1st INTERNATIONAL SYMPOSIUM ON SHIP CONSTRUCTION IN ANTIQUITY

proceedings

edited by Harry Tzalas

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1st INTERNATIONAL SYMPOSIUM
ON
SHIP CONSTRUCTION IN ANTIQUITY
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PROCEEDINGS

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Wilke, Gerard and Wilke, Maria, both participated at the Symposium and took part at the discussions although limited time did not permit the preparation of a presentation.

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N.B. You will note differences between some titles in the programme and the titles on the printed paper. This is due to the fact that some authors modified the title of the final paper.
ORGANIZING COMMITTEE

President: Harry E. Tzalas,
President of the Hellenic Institute for the Preservation of Nautical Tradition.

Vice-President: Nicos Tsouhlos,
President of the Hellenic Institute of Marine Archaeology.

General Secretary: Captain Anastassios Tzamtzis,
General Secretary of the Hellenic Maritime Museum.

Treasurer: Stelios Kokkios

Members: Charalambos Kritzas,
Curator of Antiquities.

Dr. Yannis Vichos,
General Secretary of the Hellenic Institute of Marine Archaeology.

Yannis Pantzopoulos,
General Secretary of the Hellenic Institute for the Preservation of Nautical Tradition.

Secretary: Maria Helioti.

General Coordinator of the “Athens, Cultural Capital of Europe 1985” events:
Spyros Mercuris, Special Advisor to the Ministry of Culture and Sciences.

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PROGRAMME


9.00 Address by the President of the Organizing Committee of the Symposium Mr. Harry Tzalas.
Inaugural address by Mr. Spyros Mercuris on behalf of the Minister of Culture and Sciences Mrs. Melina Mercuri.

Morning Session

EXPERIMENTAL ARCHAEOLOGY, SHIP EQUIPMENT AND FITTINGS
Chairman, Mr. Harry E. Tzalas

9.45 Prof. Richard Steffy
"The use of three-dimensional research in the Kyrenia ship reconstruction"

10.15 Coffee Break

10.30 Prof. Michael Katzev
"Kyrena II: Building a Replica of an Ancient Greek Merchantman" (Part A)

11.00 Mrs. Susan Katzev
"Kyrena II: Building a Replica of an Ancient Greek Merchantman" (Part B)

11.30 Mr. Federico Foerster Laures
"The problem of the bilge and the pump in antiquity"

12.00-12.30 Discussion

Afternoon Session

THE ATHENIAN TRIERES AND OTHER FIGHTING SHIPS
Chairman, Mr. Lucien Basch

16.00 Prof. John Morrison
"The trieres replica; value and authenticity: the nature of the evidence"
16.30 Mr. John Coates
"The trieres, its design and construction"

17.00 Prof. Ing. Antonio Servello
"Hellenic trieres and barbarian trieres at Salamis: Technical information"

17.30 Prof. François Salviat
"Le Bateau de Thésée, le vase François et les Triacontoroi"

18.00-18.30 Discussion


Morning Session

SHIP CONSTRUCTION IN ANTIQUITY
Chairman, Captain Anastassios Tzamtzis

9.45 Mr. Peter Marsden
"Ships of the Roman period in central and Northern Europe"

10.15 Dr. Marco Bonino
"Notes on the architecture of some Roman ships: Nemi and Fiumicino"

10.45 Coffee Break

11.00 Prof. Peter Throckmorton
"The shipwreck of Torre Sgarrata"

11.30 Mr. Jean Marie Gassend
"La construction navale antique de type alterné; exemple d'un mode de construction".

12.00 Dr. Yannis Vichos
"La construction navale à Psara avant la fin du XVIIIe siècle d'après un texte de Nicodemos: Un exemple de type de construction alternée?"

12.30-13.00 Discussion
Afternoon Session

SHIP CONSTRUCTION IN ANTIQUITY (CONTINUED)
Chairman, Prof. Michael Katzev

16.00 Dr. Marie-Pierre Jezegou

16.30 Prof. Vassilis Christides
“Shipbuilding in the Mediterranean and the Red Sea: A study in comparative naval construction”.

RITUALS RELATED TO THE ANCIENT SHIP

17.00 Miss Honor Frost
“Ancient warship anchors; an inquiry”

17.30 Mr. Charalambos Kritzas
“Remarks on an inscribed anchor-stock from Aegina”

18.00 Mr. Gerhard Kapitän
“Archaeological evidence from rituals and usages on ancient ships”

18.30-19.00 Discussion


Morning Session

SHIPS OF THE BRONZE AGE AEGEAN
Chairman, Miss Honor Frost

9.45 Prof. Thomas C. Gillmer
“Theories on ship configuration in the Bronze Age Aegean”

10.15 Miss Hellen Palaiologou
“Aegean ships from the 2nd Millenium B.C.”

10.45 Coffee Break
11.00 Captain Anastassios Tzamtzis
"Ikria on Minoan seals"

11.30 Dr. George Bass
"The Bronze Age shipwreck at Ulu Burun, near Kas"

12.00 Prof. George Korres
"Representation of a Late Mycenean ship on the Pyxis from Tragana, Pylos"

12.00-12.30 Discussion

Afternoon Session

ICONOGRAPHY OF ANCIENT SHIPS
Chairman, Prof. John Morrison

16.00 Mr. Lucien Basch
"Les graffiti de Délos"

16.30 Dr. Christos Boulotis
"La Déesse minoennes au rame-gouvernail: contribution à l'iconographie maritime égénne"

17.00 Prof. Hector Williams
"Figureheads on Greek and Roman ships"

17.30-18.00 Discussion

18.00-19.00 GENERAL DISCUSSION
Chairman, Mr. Harry Tzalas
Ladies and gentlemen,

On behalf of the Minister of Culture and Sciences and in my capacity as the coordinator of Cultural and Scientific events for "Athens the Cultural Capital of Europe for 1985" I have the pleasure of attending this inaugural session of the first International Symposium on "Ship Construction in Antiquity".

It is regretful that Mrs. Melina Mercuris who had accepted with enthusiasm the proposal made by Mr. Harry Tzalas for the organization of this encounter, cannot be among us today. An unexpected commitment obliges the Minister to be in Venice.

Since the dawn of history Greece has been very closely "tied" to the sea. We as a Nation owe so much to the Ancient Shipwrights and to the Ancient Mariners. Without their skill in building good ships and their ability in sailing, Greece would not be what she is. We are aware that an important part of our heritage lies in the Mediterranean Sea. We want to learn as much as possible about how ships were built and how ships sailed in ancient times.

There could be no more appropriate place for your first encounter than Piraeus; the Piraeus of Themistokles with the ancient ports of Zea, Munichia, Kantharos; Piraeus with its Trieres but also with its merchant ships trading and communicating throughout the boundaries of the known world.

I welcome you under the sign of Posseidon protector of Maritime activities and of Xenios Zeus patron-god of hospitality. May your meeting be fruitful and your stay in Greece pleasant. With these thoughts and wishes, I now declare the Symposium open.

Spyros Mercuris
Ladies and gentlemen,

It is a privilege and a pleasure to welcome you, on behalf of the Organizing Committee, to the 1st International Symposium on “Ship Construction in Antiquity”.

I would like to thank you all for your presence, and in particular the participants who will present papers.

We feel greatly honored that so many distinguished scientists and scholars from Greece, other European countries, the United States and Canada have accepted our invitation.

The selection of this location was intentional. We had to choose among several large conference-halls. The Ceres building amphitheater was selected, mainly, for two reasons: we wanted to obtain the intimate, warm and friendly atmosphere that a small but well designed space can create, secondly we wanted to be near -within walking distance- from the great and, I dare say, unique exhibition “Greece and the Sea”.

Marine Archaeology is a relatively new discipline and the number of its experts worldwide, is limited. Practically nothing was known at the beginning of this century about the way ships were built in antiquity. It is only after the discovery of the Antekythera ship-wreck that a different method of construction — that later became to be known “as the shell first” — was suspected.

Marine Archaeology has come a long way since then. Great progress in the understanding of how ancient ships were built was made during the last three decades. There is much more to learn for many more decades to come. In this room I can count —with pride— several of the pioneers in Marine Archaeology and at the same time many enthusiasts of the new generation who represent the future. We believe that encounters like the one that is about to start may prove useful and we would like to put forward a proposition — it can be debated at the closing session—: Can we hold such meetings every year or every second year on a permanent basis? Can we form an International Committee to prepare such meetings?

Before asking Mr. Spyros Mercouris, the representative of the Minister of Culture and Sciences, to inaugurate this Symposium, I would like to thank all those who have made it possible. I will start by thanking Mrs. Melina Mercouris the Minister of Culture and Sciences who has not only accepted to finance this organization but has also incorporated the event in the programme of “Athens, Cultural Capital of Europe 1985”.

I must also thank my colleagues on the Organizing Committee, as well as the Hellenic Institute for the Preservation of Nautical Tradition, the Hellenic Institute for Marine Archaeology and the Hellenic Maritime Museum for their help.

Last, but not least, I have to warmly thank Mr. George Livanos who has placed this amphitheater at our disposal and has generously provided all the necessary arrangements.

Harry E. Tzalas
LES GRAFFITI DE DELOS

Les murs intérieurs des maisons déliennes étaient généralement couverts d'une couche de stuc.

Ces stucs ont été retrouvés en de nombreux endroits portant des graffitis très divers: animaux, alphabets, etc. Il est frappant cependant de constater que le thème favori des auteurs, forcément nombreux, de ces graffitis était le navire.

Il est regrettable que la valeur documentaire de ces dessins incisés dans le stuc n’ait pas été immédiatement appréciée: si les artistes (peintres, sculpteurs, mosaïstes) n’étaient pas toujours compétents lorsqu’ils choisissaient de représenter un navire, les auteurs de graffitis, s’ils n’étaient pas toujours des dessinateurs doués, étaient des marins et connaissaient, par conséquent, parfaitement leur sujet. Par ailleurs, alors que le motif naval favori des artistes antiques était presque toujours le navire de guerre—le plus prestigieux—à Délos tous les types de navires sont représentés, de la pirogue à la trière, en passant par diverses variétés de navires marchands. Hélas, les stucs de Délos sont actuellement en grand danger de disparition totale.

Les archéologues navals ne seront jamais assez reconnaissants envers la mémoire du Commandant Carlini, attaché naval à Athènes vers 1928-1930, qui a exécuté de minutieux relevés de tous les graffitis de navires existant à l’époque: presque tous ont été détruits depuis son exploration et ceux qui subsistent sont terriblement dégradés. Le Commandant Carlini n’en a publié que trois, provenant tous de la maison du Dionysos, ses autres dessins étant demeurés inédits jusqu’ici. Il est probable que certains graffitis découverts au cours des fouilles de l’Ecole française, qui ont débuté en 1873, avaient déjà péri avant l’arrivée du commandant Carlini, notamment dans le quartier du Stade.

Après la seconde guerre mondiale, les fouilles du quartier de Skardana et celles de la Maison des Stucs ont fait apparaître de nouveaux graffitis, dont la plupart ont aussi disparu avec les stucs dans lesquels ils avaient été gravés. J'ai pu les photographier à plusieurs reprises depuis 1963 et mes relevés, ajoutés à ceux du Commandant Carlini, forment un ensemble de 75 images de navires ou de parties de navires, images qu'il serait trop long d’analyser ici. Parmi les questions que posent ces graffitis, il y a celles de leur date, de l’identité de leurs auteurs et des motivations de ceux-ci. Voici quelques éléments de réponse.
1. Des graffitis de navires ont été trouvés dans tous les secteurs de fouilles de maisons déliennes, ils sont évidemment l’oeuvre d’auteurs nombreux et différents.

2. Leur taille varie de 7 ou 8 cm à 2 cm de long et leur hauteur au-dessus du sol, de 4 cm à plus de 2 m.

3. Ces graffitis, qui endommageaient des stucs soigneusement posés et lissés n’ont pu être incisés qu’en l’absence des légitimes propriétaires des maisons. Ils supposent donc un abandon de ces habitations. Or Délos a subi deux invasions, la première en 88 av. J.C., par Mithridate, dont l’île se relevait partiellement lorsqu’elle subit, en 69, la seconde, celle des pirates d’Athenodoros, qui précipita la fin définitive de la prospérité. Les traces de reconstruction d’une maison de l’‘îlot des Bijoux’ endommagée en 88, démontrent que certains graffitis sont postérieurs à cette date et antérieurs à 69; nous avons là un terminus post quem.

4. L’abondance des graffitis de navires à Délos est peut-être moins surprenante qu’il n’y paraît à première vue. La maîtrise de l’île d’Apollon était, symboliquement, d’une importance capitale pour qui voulait exercer une thalassocratie en mer Égée, au moins depuis Polycrate de Samos et jusqu’à Antigonos Gonatas. Ceci correspond au grand nombre d’offrandes votives de nature maritime faites au sanctuaire d’Apollon et qui nous sont connues par les textes: ex-voto sous forme d’ancres, de gouvernails, d’éperons et même d’une trière toute entière, abritée dans un monument actuellement désigné comme le ‘Monument des Taureaux’, mais qui est appelé dans les inventaires antiques de l’île: ‘Neorion’2.

