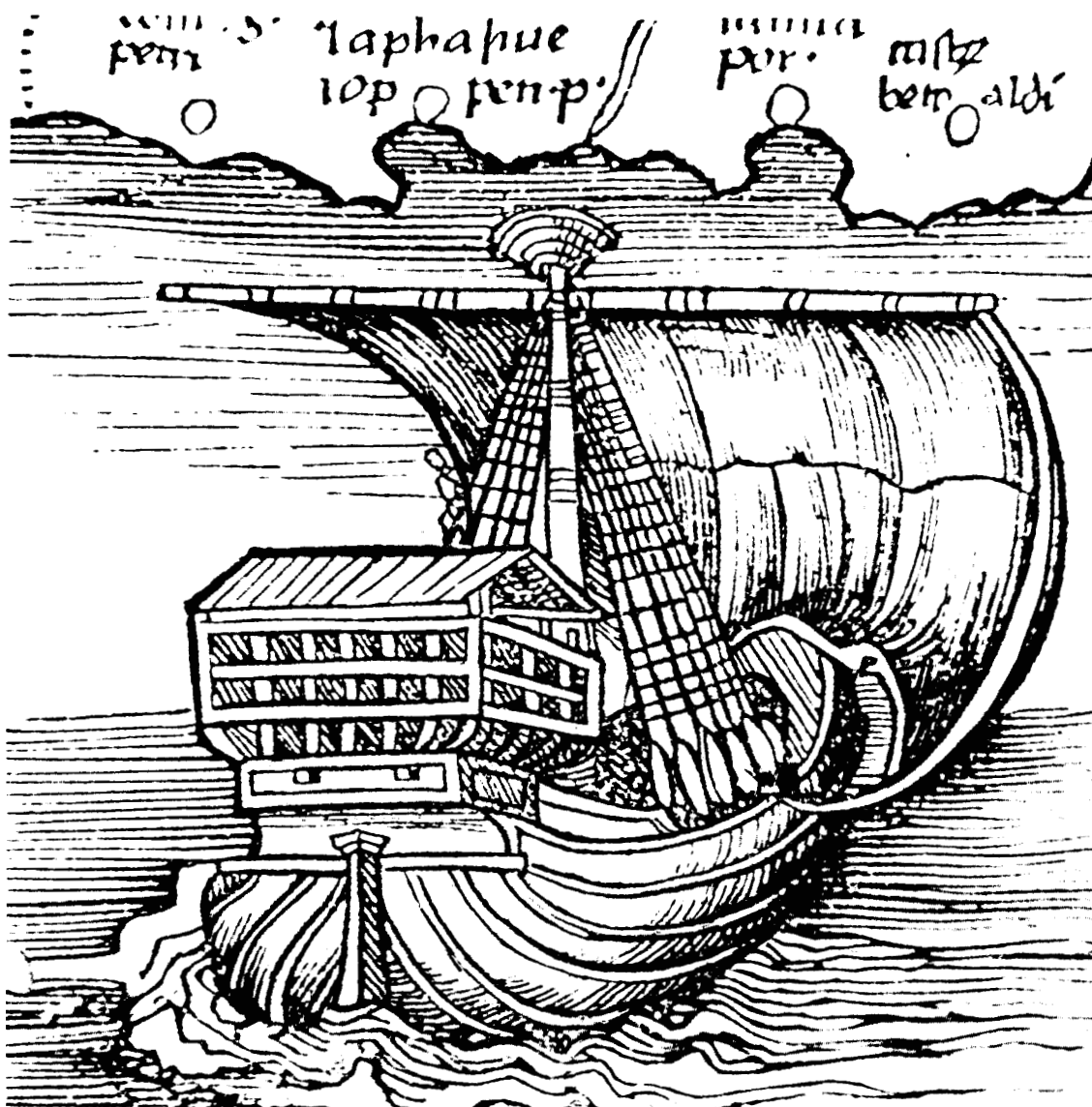


FIG. 2 – Waldseemuler, *Claudius Ptolomaeus Geographia*, Estrasburg, 1513.

ious to the complexity and variety of the different kinds of shipbuilding. Nevertheless, once launched, the false whip was carried forward by inertia and by lack of technical knowledge on the part of the historians and publicists who write on naval matters. Qualified specialists who could have corrected this mistake were absent and the error went on to become a historical reality.

A colourful example of the process outlined above, and a relatively harmless one were it not for the authority given to it by the Spanish State in perpetuating the error, is the coin recently struck by the Spanish Mint. The ship depicted on the obverse side of the 5000-peseta coin of the first series that commemorates the Fifth Century of the Discovery of America and which is labelled the *Santa María* is none other than the impostor of Columbus' Epistle. It is our old friend the Venetian *carraca* from Breydenbach.



FIG. 3 – Picture in the altar-piece from the Casa de la Contratación, Seville.

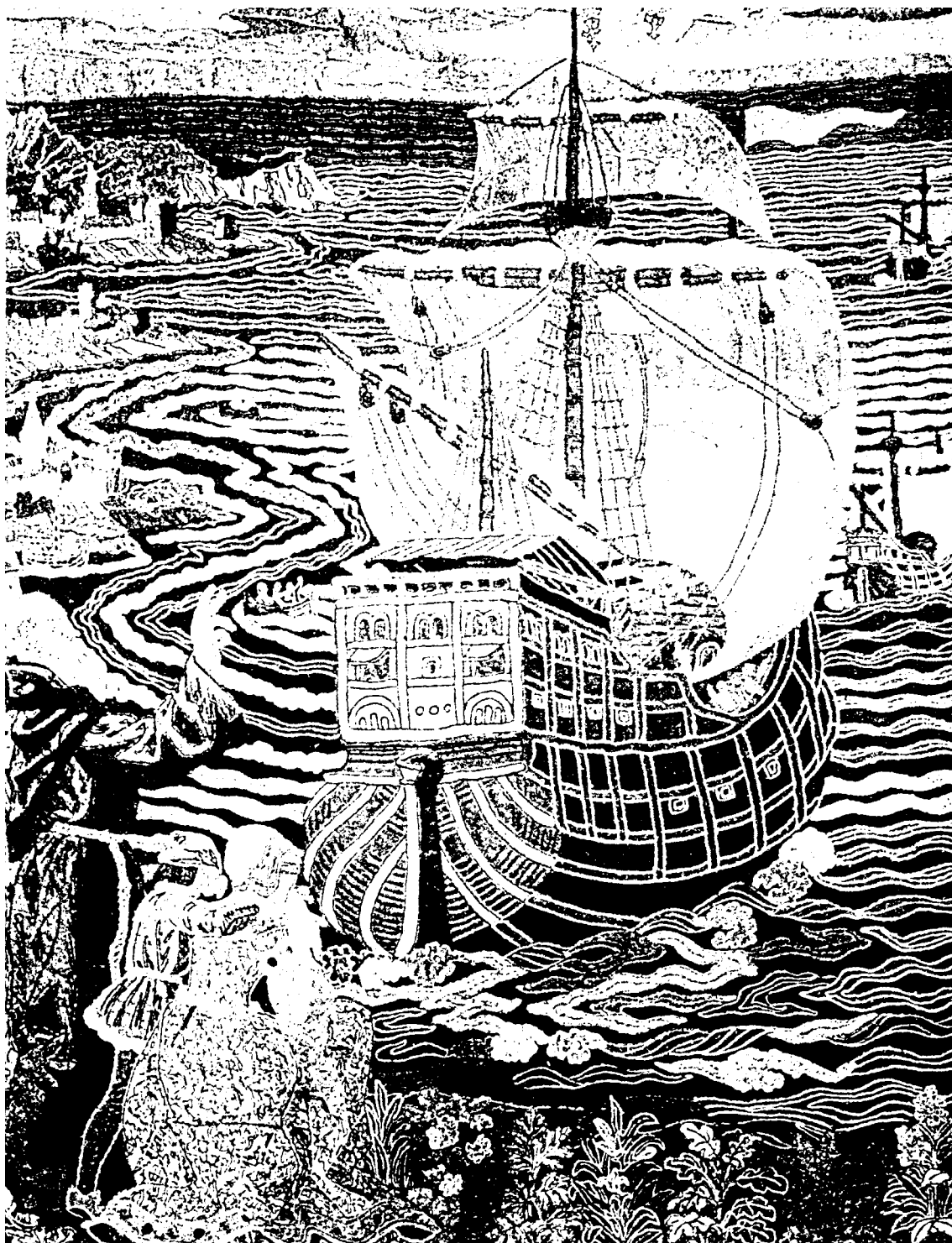


FIG. 4 – Tapestry in the Alcazar of Seville.