Il me semble que c’est dans l’ambiance si caractéristique des offrandes à l’Apollon Délien qu’il faut voir les graffitis de navires. S’il n’était pas donné à chacun d’offrir en ex-voto une trière, du moins était-il facile, grâce aux stucs, d’offrir un graffito votif. On sait que du Moyen Âge jusqu’au 19e siècle d’innombrables images de navires furent incisées dans des fresques d’églises grecques en guise d’ex-voto (tamata). Les instruments servant à pratiquer ces incisions étaient souvent une simple pointe de métal: il était plus simple de tracer des lignes dans la surface tendre de la fresque que dans celle de la pierre des murs extérieurs. Ainsi, par exemple, il existe encore plusieurs graffitis incisés dans les fresques d’une petite église à Ligourio, près d’Épidaure, alors que ses murs extérieurs n’en portent aucun.

On peut objecter à cette façon de voir qu’à Délos les graffitis sont tracés dans des lieux profanes, au contraire des graffitis chrétiens. On ne peut toutefois perdre de vue qu’à Délos des offrandes ‘maritimes’ pouvaient être agréées en dehors du temenos d’Apollon: la déesse locale Brizo, n’acceptait les offrandes que si elles étaient faites dans des vases en forme de barque, or son sanctuaire se trouvait sûrement en dehors du temenos.
L'hypothèse du graffito-ex-voto me paraît être celle qui justifie le mieux, dans l'état actuel de nos connaissances, l'extraordinaire profusion de graffiti de navires à Délos.

Ceci n'est, je le répète, qu'une hypothèse. Ce qui, en revanche, ne relève pas de l'hypothèse, est l'intérêt documentaire de la plupart des graffiti, même si les dons artistiques des auteurs de ces derniers étaient souvent inférieurs à leurs ambitions. Je ne citerai ici que quelques exemples.

Navires de Guerre

No 1. Quartier du Théâtre (fig. 1).
No 2. Maison à une colonne (fig. 2).
No 3. Maison aux Stucs (fig. 3).

Les trois navires ont plusieurs traits en commun. Le premier, qu'ils partagent avec l'écrasante majorité des graffiti, est d'être représentés en entier, jusqu'à la quille, et non jusqu'à la ligne de flottaison. Cette particularité est caractéristique de la volonté des marins, désireux de reproduire le navire, tel qu'ils le connaissaient; sur les fresques de Pompéi et d'Herculaneum, à peu près contemporaines, oeuvres d'artistes et non de marins, les navires sont toujours montrés jusqu'à la flottaison seulement (sauf lorsqu'il s'agit de montrer des navires au sec, dans les navalia). Un second point commun, fort important, est que tous trois ont un éperon se terminant par une pointe unique. D'après une opinion émise par H. Seyrig, qui se fondait sur l'examen de séries monétaires, l'éperon à pointe unique, qui aurait remplacé l'éperon "classique" à trois branches, tel celui qui fut retrouvé à Athlít (Israël), daterait de l'époque de Néron; les derniers éperons à trois branches apparaissent sur des monnaies d'Auguste. Or les graffiti de Délos sont, très vraisemblablement, de peu antérieurs au règne d'Auguste: les éperons à trois branches coexistaient donc, à la fin de l'époque hellénistique —au plus tard—, avec l'éperon à trois branches. L'iconographie rejoint ici l'archéologie, puisque le navire punique découvert par Honor Frost à Marsala (3e s. av. J.-C.) était déjà doté d'un tel éperon.

L'opinion de H. Seyrig n'était cependant pas entièrement mal fondée: les monnaies impériales représentent toujours le grand bâtiment de ligne, et non les unités légères. Ce qui s'est produit entre la fin du règne d'Auguste et celui de Néron est la généralisation de l'éperon à pointe unique et l'élimination probablement complète de l'éperon à trois branches. On observe que le navire no 2 était sûrement (et, à mon avis, les deux autres probablement aussi) un bâtiment léger. Une telle image est infiniment précieuse, car elle démontre de manière frappante que la guerre navale n'était pas seulement l'œuvre de trirèmes ou de quinquérèmes; on le sait par des textes, trop souvent négligés, mais l'iconographie "officielle" a négligé totalement ce type de navires, auquel appartient d'ailleurs aussi, très probablement, le navire punique de Marsala.

Si le navire no 1 conserve un aphlaston à plusieurs branches, il n'en va pas de même des deux autres: on voit que cet ornement n'était pas toujours en usage, ce
qui, à nouveau, contredit l'iconographie “officielle” et rend une image bien plus proche de la réalité.

Le navire no 3 présente un double intérêt: son éperon, dont l'extrémité est tranchée verticalement, est absolument identique à celui du modèle réduit en terre cuite du Musée de Sparte, trouvé sous l'eau au large de Gythion, et que l'on peut dater de la fin du 1er s. av. J.-C. ou du début du 1er s. ap. J.-C.5 A cet égard, le graffito et le modèle, pratiquement contemporains, se complètent parfaitement. L'autre point intéressant est la position des gouvernails: alors que celui de tribord est abaissé, donc en fonction, celui de babord est relevé à l'horizontale, ce qui démontre clairement, d'une part, qu'un navire antique pouvait naviguer avec un seul gouvernail latéral et, d'autre part, que ce gouvernail pouvait subir une rotation de 90° dans le sens parallèle à l'axe du navire.

Enfin, alors que l'iconographie en général (et en particulier les fig. 1 et 2 montre que la quille forme, vers la poupe, une courbe longue et continue, la fig. 3 démontre qu'une jonction anguleuse des fonds de la poupe pouvait également exister sur un navire de guerre; ici encore, l'iconographie rejoint l'archéologie, puisque tel est aussi le cas du navire de Marsala).

**Navires de commerce**

Les graffitis qui les représentent à Délos sont — ou plutôt: étaient — très nombreux. Je n'en présenterai ici que deux, l'un provenant de l'llot des Bijoux (fig. 4), l'autre de la Maison aux Frontons (Fig. 5). Le premier, bien que très schématique, n'en représente pas moins une coque arquée très élégante, alors que le second est plus détaillé. Il est très curieux que les rames-gouvernails soient absentes de ces deux documents, alors qu'elles étaient indispensables. Il est, par ailleurs, remarquable que, dans les deux cas, le mât ait été prolongé jusqu'à la quille: c'est sûrement en cet endroit qu'il aboutissait dans une emplanture, mais cette jonction était évidemment invisible au dehors; si le dessinateur l'a néanmoins représentée, c'est parce qu'à ses yeux, elle était essentielle.

Il est assez difficile de se prononcer avec certitude sur la question “proue-poupe” de la fig. 5. Si l'on considère que le gréement, on verrait volontiers la proue à gauche. Cependant, je verrais plutôt une étrave dans la structure complexe de l'extrémité droite. Ce document, en dépit des problèmes qu'il pose, est le type même du graffito qu'il faut absolument conserver: le fait que son auteur ait pris la peine d'indiquer à la fois les bordages (lignes horizontales) et les couples (lignes verticales), comme si l'ensemble était vu aux rayons X, ne permet pas de prendre les autres caractéristiques à la légère, même si notre ignorance actuelle ne permet pas d'en comprendre toutes les obscurités.

Notes

3. Fresque no 8604 du Museo Nazionale de Naples (L. Basch, "Roman triremes and the outriggerless Phoenician trireme", The Mariner's Mirror, 65, 1979, p. 293, fig. 5); la fresque no 8606, du même Musée, est à peu près identique.

Fig. 1: dessin du Commandant Carlini; fig. 2, 3, 5: dessins de l'auteur; fig. 4: dessin d'Isabelle De Decker.

Lucien Basch
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1050 Bruxelles
THE CONSTRUCTION OF A SEAGOING VESSEL OF THE LATE BRONZE AGE

The excavation of a Late Bronze Age shipwreck at Ulu Burun, near Kas, Turkey (fig. 1), has extended our knowledge of the construction of seagoing vessels by nearly a millennium. Because of the slow and methodical pace of the excavation, however, what we have actually learned of the ship's hull during three summers and over 5,000 dives can be summarized in a single paragraph:

The garboard is attached to the keel and to the second strake by mortise-and-tenon joints secured with wooden pegs, ca. 2.2 cm. in diameter (fig. 2), driven through the top and bottom of each joint. One mortise may be ca. 7 cm. wide and 17 cm. deep, and the center-to-center distance between pegs in adjacent tenons is ca. 21 cm. (fig. 3). The keel is 27.5 wide (or sided), and planking thickness is approximately 6 cm.

In other words, in the 14th century B.C. at least one ship was built much like the Kyrenia ship was built in the 4th century B.C. Beyond that we can say only that the keel and, probably, the strakes are of fir (Abies sp.), the tenons are of a species of oak (Quercus sp.), and the pegs are of oak or some other hardwood.

This much was revealed in 1984 when one of the stone anchors on the wreck was raised, exposing a small patch of hull partly covered with ballast stones (fig. 4). As soon as this area was drawn and photographed, it was covered again with sand for protection. Since then an effort has been made to avoid exposing more fragile wood before tons of cargo have been removed from above it.

Nevertheless, we may speculate on the nature of the ship, and what we will learn from it. The distribution of cargo between 44 and 51 m. deep (fig. 5) suggests a length of perhaps 15 to 18 m., although how much slippage of cargo has occurred on the steep slope, and how much cargo may still be buried, remain unknown, making our estimate most tentative. At this time we do not even know which end of the wreck represents the bow and which the stern, although a pair of large stone anchors at the deeper (eastern) limit of the site, not visible when fig. 5 was made, suggest that it is the bow.

Twelve anchors have been uncovered. A row of eight, originally stacked in pairs, ran athwartships between stacked rows of copper ingots which comprised the bulk of the cargo (figs. 6 and 7); one of these anchors, not on the plan, seems to have slipped down the slope on the northern edge of the site. Besides the two at the "bow", mentioned above, are two other anchors, not far from them, the lowermost visible in fig. 5. The anchors are of the general type found built into walls and floors at Ras Shamra (Ugarit) and Byblos in the Near East, and Kition on Cyprus. Although some have also been found under water, as off Cyprus and in the harbor at 'Tel Dor, this is the first time such anchors have been directly associated with a ship. Those on the wreck appear to be of three sizes, and of ten documented so far, six are large, three medium, and one small. The smallest (fig. 4) could hardly have been a ship's anchor, and may have been a hawser weight or
an anchor for a ship's boat; it resembles an anchor from Kommos on Crete. The one anchor raised from the wreck has not yet been cleaned, and thus we cannot comment on the weights of any.

The ship was carrying at least 200 four-handed copper ingots, weighing, so far, between 18 and 29 kg. apiece, totalling 4 to 5 metric tons. Add at least 100 discoid "bun" ingots, weighing from 5 to 8 kg. each, and there may have been almost 6 tons of copper on board. Tin ingots in the same shapes are fewer, but about 250 kg. of pure tin has already been uncovered, with more expected. In addition to metals, there were 100 or more amphoras, each weighing about 5 kg.; if each contained 10 kg. of contents, we should add another 1.5 tons to the weight of cargo. Lastly, there were seven large storage jars, or *pithoi*, which add perhaps another 700 kg. or so, exclusive of their contents. We cannot guess what all the *pithoi* held, although at least one may have been filled with pomegranates and another held stacks of Cypriot export pottery. If the contents of each *pithos* weighed 500 kg., we should add another 4 tons to the weight of cargo. Ignoring smaller ceramic containers, bronze tools and weapons, glass ingots, and other small items, we can still estimate that the *Ulu Burun* ship carried at least 12 tons of goods, not counting perishables that left no traces (three ebony logs have been found in the cargo, for example, but we cannot guess if quantities of lighter timber floated out and away from an open hold). The anchors weighed perhaps another 1.5 tons, if estimate of 150 kg. per large anchor prove correct. All in all, the ship was large enough to have carried much more.

Different shipbuilding traditions have left their records in the Mediterranean, where mortise-and-tenon-joined and tied hulls co-existed in antiquity. Thus, the nation or culture of origin of the mortise-and-tenon-joined *Ulu Burun* vessel is important to our understanding of the history of ship construction. Was the ship Canaanite? Cypriot? Mycenaean Greek? Egyptian? We cannot, at this stage of the excavation, even speculate.