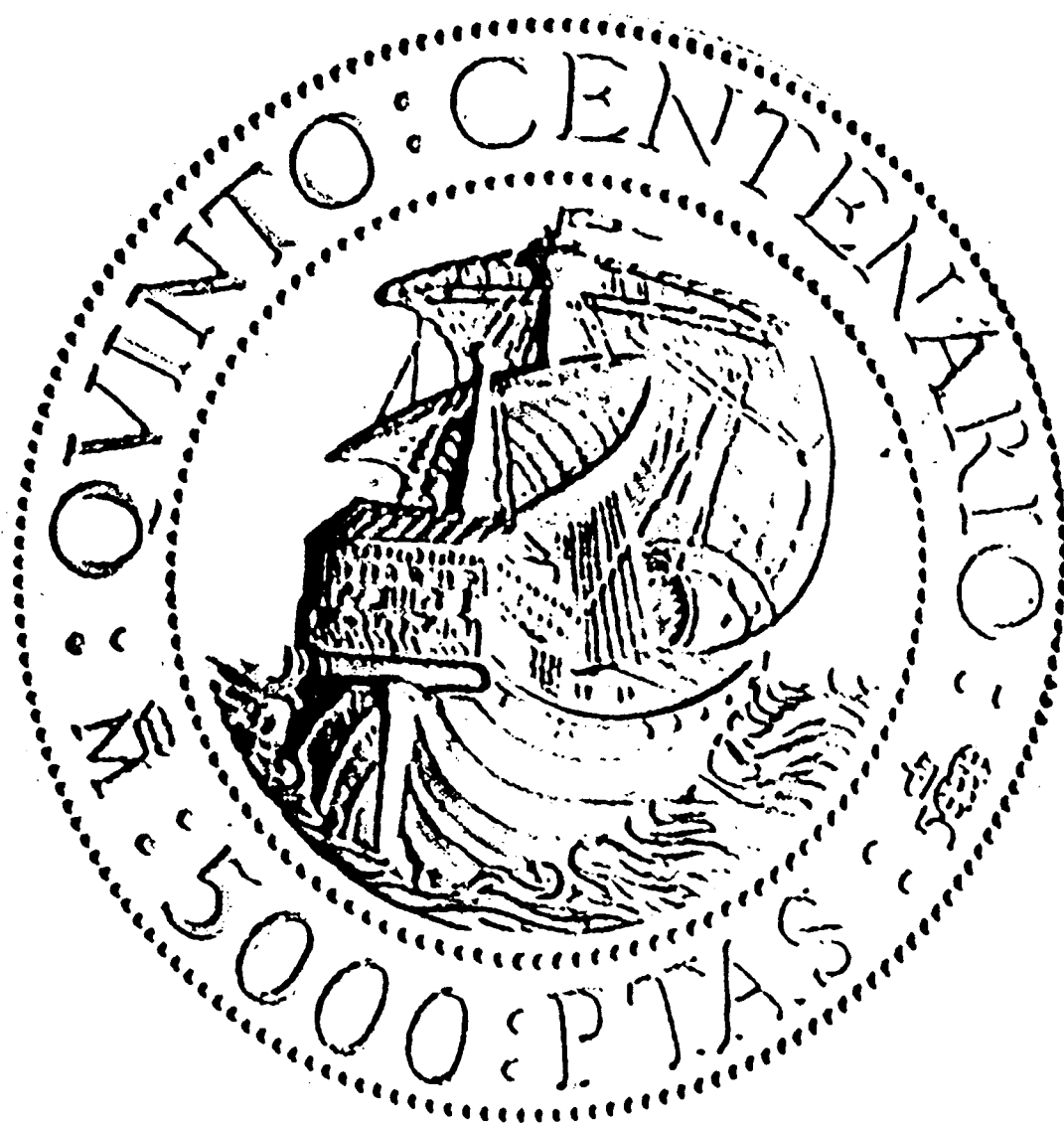


FIG. 5 – Spanish coin to commemorate 1492.

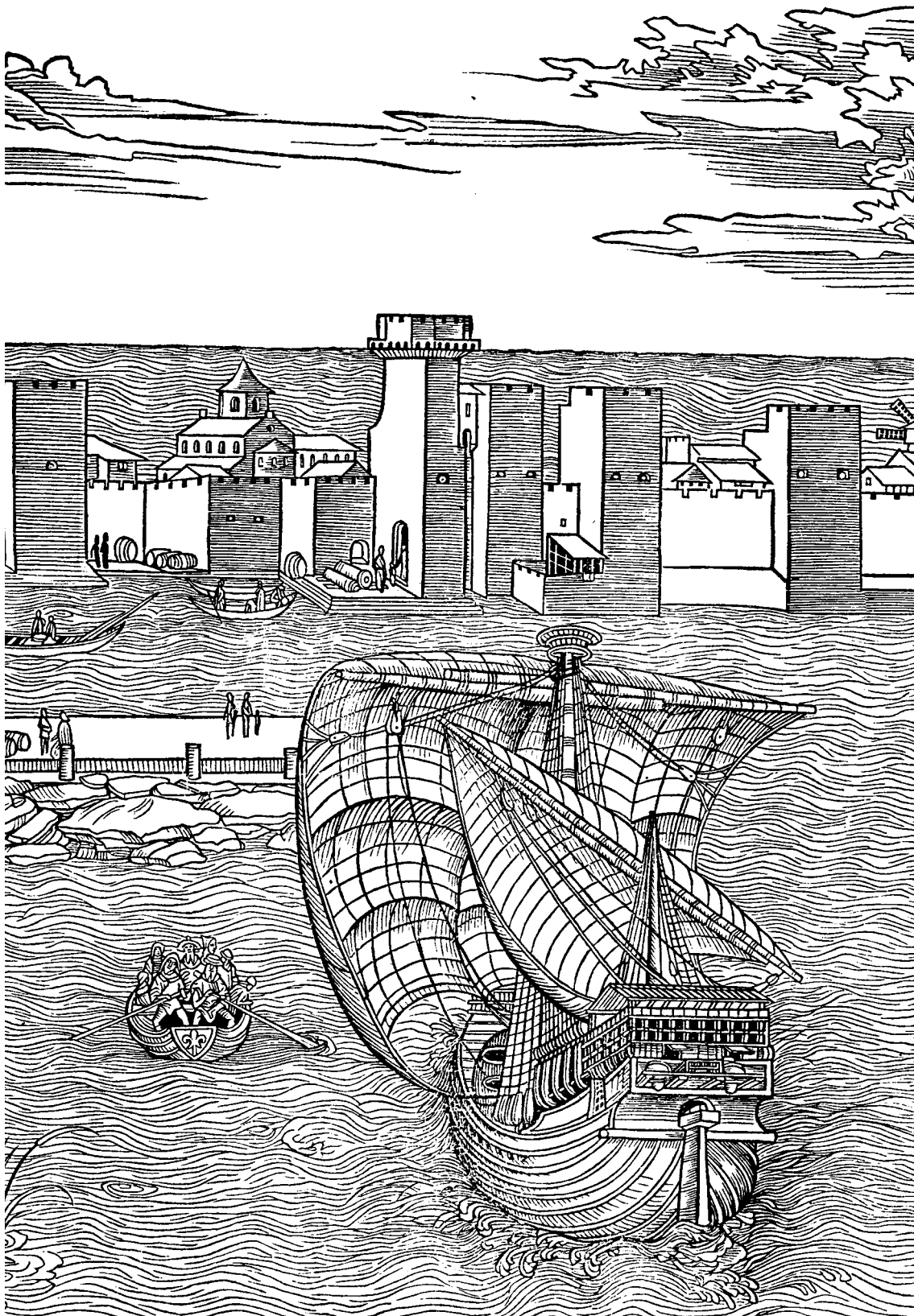


FIG. 6 – View of Mothoi (Greece). Vernhard von Breydenbach, *Peregrinationes in Terram Sanctam*, Mainz, 1486.