Because of the nature of its cargo of raw materials, including not only copper and tin ingots, but also such exotica as elephant and hippopotamus tusks, an ostrich egg, logs of African ebony (*Dalbergia melanoxylon*), and the earliest known glass ingots, the ship resembles those described in the 14th century Tell el-Amarna tablets as carrying royal cargoes between the syro-palestinian coast, Egypt, and a land called Alasia (thought by most scholars to be Cyprus). These cuneiform tablets, unearthed in the remains of the Pharaoh Akhenaten's royal city of Akhetaten in Egypt, even mention ships of Alasia, as well as shipments of copper from the same land. Thus, the *Ulu Burun* ship could have been Cypriot, especially as it carried new Cypriot pottery inside the *Pithos* mentioned above. The same clay tablets, however, tell us that raw glass was exported from Tyre on the Syro-Palestinian coast, and we know from Egyptian tomb paintings that Canaanite ships reached Egypt with cargoes similar to that carried by the *Ulu Burun* ship. Add to that the fact that much of the *Ulu Burun* cargo was carried in typically
Canaanite amphoras and pilgrim flasks, and we can as easily assume that our ship was Canaanite. But we must not forget that archaeological finds of Mycenaean pottery throughout Egypt, Cyprus and the Syro-Palestinian coast have been long seen by some scholars as evidence of widespread Bronze Age Greek seafaring in the Levant. As Mycenaean clay tablets written in the linear B script list copper ingots, ebony, and ivory, all items of cargo on the Ulu Burun ship, could our cargo have been destined for a Mycenaean palace? Some of the cargo on the wreck was, indeed, carried in large Mycenaean or Minoan coarse-ware stirrup jars. On the other hand, most of the ship’s anchors are of a type not commonly found in the Aegean world.

There is far less evidence that the ship was Egyptian, but we must not ignore scarabs and a stone plaque inscribed with Egyptian hieroglyphs as possible evidence of an Egyptian presence on board.

It is almost certain that the ship was sailing from east to west when she sank, probably blown by an unexpected south wind against the cliff at Ulu Burun during her final voyage. Her cargo, however, came from so many directions, some far from the Mediterranean, that it can tell us little at this time about the ship’s nationality. The major source of copper ore was Cyprus, but we should remember that the only mold for casting four-handled ingots of the type found on the wreck was unearthed in Syria, and that Syrian traders are universally associated with ingots of this type in 14th-century Egyptian art. The Baltic amber used for beads came from central Europe or the Black Sea region, and would normally have been thought of as accompanying Mycenaean trade goods from west to east. The tin may have been mined in Afghanistan. The ebony logs came from somewhere in Africa south of Egypt. Frankincense originated either in East Africa or South Arabia. Faience rhyta could have been made either on the Syro-Palestinian coast or Cyprus, as could terra-cotta “wall brackets”. Ivory could have come from either Africa or the Syro-Palestinian coast. And an ostrich egg could have come from the eastern or western desert of Egypt.

One might think that the nationality of weapons on board would suggest the nationality of the ship. Alas, one well-preserved sword seems typically Near Eastern, but another is of Aegean manufacture.

Bronze tools - axes, adzes, chisels, drill bits, tongs - are of different types, pointing to the Aegean, Cyprus, the Syro-Palestinian coast and Egypt for their origins. And we cannot yet speculate about which, if any, belonged to a ship’s carpenter and which were cargo.

Bronze finger cymbals, gold pendants, and silver bracelets all seem Near Eastern, but we do not know if they were cargo or shipboard possessions.

Balance-pan weights, although not yet studied in detail, seem to be based on Near Eastern weight standards, but these same standards were common to Cyprus and Crete, and thus tell us nothing of the Ulu Burun ship’s origin.

Can seals, perhaps representing official items on board, be of more help in
determining nationality? I have never wavered from my view that the Syrian cylinder seal found on the Cape Gelidonya shipwreck of ca. 1200 B.C. belonged to a merchant travelling on that vessel’s last voyage, although some scholars have held that the seal was a piece of bric-a-brac, a souvenir picked up by a Mycenaean sailor. What of seals on the Ulu Burun wreck? Alas, there are too many! A crude stone seal of Mycenaean type may have belonged to someone actually on the ship, for it seems too humble to have been prized as a memento of a trip to Greece (although logic probably did not dictate the collecting of souvenirs in the past any more than it does today!). Thus, there is some rather convincing evidence that at least one merchant (?) on the Ulu Burun ship was Greek. This is not necessarily contradicted by the presence on board of two Near Eastern cylinder seals, one of quartz and the other hematite. One of these, of probable Kassite origin, had gold caps extending down over its carved scene, making it impractical as a seal but ideal as a piece of jewelry made from a seal. As the cylinder seals were found together, it is likely that both served simply as jewelry - perhaps as souvenirs. Then there is a gold scarab of Queen Nefertiti. One might think this belonged to a royal messenger of the queen, pointing to the possibility of the Ulu Burun ship being, if not Egyptian, under Egyptian control. Alas, the scarab was found near a hoard of scrap gold, including an Egyptian gold ring which had been purposely cut in two with a chisel. Perhaps Nefertiti’s scarab was simply part of this scrap hoard. The Ulu Burun ship cannot yet be dated precisely enough within the 14th century B.C. to tell us if it sank during the queen’s lifetime.

Weapons and seals on board being ambiguous, let us turn to pottery. Once more we face problems. The Cypriot pottery seems to be cargo; even the lamps found with the certain Cypriot wares, although not definitely Cypriot, are pristine. These evidently new Cypriot export wares, therefore, do not point to the nationality of the ship or her crew, only to the fact that they were placed on board at a port of call. Syrian lamps, on the other hand, are blackened around their nozzles, suggesting shipboard use by Syrian (?) crew or passengers. Most other Syrian wares, however, such as pilgrim flasks and amphoras, were simply cargo containers, telling us no more about the ship’s nationality than the Cypriot wares. The pottery most likely to have been in actual use on board, besides the lamps, is the Mycenaean pottery, including a klyix and a spouted pitcher, neither being a shipping container. We look forward to discovering the ship’s cooking wares, for they should be diagnostic of their owners’ nationality.

It is clear that the Ulu Burun shipwreck has not yet yielded its most important information. Not only further excavation, but lead-isotope analyses of fishing-net weights, neutron activation studies of clays, and continuing analyses of resins and other excavated materials will furnish additional clues. We hope that they are sufficient to help us solve this fascinating puzzle.

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Notes


3. Our wood identifications are made by Donna J. Christensen of the Center for Wood Anatomy Research, U.S. Forest Products Laboratory, Madison, Wisconsin.


8. Anchors found in the sea off Israel have, indeed, been associated with lost cargoes, but the actual ships which carried these cargoes either are not preserved or have not been located beneath the seabed. From the Depths of the Sea: Cargoes of Ancient Wrecks from the Carmel Coast (The Israel Museum, Jerusalem, Cat. No. 263, Summer 1985) 11 in English.


16. Sources of cargo items are discussed in detail in recent (supra note 1) and forthcoming excavation reports.

Captions

Figure 1. Map showing the Ulu Burun wreck in relation to the Cape Gelidonya wreck and to the Bronze Age world of the eastern Mediterranean.

Figure 2. Hardwood peg driven through fir strake to hold a mortise in place. Photographed in situ.

Figure 3. Diagrams of visible portion of the Ulu Burun hull.

Figure 4. Exposed hull section, showing, from foreground to background, collapsed mortise, ballast stones, keel, and small “anchor.” The wood disappears under the large stone anchor to the right.

Figure 5. A sketch plan of the entire shipwreck as it appeared in 1983, before excavation.

Figure 6. Plan showing artifacts exposed after three excavation campaings. The keel runs in an east-west direction in square 15-0.

Figure 7. Stone anchors, in situ between rows of copper ingots. One anchor and pithos KW 251 (which rested toward the lower left hand corner of the area shown) had been removed before the photograph was taken. West is at top.
NOTES ON THE ARCHITECTURE OF SOME ROMAN SHIPS: NEMI AND FIUMICINO

The passage from boatbuilding to naval architecture was a quality step, the origin and the procedure of which are difficult to recognize. It appears that the job differentiation between fabri and architecti was present in Greek time (Plato, *Leges* 803 a-b), Hellenistic and Roman times (Plautus, *Miles* 915-921, CIL XIII 723, CIL X 5371), where the roles played by the executor (faber) and by the planner (architectus) were well specified.¹ In more recent time (e.g. in the II-III cent. A.D.) it appears that the two jobs were absorbed into a single collegium and that they could be somewhat interchangeable (CIL VI 33833). Clearly not all ships were planned by an architect: the fabri could well plan the hulls they had to build, in many cases deriving the dimensional and shaping criteria from pre-existing hulls which were considered as satisfactory. For these cases we can assume that they built “by sight” with few main measurements, which may have been derived from concepts used also by architects. The fabri most probably were not able to lay down drawings or calculations similar to those performed by the architecti. These latter, with the experience of the building technique and of the empirical concepts, used by the fabri, applied geometrical concepts and set up theoretical methods of planning, surveying and drawing in line with the generally developed mind of Hellenistic architecture. We have no exact nor complete written evidence about these methods, so we have to derive them from wrecks.

Before describing specific instances it may be worth while recollecting the importance of the observation of nature and the technical tools at the architect’s disposal.

Many stories can be told about the attitude towards the observation of nature in Greek and Roman culture: the different legends developed in Greece and in Egypt about the origin of sails are very indicative on this purpose. The Greek legend (origin from nautilus or similar cephalopodes) shows a keen interest to the observation of nature, while the Egyptian legend is more bound to reality. Other examples are the story of the origin of the Corinthian capital as told by Vitruvius or of many others told by Pilny. In the case of ships the shapes of fishes and of dolphins may have had some importance, but I would hypothetically consider also the shape of the bone of the cuttle fish (Fig. 1 A). If we draw the shape of this bone as though it was a hull, we obtain a shape much similar to that of the bottoms of the Kyrenia and of the Fiumicino wrecks. It is an hypothesis, but in sufficient agreement with the mind of ancient boatbuilders.

In addition to the concepts of utilitas, firmitas, venustas and eurythmia, symmetria, commensus and geometricae rationes, which in the case of shipbuilding
should have had a less rigid meaning than that of modul as used in other
buildings, due consideration should be given to the tools the architects used to
plan and to lay down their drawings (formae, lineae). Preliminary drawings were
made (Plato, Cicero, Plautus) with a scale system. The Egyptians used to divide
the figure into squares which were enlarged to full size, but the Greeks developed
the proportion calculations. The Egyptians used to draw the plan and the other
three views: front, rear and side; similarly Greek and Roman architects drew plan,
side and front views of buildings. The Forma Urbis is a good example of plan
drawing.2

The use of models is known as well, however also in the case of models basic
drawing principles should be known.3

Lines and proportions were traced with a rule (regula) and compasses
(circinus), as confirmed by the stele of P. Celerius in Ostia (Fig. 1 B). We could
assume also the use of the curvilineal, but no figure nor literary evidence of it, to
my knowledge, has been preserved.

Units of length may have been different from place to place (as all other
units), however we can accept the foot as 295 mm (Fig. 1 B). Submultiples were:
1/2: semis = 147,5 mm
1/3: triens = 98,3 mm
1/4: quadrans = 73,75 mm
1/5: (?) = 59 mm
1/6: sextans = 49,2 mm
1/12: uncia = 24,6 mm
1/16: (?) = 18,4 mm

Multiples were:
× 1,5: cubitus = 442,5 mm
× 2,5: gradus = 737,5 mm
× 5: passus = 1475 mm

These units could be combined, further divided and multiplied arithmetically
or with the construction of "dynamic rectangles" or golden sections. Units of
capacity were the amphora (26,2 l) and the modius (8,733 l). No workable unit of
weight is documented for ships.

There is a source (Heron of Alexandria, De mensuris, 17) which gives the
cargo capacity of a ship in Italian modii from the hull dimensions evaluated in
cubits: 10 × length × breadth × height. But this formula is not of general
application, since not all ships had the same coefficients of fineness. This is the
basic drawback of such formulas also in recent times due to which widely
discrepant data can be obtained. However this formula indicates that rules were
known in order to obtain the required cargo capacity.4

The Nemi ships. (mid 1 cent. A.D.).
The fire which in 1944 destroyed the two wrecks had also the psychologic
effect of blocking the researches on them. Only the consideration of the shell
building technique and a revision of the already published material let me overtake the impasse and find the phases and some criteria of construction. The studies performed in the 30's and 40's, although giving for granted the skeleton building technique, could pinpoint the aspects of coefficients of fineness, metacentres and brick-wood construction, but the matter of the design of the hulls had to be reviewed completely.5

The presence of such large ships on the Nemi lake is unanimously attributed to worship reasons (Cybele, Diana, Isis) also because on all sacred lakes no craft should have sailed (Pliny the younger, Litterae VIII-20). In addition to the Eastern type of religion (e.g. navigium Isidi) there should have been also the remembrance of the large polyremes of the Ptolemies or of Iero of Syracuse, which few decades after the Nemi ships Athenaeus contributed to keep alive. About at the same age of the Nemi ship we can remember also the ship used by Claudius in the Adriatic, the obelisk carrier sank by Claudius to build the island of the phare of the new harbour of Ostia (Pliny, Nat. Hist. III, 16, 149 and XVI, 76) or the leisure ship used by Domitian (Pliny the Younger, Panegyricus, 85.1.3) on Lake Albano.

The first Nemi ship

The hand of the architectus, as we think of him from humanistic tradition, is appreciable from the shape of the stempost (Fig. 2).6 The bronze parts which were preserved are made of sectors, the junction lines of which converge to a single point R1, the centre of the main circle of constructin of the profile (arc II-III of Fig. 2). The part under this arc (I-II) was constructed like a scotia, with centre in R2, which is on the same line connecting the main centre R1 to the junction point C. A similar construction could have been made for the upper part. We find therefore the typical Vitruvian method for constructing architectural figures, with the use of rule and compasses only. If we compare this shape to that of the prows of military ships, according to Hellenistic and Roman figures, we appreciate that this profile is somewhat idealized, it is an abstraction of real shapes, which in actual oared ships were more fragmentated by the presence of the proembolion.

Coming to the general planning of the ship, the following items are of importance, once we consider that structure should be completed at stern at least by two additional ribs and by others at prow, (vs M. Gatti' survey). (Fig. 3).
— The kell is straight between about ribs 31 and 111, astern and afore those points its sheer begins.
— At about the same cross sections the curves of the sides and of the wales have a bent which does not follow the natural lines of the central parts of the hull, but show that the boards were forced to follow the narrowing of the hull towards its ends (Fig. 4 A). The deflection points have been confirmed also with models.
— Ribs without trabes (floor timbers) are from the stern end to the 9th, from the 140th to the prow end, and all ribs with even numbers, as shown also by the two pits for pumping bilge water (Fig. 3). This is the typical Roman
arrangement and gives the direct link to the building technique as documented by many other wrecks.

- The main section (rib No 68) is not materialized by a complete rib.
- Wales (cincti) at amidship section are at exact distances from the keel: that of the second is exactly twice as that of the first (Fig. 3).
- The parts of cross sections enclosed between the keel and the first cinctus are always rectilinear (Fig. 4).
- The part of cross sections enclosed between the first and the second cincti are rectilinear in the part of hull enclosed approximately by the two auxiliary sections 31 and 111.
- Regular repetitions of distances between ribs can be observed in the following cases:
  midship section: 68 intervals from stern post;
  auxiliary sections (or “active frames”): 32 intervals from sternpost and 44 intervals from main section (if we consider rib No 112), 80 intervals between them.
  Pits for pumping bilge water are at 6 to 8 intervals from auxiliary sections; apostis is 40 intervals long and 12 intervals from stern end; main superstructures are 40 and 24 intervals long.
  All these details, once they are considered in the frame of the shell building technique, show important design principles.

The construction of the shape of the hull appears to have taken into account the profile, the three “active” or main sections (M and Q of Fig. 3), and the shape of the segments of shell enclosed by the first, the second and the third orders of cincti. There is a segmentation of lines of the cross sections which affects the relevant parts and which in consequence means a conceptual subdivision of the shell into segments built around the keel and, in progressive phases, around the flat part of the bottom. This will be shown more clearly by the second Nemi ship, but can be observed also in other Roman wrecks, such as the Comacchio ship.

The internal structures of the first Nemi ship are well coordinated with those of the superstructures: the longitudinal frames which support the cross beams correspond to the bottom wales and this shows a good agreement between the nautical part of the hull and the rather complicated system of superstructures and marble or brick covered parts of the main deck.

The repetitions of regular intervals of ribs shows that the architect placed the elements according to fixed moduli. This is in line with the type of construction of the profile of the prow (Fig. 2), but here may had been also a modular criterion used also in other ships: e.g. in the second Nemi ship and in the Comacchio wreck the jokes for the steering lee boards are at the 12th interval from the stern end.

The general shape of the hull appears wider at stern and thinner at prow, in fact, among the shaping features, the main section (M) is not amidships (around the 74th rib), but it is displaced by 6 intervals (not occasional a distance) towards stern. In my Fig. 3 I had to adjust the shape of the prow, due to some lack of
consistency between Gatti's and Rabbeno's drawings, with the result of shortening a little the prow end.

The superstructures appear to have been made of two main blocks, made of two buildings each, connected by stairs and corridors, and of raised parts of the deck at the ends. This distribution gives to the ship a discontinuous look, which has no comparison with ancient figures.

The second Nemi ship

The main clues to our understanding of the design principles of this ship are:

- different directions of the boards of planking (of shell) in the different sections enclosed by the three orders of wales (Fig. 5);
- straightness to the parts of cross sections enclosed by the two orders of wales delimiting the bottom;
- planking board B of Fig. 5, at the most curved part of the sections, receives the parts of the adjacent boards; this means that during construction this board (B) was considered at least as a temporary reference to which to join the other parts of the shell;
- auxiliary sections are ribs No 35, 84 and probably 98 (Fig. 6) if we use the same criterion used for the first ship;
- the keel has an almost continous sheer, with a short straight part which does not correspond to that limited by auxiliary sections;
- like on the first ship, there is a series of ribs without *trabes* at the ends (6 and 7 at prow and at stern) and alternated ribs with and without floor timbers (*trabes*); ribs with *trabes* are the even numbers of Fig. 6, among which there is also the main section (M, III).
- The *apostis* begins at the 12th rib from stern and is 94 intervals long, the main section being at its 46th interval from stern and at its 48th interval from the prow side.
- The distance between ribs in some cases is not regular: it varies from 54 to 61 cms and this indicates that they have been put to fill an empty space of the hull, too short distances having been recovered in order to keep the foreseen number of frames.
- The system for supporting the superstructures does not correspond to the wales (Fig. 5 and 6), but it has been organized by order to obtain the widest possible space and to divide the superstructure system into regular parts (Fig. 7).

The superstructure appear to have been made of a main block, 24 ribs interval long, a heavy building at stern and a smaller one at prow. These two latter buildings are indicated by the shorter distance of the supporting cross beams and by the distribution of ballast. The lack of coordination between the nautical structure of the hull and that of the superstructures suggests that the *arctectus navalis* left to his civil colleague that job of making them on the available space, adjusting the final trim with ballast.

The design elements appearing from the above items are similar to those
noticed for the first ship, with the only difference that the main section (M) is materialized by a complete rib *trabes* and *statumina*). Other sections could be considered as "active", such as those at the ends of the apostis (12 and 106) or those with the first *trabes* (8 and 110, similarly to Nos 9, 11 and 139 of the first ship).

Building phases and the relevant design principles may have been:
1- construction of the profile;
2- construction of the flat bottom, up to the second order of *cincti*, in two phases;
3- construction of the shell up to the third wale (or topgallant bulwarks) with the intermediate reference of the board of planking at the knee of the section.

For shaping the corresponding sections the profile, the lines of the wales and the three M and Q "active" sections could have been sufficient, but with such large hulls it is possible that other "active" frames could have been put.
4- Insertion of the ribs, first those with *trabes* and then those without them, in pre-fixed patterns between the "active" frames. The wider space between ribs 80 to 85 was recovered with shorter distances between others (from 75 to 80).

Also in the case of this ship some modular repetition of ribs intervals appears to have been used by the architect to distribute the various parts (Fig. 6).

The distribution of superstructures (Fig. 7 B) may be compared to that of the marble fountain in front of S. Maria in Dominica in Rome or to the three shrines indicated on an Isian lamp in the Museum of Ostia. Both documents rely to the Isis worship and this may not be occasional. The two pairs of steering leeboards appear in a ship symbol in the catacomb of Priscilla, in paintings in the same catacomb and in that of SS Pietro and Marcellino in Rome. (About III cent. A.D.).

**The Fiumicino largest boat.** (III cent. A.D.)

Out of the five boats and the two fragments of sides which now are in the Museo delle Navi in Fiumicino, I consider in detail here the largest one, the so-called second large merchant ship. The state of distortion of the wrecks and the lack of published surveys made during the excavations made it necessary to interpret the photogrammetric drawings, published in scale 1:20, and to evaluate the extent of distortion from the observation of the wrecks, from the continuity and symmetry of cross sections, from the shape of some water lines and from oblique sections. The results are promising (Fig. 8) even if completion of the survey of technical details is pending.

Contrary to what was first proposed, the Fiumicino boats are not river crafts: there is not the large portion of flat bottom which would have been typical of river boats; on the contrary the hulls are nicely curved and shaped. This does not mean that the Fiumicino boats could not sail on the Tiber up to Rome.

The shape of the hulls and the way of putting together the planks of shells is common to all boats and even for three of them we can induce that they came out of the same yard. The largest of these crafts gives clues of nautical architecture:
— The profile of the keel was obtained with straight segments of the keel (A, B and C of Fig. 9 B) and with the round posts.

— The shell of the lower part of the hull (that which was preserved) was made in three sections: a central and two end parts, with almost rectilinear boards. The junction between the adjacent sections corresponds to the “active” or reference frames.

— Reference frames appear to have been complete ribs No 3 and 16 (Fig. 8) because of the change of direction of the boards of the shell, of the abrupt curvature they induce to the shape of the hull and of the fact that they are the only ones nailed against the keel.

— The position of the reference frames is nearly at 1/4 of length at the floating line from the ends and their distance from the midship section (M) is exactly the same. This justifies their definitions as quarti (Q) in analogy to similar references of traditional crafts.

— Midship section (or main section) does not correspond to a complete rib.

— Complete ribs (those numbered in Fig. 8) were considered different from the intermediate half ribs; in the so-called large merchant ship I, the ledger ceiling plank is nailed with two nails against the complete rib and with one nail only against the half ribs.

— The sides re-enter in their upper parts.

— The ratio between length and breadth is almost exactly 3/1, the breadth of the reference sections are the same and midship breadth is 5.9 m, i.e. exactly 20 Roman feet (295 mm).

— The cargo was fairly huge: first approximation graphical integration shows a total coefficient of fineness = 0.65. This means a displacement of about 110 tons, 82 of which devoted to the cargo (gross).

— The shape of the hull shows a cut-water shaped prow and a wide round stern (see also Fig. A): the drift features of the prow are not balanced by the shape of the stern, but probably, by the surface of the steering lee-boards.

— The mast appears to have been between ribs 7 and 8.

This wreck, better than others, shows the importance of auxiliary sections (Q) of the quarti. Moreover it confirms that the main section was not materialized by a frame (as in the first Nemi and in the Comacchio ships), but it was only imagined, and also that in a boat less important than the Nemi ships concepts of symmetry and exact measures have been used. They may have been “rules of the thumb”, as known for more recent times, but they betoke a design system which was common, with due adjustments, to larger hulls and certainly architecti navales had taken them into account.

Segmentation of the shell and of the lines of the keel appear to be in line with geometric constructions generally used by ancient architects.

Conclusions

The elements discussed above and their comparisons to wreck and figurative
documents suggest the following design procedure, which was tested with a model shaped mainly according to the relief of Altino of the 1 cent. A.D.:16

1 Profile, midship (or main) section, plan.
2 Auxiliary sections (Q), and general layout of internal framing.
3 Lines of the wales, dividing the building phases of the shell into sections.
4 Definitive layout of internal framing with distribution of volumes and superstructures, considering first complete ribs (with *trabes*) and then half ribs (*statumina* only).

Within each design phase there were symmetries of details and segmentations which followed rules made with the aim of simplifying both design and the physical execution by the *fabri*, or of obtaining "nice" or "well proportioned" drawings. Proportions of course were different according to the types of crafts, however in Fiumicino we find a not occasional approximation to the ration 3/1 (length/breadth):

fishing boat
3

I small boat
3

II small boat
2,9

I large boat
2,9

II large boat
2,94

If now we read again Vitruvius' passage (*Architectura* I, II-4) we can observe that really internal framing was planned with a certain amount of regularity, with the preference of 3, 4 and their multiples. However this does not mean that *moduli* based upon the distances between ribs were used as a strict rule. Vitruvius' passage instead appears to inherit an ancient principle based upon oared ships, with the tholes 2 cubits (88,5 cms) far from one another.

The design principles indicated above suggest also the type of survey it is advisable to perform on ancient wrecks. No water lines nor vertical longitudinal sections are used, but, in addition to the profile, main sections and plan, the lines of the wales and of the sections of the shell. These latter are also well approximated by oblique sections touching the flat (or nearly flat) portion of the hull and the most curved parts of the transverse sections.
Personal experience on drawing the hulls of the Nemi, Fiumicino and other wrecks and studies revealed that drawing the shape of the hull with obliquous sections or with the lines of the wales is quicker and more accurate than with water lines.

Design principles discussed above are outlined in Fig. 9, which is based upon the model from the Altino relief and upon the largest Fiumicino boat, with their building phases (I, II, III).

Still there is much room for research, mainly as far as loads and shapes are concerned.