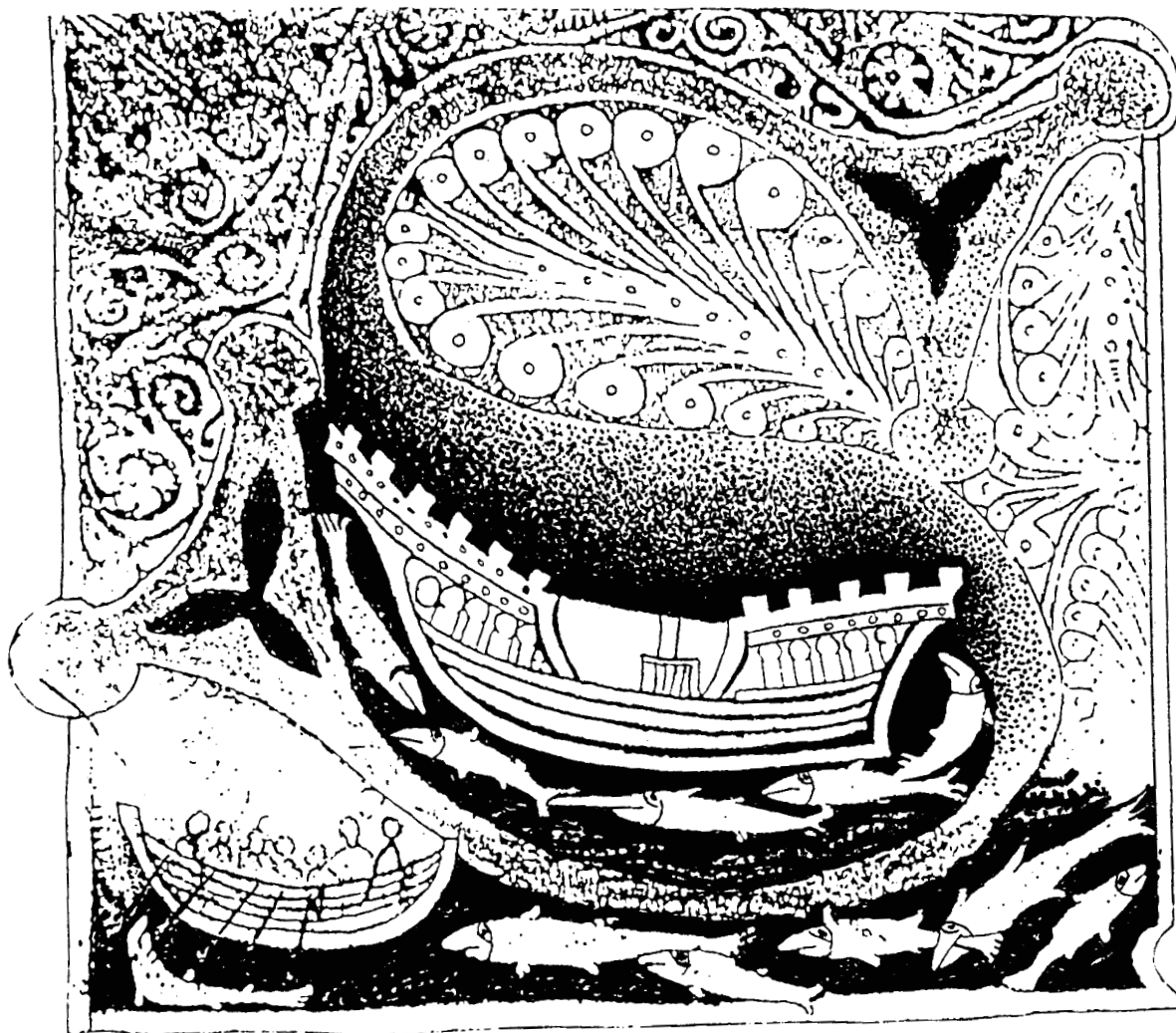


FIG. 7 – Cantabrian Nao. San Vicente de la Barquera, 1478, Museo Marítimo del Cantábrico, Santander.

A series of engravings based on the work of Breughel, the Elder (Figs. 8 to 14)

Exactly the same fate as was suffered by the famous *nao* with which the master and cartographer, Juan de la Cosa, participated in the discovery of the New World, befell that prototype of ocean-going ship: the Spanish galleon of the end of the 16th and beginning of the 17th century.

A substantial number of books edited during the last few decades, both those concerned specifically with naval history and those dealing with history in general, use the ship seen in the foreground in one of the paintings in the Hall of Battles of the Escorial as an archetypal representation of the Spanish galleon of that time⁷.

Nonetheless, the fresco from which this image was taken was painted in 1590 by the Italian artist Nicolas Granello who arrived in Spain on its Levantine coast and was totally ignorant of Atlantic Spain and its particular ships (Zarco Curvas, 1932).

The painting supposedly depicts the Spanish Fleet, which, under the command of Alvaro de Bazán, is completing the conquest of the island of Tercera, thus bringing the Azores under the authority of Philip II in 1583. The particular ship which interests us is in the foreground and