The position of the buildings and of ballast in the Nemi ships (Fig. 7) indicate that the effects of loads and of uplifts on the stresses of the hulls were foreseen only to a certain amount. In the first ship the distribution of loads is consistent with that of uplifts, while in the second ship there is a discrepancy between the heaviest buildings at stern and the others, which was balanced with ballast and with a smaller building at prow, but from the point of view of stresses it was not.

Only the complete reconstruction of these ships will help us to solve also the problems of volumes, of the positions of the centres of gravity, of sails and of lateral resistance.

The calculations of the volumes of the largest Fiumicino boat according to the coefficients of fineness (a), for example, give not so discrepant values, vs those we can obtain with Heron's of Alexandria formula (b):

a) \[ 15,95 \times (L \times 5,9 \times (l) \times 1,8 \times 0,65 (\varphi) = 110 \, \text{m}^3 \] (displacement);

28 tons = weight of the empty ship; 82 tons = cargo (gross)

b) \[ L \times 1 \times h \times 10 \] (in cubits, 1 cubit = 0,4425 m):

\[ 36 \times 13,3 \times 4,07 \times 10 = 19.487 \, \text{modii} \] (1 modius = 8,733 l) = 170,180 m³, for a net weight of corn of about 70 tons.

So we can say that Heron's of Alexandria formula can be used only if the coefficient of fineness is not far from 0,65, and if we consider the stowage factor of corn of about 400 kgs/m³. These conditions, to be rechecked case by case, are far from being general, since for large seagoing ships coefficients of fineness were most probably higher.

Hydrodynamics should have advised a wide prow and a thin stern, while in these cases (and in many others in Antiquity) we have the contrary. The bone of the cuttle-fish may have been an example (Fig. 1), however, as hinted before, this shape should be considered in terms of balance with the surface of the steering leeboards, but also of partial volumes in different trim conditions. Tests on the test tank could give a definite answer to this problem.

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Ravenna: 28th August, 1985
Dopo un cenno ai mezzi tecnici di disegno e di calcolo a disposizione degli architetti romani per il progetto degli scafi ed al rapporto con i fabri, vengono presi in considerazione i criteri per la conformazione degli scafi antichi, prendendo come esempio le navi di Nemi e la più grande delle barche di Fiumicino, in relazione alla tecnica costruttiva a guscio ed alle sue fasi di costruzione.

Il profilo della prima nave di Nemi appare delineato con una tipica costruzione architettonica, idealizzata rispetto al profilo delle navi militari a remi. Lo studio delle forme a della ripetizione regolare di distanze tra le ordinate ha consentito d'individuare le linee di riferimento (profilo, andamento delle cinte) e le sezioni trasversali di riferimento (maestra ed ausiliarie), consentendo di formulare ipotesi solide sulle fasi costruttive e di progetto.

La seconda nave di Nemi presenta spunti simili di ricerca, confermando quanto osservato per la prima. Le sovrastrutture di questa nave non sono però coordinate con la struttura dello scafo, allo scopo di ottenere uno spazio maggiore (esigenza non sentita per la prima nave). Queste sovrastrutture ricordano monumenti isiaci (marmo di S. Maria in Dominica a Roma e lampade votive), ma dal punto di vista strutturale hanno mantenuto sollecitazioni allo scafo, non compensate strutturalmente, ma solo staticamente con la zavorra.

Le barche di Fiumicino appaiono piuttosto simili ed alcune sono certo uscite dallo stesso cantiere. La più grande presenta un andamento delle tavole del guscio ed una curvatura delle fiancate che confermano la posizione di due sezioni trasversali di riferimento ai “quarti”. Vi è una segmentazione delle linee (chiglia e guscio) ed una simmetria rispetto alla sezione maestra ed ai “quarti” che, unita alla larghezza di esattamente 20 piedi romani, confermano l'ipotesi di regole di costruzione basate su simmetrie d'insieme e di dettaglio, con un rapporto lunghezza/larghezza di 3/1 per questi tipi di barche. Anche la formula di Erone d'Alessandria pare confermata, ma essa non può essere considerata di carattere generale.

E' ancora da definire lo studio completo della forma, con la prua più sottile ed avviata della poppa.

SOMMARIO

Dopo un cenno ai mezzi tecnici di disegno e di calcolo a disposizione degli architetti romani per il progetto degli scafi ed al rapporto con i fabri, vengono presi in considerazione i criteri per la conformazione degli scafi antichi, prendendo come esempio le navi di Nemi e la più grande delle barche di Fiumicino, in relazione alla tecnica costruttiva a guscio ed alle sue fasi di costruzione.

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Footnotes


2. I can recollect the drawings on Egyptian papyri at the Museum of Berlin, which report the division into squares of the statues, the studies by Archimedes about the increase of three and two dimensional figures with any proportionality ratio.


9. G. Ucelli, *Le navi di Nemi*, cit, tav. II-IV and Fig 151 vs tav V.


14. V. Scrinari, *Le navi*, cit, Fig. 16.

15. Among many instances we can recollect the segmented parts of the routes of Roman roads, both within and outside the townwalls.

Captions to figures

Fig. 1. A: sections of the bone of a cuttle fish (sepia officinalis);
   B: stele of P. Celerius, Ostia I cent. A.D.
Fig. 2. Geometric construction of the stempost of the first nemi ship.
Fig. 3. First Nemi ship: criteria of shape and symmetry.
Fig. 4. Cross sections of the Nemi ships, the arrows point out the sections corresponding to the deflections of the shell.
Fig. 5. A: Second Nemi ship: shape of the shell planks, A and B being the references;
   B: Second Nemi ship: midship cross section.
Fig. 6. Second Nemi ship: criteria of shape and of symmetry.
Fig. 7. Layout of the superstructures of the Nemi ship:
   A: first ship
   B: second ship, with the repetitions of regular intervals (A and B) in the main cross section.
Fig. 8. Fiumicino largest boat reconstruction.
Fig. 9. Criteria for shaping Roman hulls in connection to shell building technique and phases:
   A: study from a relief of Altino (I cent. A.D.)
   B: segmentation of shapes defining the first building phases of the largest Fiumicino boat (II-III cent. A.D.)
6 — Seconda nave di bami, criteri di forma e di dimensioni.
LA DÉESSE MINOENNE A LA RAMÉE-GOUVERNAIL

On a récemment publié dans la revue Kadmos 23 deux rondelles fragmentaires de terre-cuite datant de l'époque MR I et provenant de la Canée (Fouilles gréco-suédoises 1982/83). Toutes les deux portent des signes de l'écriture Linéaire A et l'une d'elles (Canée, Mus. no 2117) porte, en plus, quatre empreintes figurées, sorties du même sceau amygdaloïde. La représentation des empreintes (Fig. 1 a-b) caractérisée par un "naturalisme" avancé — dominant à cette époque — montre une figure féminine debout, totalement nue et à la chevelure longue. De la main droite, elle tient un objet oblong, vraisemblablement plus haut qu'elle, verticalement disposé. La scène est enfin enrichie par un motif ondulé partiellement conservé en bas de l'extrémité droite de l'empreinte.

Pour l'interprétation de la scène dans la publication ci-dessus les points de départ suivants avaient été, avec raison, mis en exergue: a) la nudité totale de la figure, phénomène extrêmement rare dans l'iconographie égéenne du 2ème millénaire av. J.-Chr. se rencontrant surtout dans un contexte sacré, b) l'objet oblong dans lequel on a voulu reconnaître "a high pole [d'ordre sacré] with an oval base". Par conséquent on rapprocha la scène de la sphère religieuse/cultuelle considérant la figure féminine comme déesse ou plutôt comme adorante priant devant le "sacral pole" pour provoquer l'épiphanie de la divinité. Cette dernière hypothèse fut surtout étayée par la scène connue d'une bague provenant de Cnossos —aujourd'hui au musée Ashmolean d'Oxford— qui représente une adoratrice dans un sanctuaire de plein air et, parmi d'autres éléments, un "sacral pole" et une divinité masculine en épiphanie descendant du ciel.

Mais je crois que le parallélisme suggéré entre la scène de la bague de l'Ashmolean et celle des empreintes —que j'avais trouvé moi aussi autrefois plausible— ne repose que sur des ressemblances d'une première approche. La nudité totale de la figure féminine est en fait un indice pour des allusions à caractère sacré d'ordre général. Et pourtant, la clé pour la compréhension du sens spécial de cette scène réside primordialement dans l'objet oblong, dont l'identification proposée comme "sacral pole" va devoir être ici modifiée.

Autour de "sacral poles" dans l'iconographie créto-myénéenne la bibliographie est riche. Sous le terme "sacral pole" l'on entend habituellement des poteaux en bois de forme et de taille différentes, qui sont figurés ou bien se dressant de façon libre comme par exemple sur la bague de l'Ashmolean, ou alors fixés à des façades de sanctuaires comme nous les montrent des fresques, sceaux, vases de pierre avec des scènes en relief, ou parfois transportés par des ministres du culte. Pour la définition de leur valeur sémantique, qui ne saurait être la même dans tous les cas étant donné la diversité de forme et de fonction, on a tenu compte des parallèles orientaux, égyptiens et grecs de l'époque historique. Mais en
comparant d'un oeil plus critique l'objet oblong de nos empreintes avec l'ensemble des "sacral poles" créto-mycéniens, l'on remarquera que la formation de leur partie inférieure est fondamentalement différente. Tandis que ces derniers apparaissent cylindriques ou graduellement réduits du bas en haut, celui-là montre une forme elliptique et pointue dans son extrémité basse. L'explication donnée comme "oval base", destinée à supporter le "sacral pole", se heurte à des difficultés non négligeables. D'abord, une telle espèce de support, sans parallèle, ni réel, ni iconographique, serait tout à fait inconvenante pour des raisons statiques. En outre, la représentation elle-même ne nous permet pas d'accepter deux objets superposés, mais un seul, à contour continu, large dans sa moitié inférieure, beaucoup plus étroit dans sa partie supérieure. Il devient donc nécessaire de rejeter la possibilité d'un "sacral pole" combiné avec une "oval base".

A la recherche d'une identification plus convaincante, les ressemblances sont frappantes entre notre objet et le gouvernail égéen du type "rame", attesté au moins dès la fin du Bronze Ancien à travers la représentation partielle d'un navire sur un tesson de Phylakopi I (Fig. 2a). Mieux attesté, est ce type dans l'art figuratif du 2ème millénaire av. J.-Chr., dont les exemples les plus caractéristiques et riches d'enseignement nous sont parvenus par la "frise de la flotte" d'Akrotiri. Le fait que la frise se situe dans le même cadre chronologique que les empreintes de la Canée (MR 1), ajoute à notre comparaison une validité supplémentaire. Les ressemblances ne se confinent pas seulement dans la forme des rames-gouvernails mais aussi dans leur taille en rapport avec les figures qui les tiennent (Fig. 2b). Sur la frise il s'agit exclusivement d'hommes représentés debout, près de la poupe, un dans chaque bateau, sauf dans le cas où, correspondant au nombre des rames-gouvernails, les hommes sont deux. Si les rames-gouvernails sont tenues ici en biais, c'est parce que le peintre a voulu les rendre en position fonctionnelle, c'est-à-dire en accord avec l'accent narratif de la frise. La position verticale sur nos empreintes a été, en revanche, imposée par l'étroitesse de la surface du sceau amygdaloïde, disponible au graveur, qui a essayé de représenter le plus clairement possible l'objet caractérisant la scène. Une raison de plus, comme nous le verrons plus bas, a suscité, semble-t-il, cette disposition verticale. Préalablement, signalons ici que l'extrémité basse de la rame-gouvernail se trouve à peu près au même niveau que la figure féminine.

Dans la première publication on a pris le motif ondulé en bas de l'extrémité droite de l'empreinte pour un terrain rocheux schématiquement visualisé, sur lequel serait fixé la base du "sacral pole". Mais après avoir détecté à la place du "sacral pole" une rame-gouvernail nous devons chercher pour le motif ondulé, dont, d'ailleurs, le rapprochement avec la scénographie rocheuse me paraît arbitraire, une explication plus harmonieuse avec le sens spécifique de la scène: c'est l'iconographie maritime qui nous procurera, à mon avis, la seule explication raisonnable. Le motif ondulé, bien qu'insuffisamment conservé, nous évoque l'extrémité élevée d'un navire, peut-être celle de la poupe, si l'on accepte que le

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graveur eût le souhait de représenter la rame-gouvernail en association avec la partie du navire à laquelle elle appartient fonctionnellement. Le fait que le navire ne soit représenté que partiellement ne pose aucun obstacle à notre proposition, puisque le principe artistique du pars pro toto était fort répandu dans l’art créto-mycénien et spécialement, comme il est d’ailleurs naturel, dans la glyptique de sceaux à cause de la surface minuscule à graver. Il suffirait de mentionner une grande série de bateaux minoens gravés partiellement, d’après ce principe, sur les sceaux du groupe dit “talismanique”,8 qui datent dans leur majorité de la même période que nos empreintes (MR I). Il s’agit toujours du type de “Kajütenschiff”, gravé dans l’axe de la longueur des sceaux amygdaloïdes, ce qui a donné la possibilité de le représenter le plus souvent par moitié. Dans notre cas, en revanche, manquant de place, le graveur s’est borné à la poupe (ou proue), destinée à fonctionner comme une abréviation éloquente à la place du navire entier.

Si notre analyse iconographique est correcte, la figure féminine se tient alors debout sur le pont du navire s’appuyant apparemment sur la rame-gouvernail retirée de la mer, et non pas priant comme on l’avait prétendu, partant de la fausse impression que donne l’élévation de sa main à la hauteur du front. Cette impression de l’appui sur la rame-gouvernail est évoquée par l’inclinaison légère de son torse en avant, liée à la position détendue de ses membres inférieurs.

Après avoir — je l’espère — résolu les problèmes iconographiques, passons à l’interprétation de la scène. Il est évident, comme nous l’avons déjà noté, que la nudité totale de la figure féminine nous conduit décidément aux domaines du culte; rame-gouvernail et bateau témoignent, de leur côté, plus spécialement des croyances maritimes religieuses, dont les racines doivent remonter au moins jusqu’au 7ème millénaire, c’est-à-dire à l’époque des premiers essais de navigation archéologiquement confirmés. En aucun autre lieu que la mer l’homme ne s’est trouvé aussi exposé à la merci des forces naturelles. Il était donc plausible que se formât au cours des siècles une série de croyances, superstitions, mythes et rites relatifs à la mer, ces derniers exercés pour assurer l’εὔπλος, la bonne issue des voyages. Déjà dans leurs représentations les plus anciennes, gravées sur les “frying pans” cycladiques du 3ème millénaire, apparaissent les bateaux égéens ornés de symboles (simulacres de poissons fixés sur des poteaux, bannières) de valeur apotropaïque. Avec la systématisation et l’épanouissement dynamique de la navigation minoenne, contrôlée en grande partie par l’administration palatiale, le rituel maritime ne se serait pas seulement enrichi, mais il aurait été désormais officiellement établi. Les activités nautiques, d’après les données archéologiques, atteignent leur apogée à l’époque MM III — MR I, qui semble coïncider avec la période de la Thalassocratie légendaire de Minos;9 et il n’est pas alors du tout surprenant que du même cadre chronologique nous possédions, à côté de multiples représentations de navires,10 des indices précieux pour l’existence d’une iconographie maritime sacrée, parvenue jusqu’à nous essentiellement à travers la
glyptique de sceaux et la "frise de la flotte" d'Akrotiri, qui nous transporte dans l'atmosphère festive d'une procession navale se mouvant entre deux villes littorales. Quel que soit le caractère exact de cette νροπομαι, néanmoins il est vraisemblable que des déplacements pareils, par voie de mer, pour exercer des cérémonies dans des sanctuaires littoraux et dans des îles voisines, auraient leur place dans le catalogue de fêtes minoennes, tressées autour d'un noyau cultuel/mythique.

De plus grande importance pour notre sujet sont, sans doute, les témoignages d'un cycle iconographique "maritime", qui se forme par la bague CMS II 3, no 252 de Mochlos (Fig. 3a), la bague dite de Minos (Fig. 3b) —toutes les deux aujourd'hui disparues— une empreinte de sceau d'Hagia Triada (Fig. 3c), un sceau amygdaloïde, trouvaille récente de Makrygialos (Fig. 3d) et finalement par un autre sceau amygdaloïde, CMS I Suppl., no 167, de la Collection Stathatos (Fig. 3e). L'authenticité de ce dernier sceau amygdaloïde a été —je crois à tort— mise en question, tandis que l'authenticité de la bague de Minos, qu'on a de nouveau essayé de défendre, me parait plus problématique.

La cohérence de ce cycle iconographique, à l'élargissement duquel contribue maintenant la représentation des empreintes de la Canée, est soulignée: a) par l'homogénéité des supports artistiques; dans tous les cas il s'agit de sceaux et de bagues sphragistiques, b) par la provenance géographique commune; tous les exemples, à l'exception du sceau de la Collection Stathatos, dont le lieu de trouvaille reste incertain, proviennent de Crète, c) par leur attribution au même horizon chronologique, c'est-à-dire au MR I, et d) par le fait que, malgré la grande diversité des éléments iconographiques, les navires, à l'exception peut-être de celui de l'empreinte d'Hagia Triada, apparaissent combinés avec des figures féminines, ce qui suffirait à exclure, à première vue, la possibilité de représentations profanes. Quant à l'identification du sexe de la figure sur l'empreinte d'Hagia Triada, effectuée par analogie avec la bague de Mochlos (figure féminine assise, type de navire), nous avons quelques réserves, car en raison de l'absence des caractéristiques accentués de sexe, on pourrait également prendre cette figure pour masculine. Sur les bagues de Minos, de Mochlos et sur le sceau amygdaloïde de Makrygialos les navires surmontés d'autels, qui sont accompagnés dans les deux derniers exemples par un arbre sacré, ressemblent à des sanctuaires flottants. La fonction exceptionnelle des navires sur les bagues aussi bien que sur l'empreinte d'Hagia Triada est en plus soulignée par leur forme "fantastique" avec des parallèles dans la catégorie des navires de culte égyptiens et mésopotamiens.

Si l'on voulait maintenant caractériser les figures de chaque scène, on se heurterait à des difficultés d'interprétation, dues à la nature même du matériel disponible, qui, pour emprunter l'expression connue de M. Nilsson, compose un livre illustré, mais sans texte. Ce n'est pas ici le lieu approprié pour suivre les détails iconographiques; exposons donc brièvement notre avis sur la fonction des figures dans leurs contextes concrets: il est justifié, je crois, de reconnaître des prêtresses sur le sceau amygdaloïde de la Collection Stathatos maniant les deux
rames-gouvernails, une prêtresse (ou adoratrice) en geste d'adoration sur le sceau amygaloïde de Makrygialos et sûrement une divinité sur la bague de Mochlos, assise dans son bateau sacré, qui semble, manquant de moyens de propulsion, être poussé par une force miraculeuse. Dans la figure de l'empreinte d'Hagia Triada, qui rame avec rigueur dans son bateau/barque de forme fantastique et dans l'autre de la bague de Minos, représentée debout dans un bateau de même type maniant elle aussi la rame-gouvernail, on reconnaît habituellement des divinités; pourtant, on doit garder à l'esprit la possibilité d'une interprétation alternative: "prêtresse/ministre de culte", qui est aussi tout à fait plausible.

Dans l'effort de préciser davantage la physionomie des divinités de ce cycle iconographique, on a souvent parlé d'une déesse minoenne protectrice de la navigation21, explication a priori raisonnable étant donné la prépondérance évidente de l'élément maritime. Mais dans ce jugement il faut aussi tenir sérieusement compte de l'aspect végétal attribué surtout à la déesse de la bague de Mochlos par l'addition de l'arbre sacré. Des indices supplémentaires pour cet aspect végétal sont fournis par la présence de bulbes de scilles (Urginea Maritima L), représentées en paire sur la même bague, devant un sanctuaire littoral.22 L'établissement de la combinaison cultuelle "navire-arbre sacré" est également démontré par le sceau amygaloïde de Makrygialos et par un autre sceau amygaloïde, CMS VII, no 72, du groupe "talismanique"23 (Fig. 30). Sur la bague de Minos l'arbre ne figure pas dans le navire même, mais dans des sanctuaires littoraux, ce qui indique indirectement la liaison du cycle sacré de la végétation avec celui de la mer.24

Se pose donc la question de savoir si l'influence de la grande déesse de la nature ne s'étendait pas aussi au royaume marin (soit pêche soit navigation), comme on l'a maintes fois suggéré par Evans.25 Conscient de la complexité du problème, nous ne voulons pas donner ici une réponse définitive; tout simplement nous nous référerons à quelques indices, contemporains et postérieurs, qui semblent soutenir cette possibilité: sur un diadème d'or de Zakros26 (MR I?), par exemple, la Potnia Theron est flanquée, à côté d'agrimia, par des poulpes26, dont la présence ne peut s'expliquer simplement comme un arbitraire artistique sachant que l'art minoen est en grande partie un phénomène religieux. L'association des déesses aux serpents avec des coquillages réels et avec des simulacres de coquillages, poissons et argonautes dans les "Temple Repositories" de Cnossos27 pourrait avoir un sens analogue. Un ensemble de trouvailles similaire (idole de femme assise, coquillages pectunculus, vases miniatures), mis au jour à Phaistos néolithique, marque —peut-être— les origines d'une telle tradition cultuelle.27b Outre les coquillages offerts à la divinité de la caverne de Skoteino, vénérée, apparemment, même sous un aspect marin,27 il faudrait aussi mentionner le triton en stéatite (MR 1) récemment découvert à Malia, qui porte en relief la représentation de deux démons de type Taurt (Minoan Genius) se livrant à un acte de libation.28 Comme il est prouvé, ces démons, liés à la chasse et à la fois à la végétation, se trouvaient principalement au service de la grande déesse de la
nature. D’autre part, des tritons et leurs simulacres, découverts souvent dans des contextes sacrés, constitué des objets de culte appropriés en particulier pour un rituel marié, comme récipients, peut-être d’eau de mer, à laquelle on avait attribué dans l’antiquité des propriétés purificatrices. Le choix du thème concret pour la décoration du triton a donc été imposé mutatis mutandis par la même conception que dans le cas du diadème de Zakros, mais avec une différence essentielle: à la place de la déesse figurent ici ses acolytes. Le rapport des démons Taurt avec le royaume marin semble être confirmé, je crois de façon éloquente, par un vase en bronze provenant de Chypre, dont les anses montrent en relief les Taurt combinés avec des poulpes. Rappelons, en passant, que les divinités crétoises Diktynna et Britomartis, d’origine minoenne, réunissaient dans leur hypostase la mer et la nature sauvage. C’est d’ailleurs chez Artémis que nous retrouvons cette combinaison, lorsque la déesse était vénérée dans certains lieux comme Πότνια Ἡθῶν (Maîtresse des Poissons) ou comme Δελφίνια, épithète qu’elle se partagait avec son frère Apollon Δελφίνος. Quelques sceaux minoens/mycéniens avec la représentation d’une figure féminine tenant des poissons ou accompagnée par des dauphins nous révèlent très probablement la Potnia des Poissons du 2ème millénaire av. J.-Chr. (Fig. 4a-c).

En observant de nouveau les représentations de la glyptique de sceaux, qui montrent le bateau de culte combiné directement ou indirectement avec l’arbre sacré, et avant tout la scène sur la bague de Mochlos, l’on peut bien maintenir qu’elles illustrent le renouvellement symbolique de la nature coïncidant temporellement avec le début de la navigation aux mois printaniers. Notons que c’est le nom d’un tel mois de navigation que l’on a proposé, parmi d’autres explications, pour la lecture du mot mycénien porowito = πλωφιτός, du verbe πλέω. De même on a voulu reconnaître dans la “frise de la flotte” d’Akrotiri la représentation probable de la célébration d’une “annual resumption of the navigation season”. Dans un contexte de navigation on pourrait en outre mieux comprendre la mention d’une Anemo ijereja (prêtresse des vents) dans les tablettes du Linéaire B de Cnossos.

Renouvellement de la nature et reprise de la navigation, ces deux événements d’importance capitale pour la vie socio-économique, seraient donc conçus et visualisés dans la mythologie sacrée et la pratique rituelle comme un retour de la déesse en bateau miraculeux, dans lequel pousse ou par lequel est transporté l’arbre sacré substituant la végétation dans son ensemble. Dans la fête attique Ἡρωούρια, consacrée à la fois à la célébration du printemps et aux vents favorables pour la navigation, on pourrait voir, malgré le décalage des siècles, un parallèle révélateur. Des idées analogues sont aussi soujacentes aux Anthéstèria, fête de la floraison printanière, pendant laquelle avait lieu l’épiphanie/retour de Dionysos en bateau (Schiffskarrenumzug). La présence du bateau faisait ici sans doute allusion à des épisodes maritimes de la vie du dieu et peut-être à la façon même dont s’est répandu son culte dans l’Égée; toutefois cette apparition du bateau devient d’autant plus significative si l’on l’attache à la reprise de la
navigation.40

Comment s'inscrit maintenant notre figure féminine des empreintes de la Canée dans le cycle iconographique que nous venons brièvement d'esquisser ? À la question "prêtrise/adoratrice" ou "déesse" — dilemme déjà posé dans la première publication, qui préoccupe d'ailleurs souvent les chercheurs de la religion crêto-myécénienne — les données iconographiques favorisent, je crois, décidément la deuxième possibilité. On s'imaginerait à peine une prêtrise ou adoratrice représentée totalement nue dans un bateau tenant ou s'appuyant sur une rame-gouvernail sans autre allusion narrative. La nudité totale, si répandue chez les figures féminines jusqu'à la fin du 3ème millénaire, tend à disparaître au 2ème millénaire av. J.-Chr. à cause sûrement d'un changement profond des conceptions socio-religieuses.41 Et tandis que la nudité du sein devint presque la règle dans la sphère religieuse, la nudité totale fut surtout réservée à certaines divinités. La "déesse aux colombes" sur les lames d'or de Mycènes (tombe à fosse III),42 la déesse assise devant une colonne sur la bague CMS I13, no 103 de Kalyvia (Phaistos) et une autre déesse (ou son substitut) également assise et flanquée par des servantes de culte sur l'empreinte de sceau no 1528 de la Canée43 constituent quelques exemples caractéristiques.