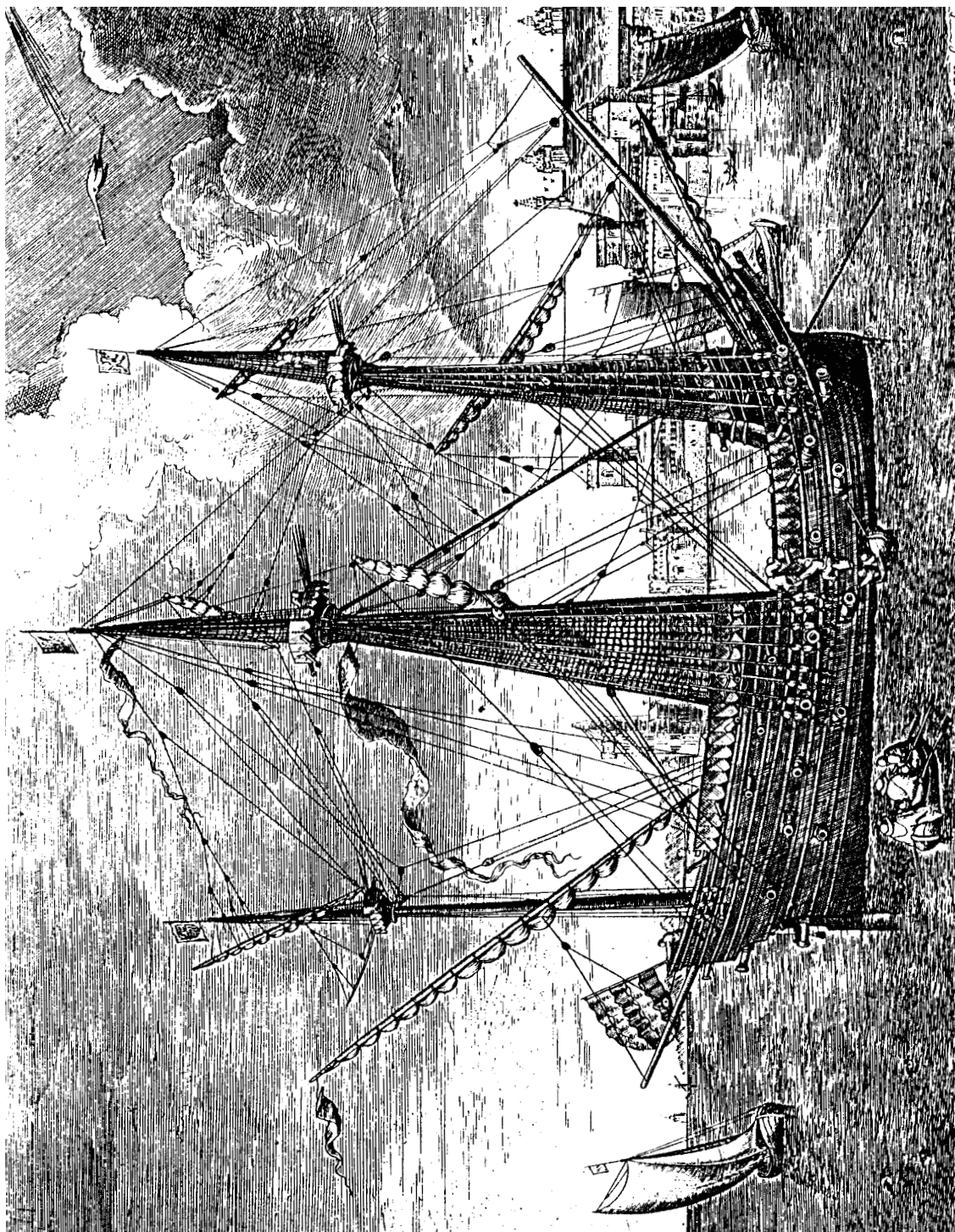


FIG. 8 – Armed “nao”. Franz Huis, from Bruegel, 1550-60.

is larger than the other ships in the fleet to distinguish it as the flagship. It is supposedly the *San Martín* galleon, which was taken from the Portuguese on the capture of Lisbon three years earlier.

In fact, the ship is an almost literal copy of the one that appears in the copper engravings of Frans Huys of 1561 who, in turn, had taken his models from the sketches of Pieter Breughel⁸ (11) who had gathered his material during his visit to Italy between 1551 and 1555.

The differences from the original are minimal: the topmast has been removed from the mizzenmast and the large flag that indicated that the boat was the flagship has been substituted on the stern by the lantern. The Italian artist has stuck so faithfully to his model that even the sailors on the decks and forecastle are the same as those in the copper engraving that preceded the fresco by thirty years.

The painting occupies a fairly narrow space. An entrance door is on the left and a corner is on the right. This forced the painter, since he wanted the ship to appear in the foreground, to foreshorten the boat by a third whilst, at the same time, broadening it disproportionately. The result is a ship that appears virtually round and has an enormously high superstructure. In short, it is a walnut shell with sails which would be hard to sail and almost impossible to manoeuvre. The depiction of the ship has nothing to do with any contemporary Spanish or Portuguese ship. Its origins are false and the manipulations practised on it by the painter distort it even further.

This was not the only occasion when the ships used in the Breughel series of engravings were used for the documentation of maritime scenes and paintings of ships. We have come across many in the century and a half after the publication of the first edition. A sample of some of the most glaring examples will illustrate our point⁹.

Contemporary to the frescoes in the Escorial is the painting of Elizabeth I of England known as the "Armada Portrait" at present in Woburn Abbey and attributed to George Gower. In this painting, on either side of the Queen's head, appear scenes from the Armada. On the left, in the foreground, we see four English ships watching the fire-ships sailing towards the Spanish squadrons. On the right, five or six Spanish ships founder in heavy seas and are dashed against the rocks. Both sets of ships are directly copied from the engravings of the very same series (Strog, 1977, 1987).

The impressive ship that appears in the dalmatic of "St. Vincent", in the beautiful painting by Sánchez Coello "St. Vincent and St. George" (1582) in the monastery of San Lorenzo of the Escorial, is also taken from the same collection, in this case from the engraving entitled "The Fall of Icarus", although, in this particular instance, it is meant to represent the legendary story of the ship that carried the Saint's body to Lisbon (Benito Domenech, 1990).

A series of motifs of different boats from these engravings were regularly used to illustrate the title pages of books on navigation and maritime atlases; for example, they appear in what is considered the first modern hydrographical atlas by Lucas Waghenaeer (1584) both in the original as in the immediately subsequent English edition (Waghenaeer, 1588).

They also appear on the cover of a book of sea charts of the Mediterranean produced by William Barentzoen where they figure in an illustration of the port of Genoa (Barentzoen, 1595) (16); we find again them in the book by Jan Van Linschoten and in its English edition of the Dutch expedition to the Portuguese Indies (Linschoten, 1596).

We close this appendix with a mention of the two-page representation that was published in one of the earliest and most influential treatises on Dutch naval construction by Van Yk (Van Yk, 1697, p. 9) (18). This splendid engraving appeared in 1697 over the title *Carracas y Galeones Españoles* even though all the ships illustrated derive with great accuracy from the same Breughel-Huys series almost one hundred and fifty years after its first apparition. Once again, we are coming up against a complete lack of concern for accuracy both in descriptive terminology

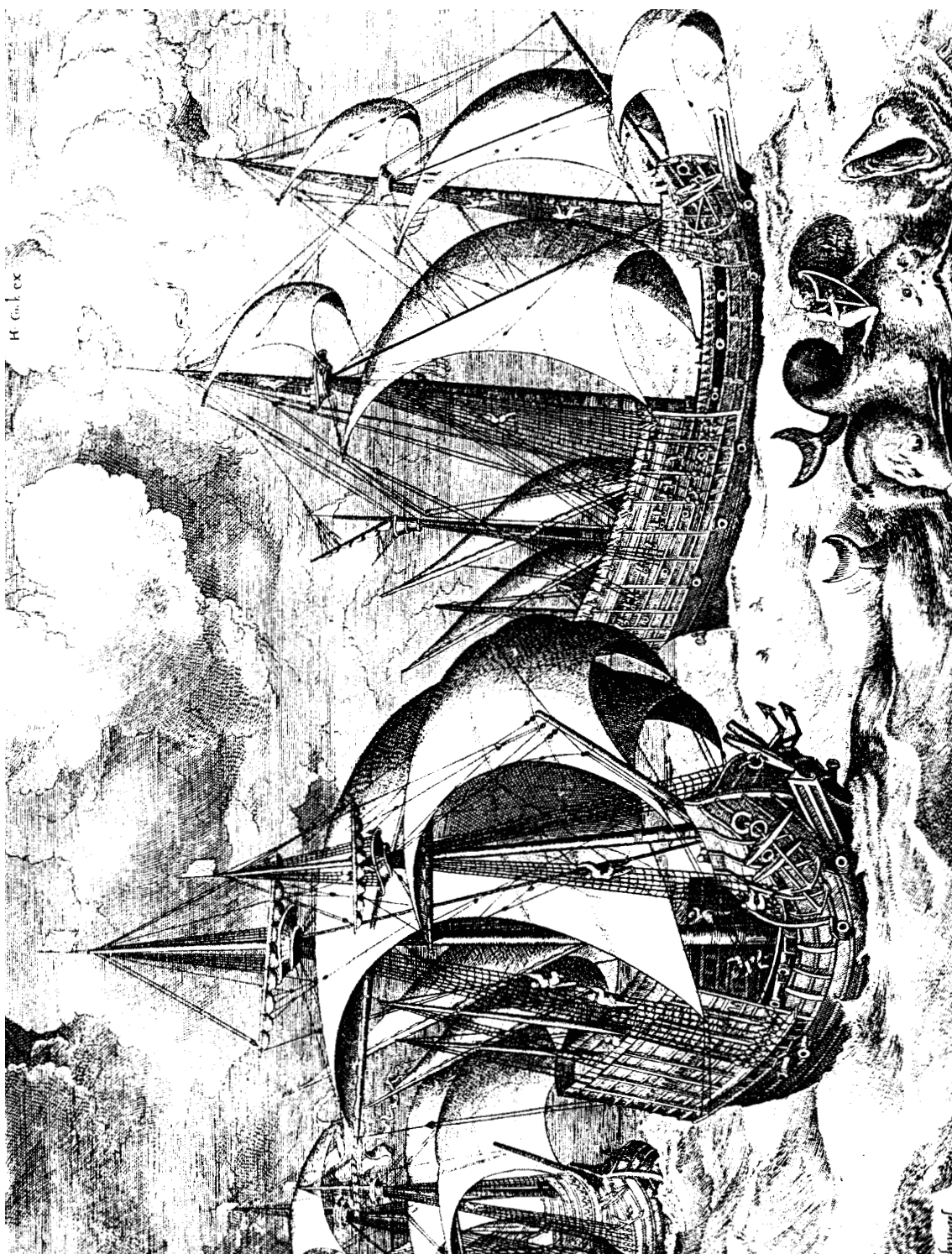


FIG.9 – Franz Huis, from
Bruegel, 1550-60.