Mais le caractère divin de la figure de la Canée se manifeste, je crois, décidément et avant tout par la manière, dont elle se groupe avec la rame-gouvernail. Retirée de la mer et tenue verticalement sur le pont du navire — et non pas en position fonctionnelle — la rame-gouvernail évidemment obtient ici la valeur d'un attribut, ce qui peut aussi expliquer l'absence des allusions narratives dans la scène.

Dans l'iconographie et la pratique maritime égéenne il y avait — nous l'avons noté plus haut — une catégorie de bateaux de culte. Une valeur symbolique était attribuée, comme l'atteste plus clairement la "frise de la flotte" d'Akrotiri, au Akrostolon et au Aphlaston, lorsque on les ornait de symboles et de figures d'animaux, destinés soit à protéger le bateau, soit à lui transmettre leurs propriétés.44 Les "ikria" (cabinets) d'Akrotiri, du même programme décoratif que la "frise de la flotte", témoignent de l'instauration d'un rituel autour de cette partie du bateau.45 Finalement, on a de nouveau argumenté pour l'existence d'ancres sacrées partant d'une ancre fragmentaire de Makrygialos et de l'ancre célèbre de Cnossos avec la représentation de poulpes.46

Les empreintes de la Canée viennent maintenant enrichir cet inventaire de symboles nautiques sacrés en y ajoutant la rame-gouvernail. A travers cet attribut et sa combinaison avec le bateau partiellement figuré, le graveur du sceau a réussi à caractériser d'une façon optimale la déesse de la navigation, qui apparaît d'une allure presque statuaire en nous rappelant vivement les types iconographiques postérieurs d'Aphrodite, de Némésis, d'Isis, de Fortuna, d'Annona etc. tenant le gouvernail.47

Aucun autre accessoire de l'armement du bateau ne serait peut-être plus indiqué pour mettre en pleine évidence l'hypostase d'une divinité maritime.48 L'
importance fonctionnelle du gouvernail (rame), qu'on peut bien classer parmi les symboles “archaïques” de l'humanité comme un symbole signifiant de l'expérience gagnée sur les mers, justifie l'utilisation allégorique large du mot ἱμματος, gouvernator, gouverneur. Déjà Homère utilise le gouvernail, ou à proprement parler le mot ἐρετμόν (rame), de façon métonymique pour désigner le navire entier ou les occupations nautiques: dans la Nekyia l'âme d'Elpénor demande à Ulysse de πηχαίες ἐπι τούμβῳ ἐρετμόν (λ. 77), tandis que plus bas (λ. 119 sq.) l'âme de Tirésias, lorsqu'elle prédit à Ulysse ses futures aventures, lui précise qu'après la Mnestérophonie, λαβὼν εἴδης ἐρετμόν, il devra errer longtemps loin de la mer jusqu'à rencontrer des hommes qui prendront la rame pour ἀθηρηλωγόν (pelle à grains); c'est là qu'Ulysse devra enfoncer la rame dans la terre et accomplir ensuite des sacrifices de purification, qui le délivreront enfin de la colère de Poséidon. Dans ce dernier passage la rame acquiert en plus le caractère d'un ex-voto. Selon les sources —surtout littéraires— rame et gouvernail faisaient partie des ex-votos nautiques par excellence: S'Agamemnon, par exemple, dédie son gouvernail (πηδαλίον) au temple d'Artémis à Samos (Callim., Hymn. Dian., 228 sq.), Kanopos, le gouverneur du navire de Ménélas, dédie ses gouvernails (οἰων) au temple d'Athéna et Poséidon à Lindos (FGrH, 532 B, 12); de même, d'après Ampelius (Liber memorialis 8.5), au temple d'Apollon à Sicyone l'on pouvait contempler, parmi d'autres ex-votos, les “remi Argonautarum [cum] [et] guber- naulis…”.

Pour clore cette brève parenthèse sur l'utilisation symbolique du gouvernail (rame), ajoutons également que sa dimension cultuelle se voyait majorée considérablement par son contact permanent avec l'eau purificatrice de la mer. C'est, du moins, ce qu'exprimaient les croyances ultérieures, dont a découlé l'expression proverbiale «ἀγνότερος πηδαλίον ἐπὶ τῶν ἀγνῶς βεβιωκότων, πάρ’ ὁσὸν ἐν θαλάσσῃ διὰ παντὸς ἵστι τὸ πηδαλίον» (Suda 1, 30, no 281, 10 sq.).

Le schéma iconographique d'après lequel fut exécutée la scène des empreintes de la Canée révèle une structure claire et additive, habituelle dans la représentation des divinités: divinité plus attribut (-s) ou symboles. La rame-gouvernail et le bateau rendent la mer au domaine propre d'influence de notre déesse. Qu'elle soit de plus liée au cercle de la végétation (cf. supra) ou qu'elle ait représenté dans les conceptions théologiques minoennes une divinité autonome, protectrice exclusivement de la navigation, il est bien difficile de l'affirmer. Ce qui est certain, en tous cas, est la volonté du graveur de lui donner le plus clairement possible l'hypostase maritime.

Le fait que la sauvegarde en mer ait été confiée en premier lieu à une divinité féminine ne nous surprend guère, étant en harmonie avec la ligne “matriarcale” du panthéon minoen. Sans prendre ici le risque de donner un nom concret à notre déesse, signalons qu'elle préfigure, d'une certaine façon, les traits maritimes d'Amphitrite et d'Aphrodite, cette dernière vénérée sous les épithètes Εὔπλοια, Ποντία, Λυμένια, Ναυαρχις.

Nous reviendrons sur Amphitrite à la fin de notre communication. Quant à
Aphrodite, son premier concept a pu être formulé déjà au 2ème millénaire av. J.-Chr.: on l’a reconnue en particulier en la “déesse aux colombes” de Mycènes (cf. supra), qui est représentée frontalement, dénudée comme notre déesse de la Canée, et pressant son sein, selon un schéma sémitique, caractéristique pour la déesse de l’amour Istar-Astarté. En revanche, c’est en rapport avec l’hypostase maritime d’Aphrodite que fut placée la scène d’une empreinte de sceau de Cnossos (Fig. 4d) représentant une figure féminine allongée sur un motif d’écailles, qui rend —semble-t-il— en langage conventionnel l’ondulation de la mer. On a suggéré pour cette figure une “Lady of the sea” se reposant sur les vagues, ce qui a conduit certains à lui attribuer, bien qu’anachroniquement, l’épithète ἀφ Peye-veia.

Suivre nos réflexions sur la recherche d’Aphrodite au 2ème millénaire av. J.-Chr. dépasse le cadre de notre communication. Mais avant de confronter notre déesse maritime au Poséidon du Linéaire B, je considère comme nécessaire de souligner l’importance de l’île de Cythère pour l’ancienneté du culte d’Aphrodite dans l’Egée: son épithète Κωδερεώ dans l’Odyssée et dans les Hymnes homériques la relie étroitement avec l’île, et selon Hésiode (Thèog. 188-193) c’est par Cythère qu’elle passa aussitôt après sa naissance, avant que le Zéphyre ne la pousse vers les côtes de Chypre. Pausanias (III. 23.1) nous informe qu’Aphrodite Ourania possédait à Cythère son sanctuaire le plus ancien et le plus respecté de toute la Grèce et une image de culte, qui la montrait armée, tandis qu’Hérodote fait remonter l’érection de son temple aux Phéniciens (I. 105.3) témoignant ainsi du caractère très ancien et de l’origine orientale de son culte.

Déterminer quand et comment s’est effectuée l’“introduction” d’Aphrodite orientale dans l’Egée n’est pas aussi évident que l’on croit, d’autant plus que ses aspects cultuels sont à détecter chez les Créto-mycéniens, bien que de manière fragmentaire, tout au moins dès le début du Bronze Récent, ce qui s’oppose à une “introduction” par les Phéniciens à l’aube de l’époque historique. En modifiant alors nos considérations, il est préférable de penser plutôt à une influence graduelle ou à une adaptation de ses traits aux schémas religieux préexistants dans l’Egée. La présence phénicienne à Cythère est loin d’être archéologiquement prouvée; en revanche, les fouilles récentes y ont mis au jour une colonie minoenne florissante, contemporaine de notre déesse à la rame -gouvernail et du cycle iconographique apparenté. Les Minoens ont sûrement transplanté leur panthéon jusqu’à Cythère inaugurant ainsi une tradition cultuelle, dans laquelle doivent —à mon avis— s’inscrire aussi les références littéraires concernant la haute antiquité du culte d’Aphrodite.

A partir de la seconde moitié du 2ème millénaire av. J.-Chr., lorsque le contrôle sur les mers passa graduellement aux Mycéniens, les tablettes du Linéaire B de Cnossos et de Pylos attestent le nom de Poséidon. Particulièrement fréquente est la mention de Poséidon à Pylos, où il semble être la divinité principale. Il serait important pour notre sujet de savoir, si et à quel degré le dieu possédait déjà à cette époque son hypostase maritime, telle qu’elle nous est
familière depuis Homère. La question pourrait être élucidée par l’étymologie de son nom, mais là les opinions divergent : la thèse la plus répandue reconnaît en lui un πόσις δᾶς (maître, conjoint de la terre),

cest-à-dire une divinité principalement chthonienne. C’est du moins l’aspect que nous confirmes ses épithètes homériques ἐν(ν)οιξθην, ἐννοιγας, γανήχας, son épithète ἐννοιδας chez Pindare (Pyth. 4, 33) ainsi que sa relation cultuelle avec Déméter. Ces épithètes chthoniens sont, sur toute vraisemblance, préfigurés par le mot Enesidaone, un hapax mycénien dans la tablette KN M 719 de Cnossos. Cependant les partisans de l’“aspect chthonien” n’ont pas manqué d’attirer l’attention sur la liaison du dieu avec l’élément aquatique, spécialement avec les eaux souterraines, les sources et les fleuves, liaison qui, d’après eux, mena à l’expansion de sa souveraineté sur les mers. L’aspect aquatique fut poussé au premier plan par une autre proposition étymologique selon laquelle le deuxième composant du nom du dieu est l’indoeuropéen *da, dans le sens “eau coulante” (sources, fleuves), au lieu de da = terre. On a ainsi pu reconstituer un πόσις (conjoint, seigneur) des Eaux. Enfin, une troisième étymologie —moins convaincante— reconnaît dans le Poséidon mycénien une divinité proprement maritime tirant son nom de ponti-dahos, qui désignerait le seigneur des voies maritimes ; toujours d’après la même proposition Enesidaone de Cnossos signifierait, par analogie, le seigneur des vagues.

Quelle que soit l’étymologie correcte, et par conséquent l’hypostase originale du dieu, je placerai volontiers sa liaison étroite avec la mer déjà dans l’époque mycénienne, ce qui expliquerait d’une manière satisfaisante son aspect maritime bien établi chez Homère, à côté de l’aspect chthonien. Par ailleurs, dans l’état actuel de nos connaissances sur le panthéon du Linéaire B, aucune divinité autre que Poséidon ne revendique de plein droit la suprématie sur les mers, sans que l’on puisse exclure, bien entendu, une coexistence d’autres divinités d’hypostase analogue.

Tenant maintenant compte du rôle fécondateur que la Crète joua pour la formation de la religion mycénienne, il me paraît tout à fait légitime de penser que les Mycéniens, outre l’expérience des Crétois sur la navigation et l’architecture navale, adoptèrent aussi —peut-être via les Cyclades — la déesse maritime. Notons que la fameuse tablette de Pylos PY Tn 316.2 consigne, parmi d’autres divinités, une déesse Posidaeja (un hapax), en laquelle les mycénologues ont reconnu presque unanimement le pendant féminin de Poséidon, autrement dit sa parèdre. Une scholie à l’Odyssee nous informe qu’Amphitrite comme conjointe de Poséidon portait l’épithète Ποισιδωνία, ce qui nous pousse à entrevoir dans la Posidaeja mycénienne une déesse maritime, subordonnée à Poséidon, si l’on en juge par la formation de son nom. Il est donc justifié de se demander si derrière Posidaeja “se cache” la déesse maritime des Minoens, la déesse à la rame-gouvernail.