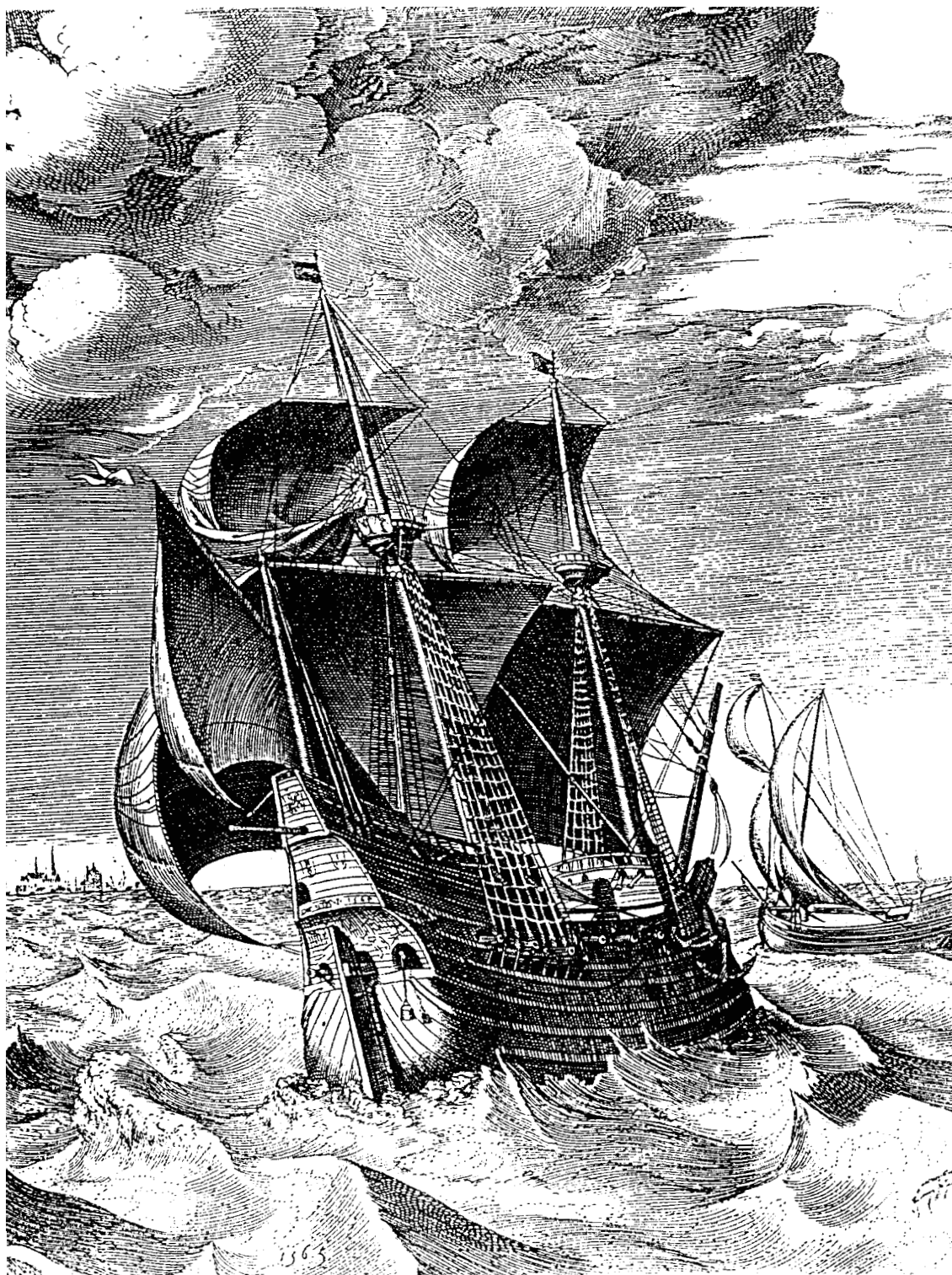


FIG. 10 – Franz Huis, from Bruegel, 1550-60.

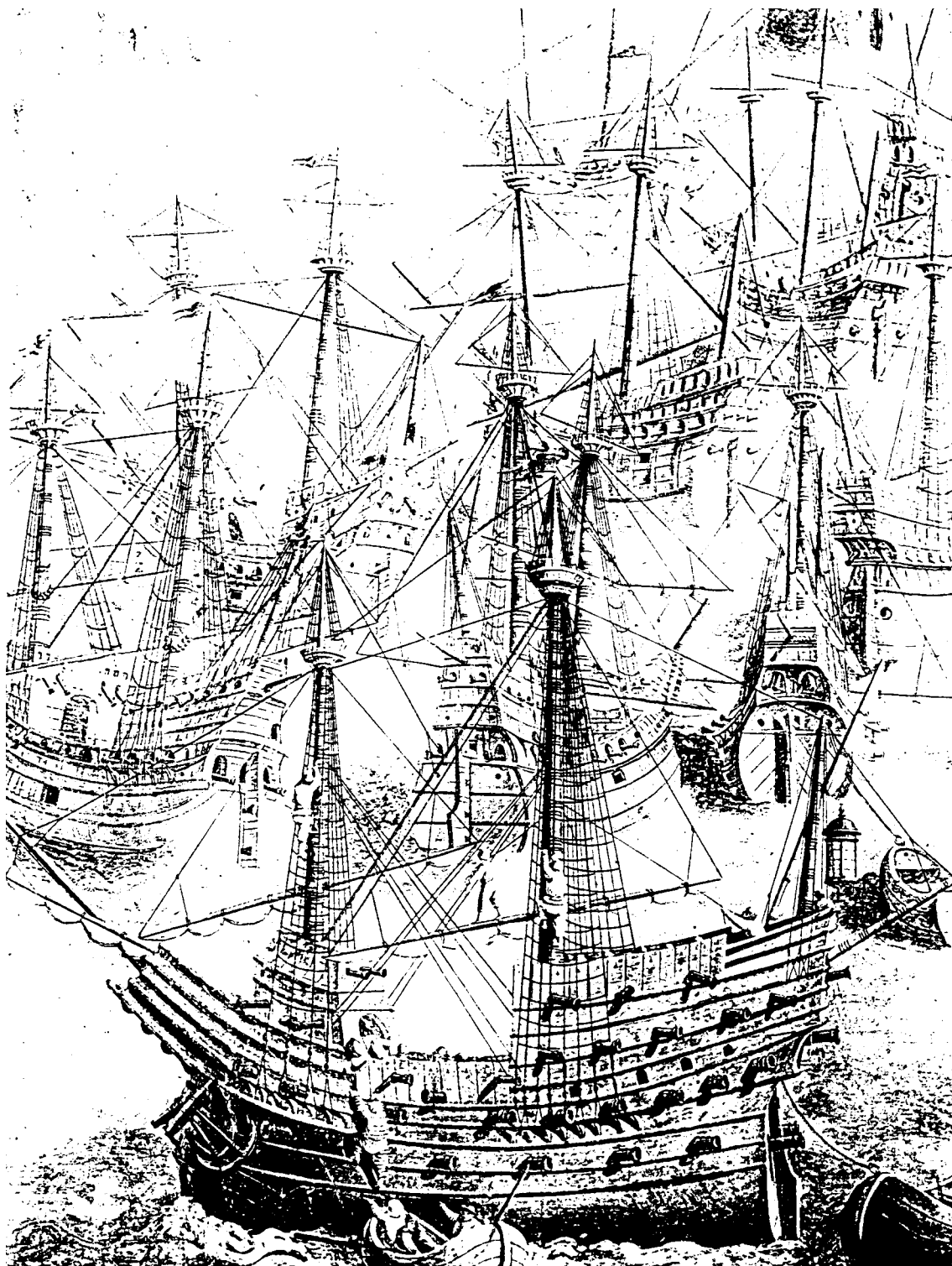


FIG. 11 – Galleon *San Martin*, 1590, *Sala de las Batallas*, San Lorenzo del Escorial, Madrid.



Chez Corneille Nicolas, marchand Libraire, demeurant a Amsterdam, a l'enfeigne du
livre à écrire, l'An M. D. XCVIII.

FIG. 12 – Front page of *Description de la Mer Mediterranée*, W. Barentsz, Amsterdam, 1599.

ITINERARIO. Voyage ofte Schipbaert / van Jan Huygen van Linschoten naer Oost ofte Portugaels In-

dien uithoudende een coyte beschryvinghe der selver Landen ende Zee-custen/ met aen-
wysinge van alle de voornaemste principale Havens/ Rivieren/ hoeken ende plaetsen/ tot noch
toe vande Portugesen ontdeekt ende bekent: Waer by ghevoecht zijn / niet alleen die Conter-
septsels vande habten/ dyahten ende wesen/ so vande Portugesen aldaer residenten/ als vande
de ingeboornen Indianen/ ende huere Tempels/ Afgoden/ Guplinge/ met die voornaemste
Boomen/ Duchten/ Kruiden/ Specerijen/ ende diergelijcke materialen/ als ooc die
manieren des selfden Volckes/ so in hunnen Godes- diensten / als in Politie
en Huys- houdinghe: maer ooc een coyte verhalinge van de Coophan-
delingen/ hoe en waer die ghebieden en ghebonden worden/
met die ghedenckweerdichste geschiedenissen/
voorgheballen den tijt zijnder
residentie aldaer.

Alles beschreven ende by een vergadert, door den selfden, seer nut, oorbair,
ende oock vermakelijcken voor alle curieuse ende Lief-
hebbers van vreemdigheden.



AMSTELREDAM.

By Cornelis Claesz. op't VVater, in't Schryf-boeck, by de oude Brugge.

Anno CIO. IO. XCVL

FIG. 13 – Front page of *Itinerario*, Jan Huygen van Linschoten, 1596.



FIG. 14 – C. van Yk, *De Nederlandsche scheeps-bouw-konst open gesteld*, Amsterdam, 1697.

as well as chronology. This glaring lack of care is made even worse by the fact that the author was a specialist in the subject.

What can we expect of visual representations of maritime and naval matters when the craftsmen involved were more concerned with aesthetic considerations than accuracy? The answer is almost anything. From what we have seen, however, what we cannot rely on is an accurate representation that enables us to establish the technological facts of the past.

For this reason, we must once again stress that we have to have recourse to the appropriate decodifying instruments that will enable us to interpret with accuracy our valuable and indispensable iconographic inheritance. To achieve this it is essential to research and study the evidence furnished us by comparative documentary exegesis and archaeology.

NOTES

- ¹ It does not mean that there was only one manysided type like it is pretended by Barkham, in Cedrelund, 1985, but there was a number of types to cover different functions, see Casado Soto, 1991b.
- ² Especially in Archivo General de Simancas, the sections Guerra Antigua and Estado, and in Archivo General de Indias, sections Patronato, Contratación and Indiferente General.
- ³ We will not go into detail here since Armada ships originated from many different European countries from the Adriatic to the Baltic and findings, so far, have not been sufficiently complete to add significantly to our knowledge of their structure. Stenuit, 1972; Martin, 1975; Fallon, 1978; Flanagan, 1988.
- ⁴ For example the plans of galleons, galizabra and other ships published by Casado Soto, 1988, p. 133, 145, 192, 205, and 222.
- ⁵ In the ambit of the protestant culture the revision start with Mattingly, 1954, and go on with Rodríguez Salgado, 1988.
- ⁶ For example, within our own context, Martínez Hidalgo, 1969, p. 78, where, though he is aware of the origins of the image in the Columbian Epistle, he overlooks the fact that it is a Cantabrian “nao” and does not distinguish between the distinctive features of Mediterranean and Atlantic ships of the time.
- ⁷ To illustrate this point by referring to recent publications, it appears in almost all English books published since 1988 on the Armada. Even the Instituto de Historia y Cultura Naval has reproduced it on the back cover of all eight volumes of the Colección Gran Armada.
- ⁸ Breughel and Huys were commissioned to do the collection of ten engravings dealing with ships by the printer Hieronymus Cock. Their content and nature make it clear that Breughel used sketches and studies he had made during his visit to Italy some years earlier since the ships are of the same Mediterranean type that appear in paintings such as A Naval Battle in the Port of Naples. Until recently Huys sheets were dated 1565 which is the date which appears on some of the engravings but I. de Remaix, 1968, p. 258-293 and 57-58; 1969, p. 23-54, has demonstrated that Huys had died in April 1562, thereby showing that the date of the sheets corresponds to the first edition of the series made by Cock.
- ⁹ Cock printed several editions of the ten engravings until, in 1568, the sheet became the property of the famous printer Theodore Galle, who added his name to them and with which they appear in subsequent editions. In the inventory made on his death (1636) these figure as “the twelve Breughel ships, twelve sheets” and, subsequently, attempts were made to increase the series by adding to it the anonymous sheets vaguely related in subject matter. The best catalogue of Breughel’s work continues to be Bastelaer, 1908, although he thought that the original series consisted of eleven sheets. The other two important authors are Muller, 1863-1882, and Lebeer, 1969, to which can be added the more easily available recompilation of Klein, 1963.

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