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Notes


2. Hallager-Vlasakis, op. cit., p. 3 sq., fig. 1a, pl. I, III.
3. Dans les reproductions graphiques de la scène, Hallager - Vlasakis, op. cit. fig. 1a, pl. III, on a donné à l'objet oblong la même taille qu'à la figure féminine, mais comme les auteurs l'observent avec raison, jugeant d'après les empreintes mêmes, "the height of the pole may exceed that of the woman and it may disappear outside the limit of the seal impression".
4. Evans, PM I, p. 160, fig. 115; Nilsson, MMR: p. 256, fig. 123; V.E.G."Kenna, Cretan Seals (1960), p. 125, no 250, pl. 10(250); Hallager - Vlasakis, op. cit., p. 4 sq.
12. S. Alexiou, Μινωικής Πολιτείας (1969), p. 120 sq. Cf. aussi l'interprétation d'Evans pour la bague de Minos (infra, et fig. 3b), sur laquelle sont représentés trois sanctuaires littoraux, PM IV, p. 950: "The subject on the bezel of the ring may be briefly described as the passage of the Goddess from one rock sanctuary to another across an intervening stretch of sea".
13. Voir par exemple le voyage maritime sacré d'un couple sur la bague CMS I, no 180 de Tirynthe


15. C. Davaras, Guide to Cretan Antiquities (1976), p. 326, fig. 189; idem, ancre min., p. 71; Morgan - Brown, op. cit., p. 640, fig. 22.

16. Sur l'authenticité du sceau: Onassoglou, op. cit., p. 35; à ses arguments on ajoutera la présence de deux rames-gouvernails, comparable avec un seul exemple dans la “frise de la flotte” d'Akrotiri.

17. Depuis Evans, PM IV, p. 947 sq., fig. 917, pl. LXV, c'est surtout N. Platon, qui a argumenté en faveur de l'authenticité de la bague: Τό χρυσό δαχτυλίδι τοῦ Μήνας, Ροτόντα 4 (Janvier 1978), p. 434 sq.; idem, The Minoan Thalassocracy and the Golden Ring of Minos, dans Min. Thalassocracy, p. 65 sq. A ses arguments il faut maintenant ajouter la frappante identité formelle entre la rame-gouvernail de la bague de Minos et celles de la frise d'Akrotiri et des empreintes de la Canée, que le falsificateur ne pouvait naturellement pas connaître; identique est en outre la manière, dont les rames-gouvernails sont maniées. Toutefois, le falsificateur aurait pu se servir comme modèle des parallèles iconographiques égyptiens. Sur la bague de Minos, la mer est représentée par un motif d'écailles, habituel dans la Canée, sortie d'une bague sphragistique, E. maye, et la poitrine ne saurait être visible étant couverte par la main de l'empreinte, que le falsificateur n'était pas attestée jusqu'à la découverte toute récente de la “Master Impression” de la Canée, sortie d'une bague sphragistique, E. Hallager, The Master Impression, SIMA 69 (1985), p. 16, fig. 11, 18; or, ce nouveau document fournit un argument supplémentaire en faveur de l'authenticité de la bague. Cf. aussi les articles de P. Warren et de I. Pini, dans Hommage à N. Platon (à paraître).


21. Evans, PM II, p. 249 sq; IV p. 679, 950 sq.; Nilsson, GGR3I, p. 300: “Sie ist eine Meeressgöttin oder eine Göttin der von den Minoern eifrig betriebenen Schiffahrt”; Ch. Picard, Les religions préhelléniques. Crète et Mycènes (1948), p. 80, 110; Platon, op. cit.(Min. Thalassocracy), p. 67; “It must be considered certain that the Minoans believed firmly that their thalassocracy, with its conspicuous prosperity in commerce and navigation, was assured by the protection of the Great goddess in her special role of a Sea-goddess”.

22. P. Warren, Of Squils, dans Aux origines de l'Hellénisme. La Crète et la Grèce, Hommage à H.


24. Des conceptions religieuses pareilles nous sont évoquées par la combinaison de navires avec des branches, attestée déjà dès l’époque protopatiale à travers la glyptique de sceaux: CMS II (2), no 276; Marinatos, marine, cat. nos 31, 32, 37, 39, pl. XV. On retrouve la même combinaison dans les sceaux “talismaniques”, Onassoglou, op. cit., p. 31.

25. Evans, PM II, p. 277; idem, loc. cit. (supra n. 22); Davaras, ancre min., p. 68 sq. avec la bibliographie antérieure.


27. Evans, PM I, p. 517 sq., fig. 377-80.

27a. A. Mosso, Ceramiche neolitiche di Praisos e vasi dell’epoca minoica primitiva, Mon. Ant. 19 (1908), col. 151 sq., fig. 8-12; Evans, PM I, p. 37, 519 sq., fig. 12 (6a), 13 (3). D’après Evans, ibid. p. 37, “it seems probable that these objects had served a votive purpose in connexion with the little image”.


40. Nilsson, GGR 1, p. 583.


42. G. Karo, Die Schachigräber von Mykenai (1930-33), p. 48, no 27, pl. 27.


46. Davaras, ancre min., p. 47 sq., en particulier p. 67 sq.

47. A. Gottlicher, Nautische Attribute römischer Gottheiten (1981), en particulier p. 8 sq., 211 sq.,

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pl. II, IV-X, XIV, XVII. Le type d'Aphrodite s'appuyant sur une rame est attesté au 3ème siècle av. J.-Chr. à travers des terres-cuites grecques, ibid. p. 9. Une série d'empreintes de sceaux de Délos (non publiées) datant du 2ème - 1ère siècle av. J.-Chr. montre une variation du même type (information fournie par mon collègue N. Stampolidis). Partant d'un relief en tête de décret (Egine) — LIMC II 1 (1984), p. 283, no 805*, s.v. Apollon — A. Delivorrias interprète le type de la dite Héra Borghèse comme Aphrodite à la rame (à paraître); or l'association de la déesse avec cet attribut nautique peut remonter au moins jusqu'à l'époque classique.


51. Wachsmuth, op. cit., p. 135 et n. 228-229.

52. Ibid., p. 218 sq.


54. Nilsson, GGR 1, p. 350 sq., 300 sq., 520; idem, MMR 2, p. 397; Picard, op. cit., p. 110; Simon, op. cit., p. 239, fig. 225-226.

55. Evans, PM IV, p. 955 sq., fig. 925.

56. Evans, loc. cit.; Sp. Marinatos, Αἱ θαλασσογραφικαὶ παραστάσεις τῆς κρητομυκηναϊκῆς ἐποχῆς, ΑΕ 1930 (1931), p. 116 sq.; Hallager, op. cit., p. 16, fig. 11, 18. Comparer toutefois une variation de ce motif qui désigne, bien que très rarement, des rochers, Evans, PM IV, fig. 597 A (e).


60. Hom. Od., θ 288; σ 193. Hom. Hymn. Ven. (V), 6, 175, 287; (VI), 18; (X), 1.

61. Coldstream - Huxley, op. cit., p. 36.


62. Comparer l'explication proposée par Coldstream - Huxley, op. cit. (n. 59), p. 36: "It is conceivable that Phoenicians, at some time unknown, adapted for their own purposes and brought to Kythera a cult of an originally Minoan dove-goddess".


Fig. 1: a-b, “la déesse à la rame-gouvernail”, empreinte de sceau de la Canée.

Fig. 2: a, Tesson de Phylakopi I. b, Navire orné, “frise de la flotte” d’Akrotiri.

Fig. 3: a, La bague de Mochlos CMS III 3, no 252. b, La bague de Minos. e, Empreinte de sceau d’Hagia Triada. d, Sceau de Makrygialos. e, Le sceau de la Collection Stathatos CMS I Suppl., no 167. f, Le sceau CMS VII, no 72.

Fig. 4: a-c, La “Maitresse des Poissons”, (a, Sceau à la Collection Piet de Jong; b, Le sceau CMS II, no 327; e, Le sceau CMS II, no 344). d, Empreinte de sceau de Cnossos.
SOME REMARKS ON THE MEDITERRANEAN AND RED SEA SHIPS IN ANCIENT AND MEDIEVAL TIMES: A PRELIMINARY REPORT

The difference in shipbuilding between the Mediterranean and the Red Sea vessels in ancient and medieval times has been a topic of many discussions; but the scope of these discussions has been limited to the use of iron fastening in the construction of ships in the Mediterranean in contradistinction to the fastening by stitching the planks with fiber used in the Red Sea and the Indian Ocean. (To mention a few scholars: J. Hornell, Richard le Baron Bower, G. Hourani, L. Casson, and more recently N. Chittick and Patrice Pomey. The last one shows that sewn boats were also used in the Mediterranean in Roman times).

The aim of the present paper is first to offer a cursory examination of the main problems concerning the differences between navigation in the Mediterranean and the Red Sea and second to discuss in particular three of an array of problems which have remained obscure, i.e., the differences in the construction of cabins between Eastern Mediterranean and Red Sea - Indian Ocean going merchantmen in medieval times, the use of oars in the same type of vessels in both areas, and the lookout men.

Navigation in the Mediterranean in ancient and Medieval times with all its relevant problems (construction of ships, crews, equipment, etc.) has been thoroughly studied. In contrast, the study of navigation in the Red Sea and the Indian Ocean at the same period has been inadequate. It must be noted that while certain progress has been accomplished in the research of the construction and equipment of the ships used by the Arabs, Ethiopians and Indians in the Red Sea and the Indian Ocean in antiquity and later times, the paucity of sources has prevented any systematic work on the types of ships used by the Ptolemies, the Romans and the Byzantines in these seas. The lack of any concrete information about the type of ships used by the Ptolemies in the Red Sea is well illustrated in the description of Cleopatra's plan to escape through the Red Sea to Ethiopia after Octavian's victory in Actium (31 B.C.). According to Plutarch, Cleopatra ordered a fleet to be carried across the Isthmus of Suez, but the first vessels that were carried were burnt by the Nabataean Arabs. Dio, on the other hand, reports that Cleopatra's vessels, some of which were burnt by the Arabs, were not carried but built on the Red Sea coast, being especially constructed to sail in its rough waters. If Dio is correct, and most probably he is, then it is obvious that Cleopatra decided to have ships built on the Red Sea coast in order to have them constructed in the best way for sailing in the Red Sea. The contemporary Arab sailing boats are built either on the ports of the Red Sea or on other ports of the Indian Ocean.

In Aelius Gallus' ill fated expedition of 25 B.C. there is somewhat better information concerning Roman ships used in the Red Sea. He initially built a fleet
of 80 biremes (δίκροτοι), triremes and phaseli; but when he realized their unsuitability in the Red Sea he constructed instead 130 cargo carriers.5

The Byzantine sources reveal that Byzantine ships were stationed in Clysma (Ar Qulzum), the chief trade port near modern Suez and the abbess Aetheria, who visited Sinai in the sixth century, reports that a number of Byzantine ships retained their control of the trade traffic of the Red Sea at this time.6 In the Pratum spirituale (6th c A.D.) there is mention of Byzantine monks who sailed from the port of Raithou to the Red Sea and engaged in fishing.7 The Synaxarion Constantinopolitanae, describing the shaughtering of the Byzantine monks of Sinai in the 4th century by the Blemmyes, states that the Blemmyes sailed in large pirogues (ξύλοις μεγάλοις) and confiscated a Byzantine ship (πλοῖον) in Aila (modern Aqaba).8 Unfortunately, none of these sources offer us any details about the nature of Byzantine ships, their places of construction and their types.

Interestingly enough the 4th century byzantine authors Palladios and Procopios10 (6th c. A.D.) describe the India bound Arab and Indian ships constructed by stitched planks but are mute about the Byzantine ships of the Red Sea. We can assume that all or some of them must have been constructed in the shipyards of Alexandria, then carried dismantled to the Red Sea and/or that Byzantine ships were constructed by the Red Sea with imported Malabar wood.

To turn now our attention to the comparison between the Mediterranean and the Red Sea vessels it must be emphasized that the scope of the present paper is only limited to the comparison of few conspicuous points.

The first is the use of special cabins for passengers in the two above mentioned categories of vessels. Concerning the Mediterranean merchantmen there is ample literary information about a unique ship, Heros's monstrous ship (3rd c. B.C.) in which a number of luxurious cabins appear prominently, but we know little about the ordinary passenger freighter vessels in the Hellenistic and Roman periods.11 In the Roman ships most of the passengers accommodated themselves on deck which at times could be open and other times partly covered by small shelters as the literary and iconographical evidence show (Fig. 1).

The coast-wise, sailing Mediterranean merchantmen— which could carry as many as 500 people— needed not sheltering cabins, since the crew and the passengers often dined and lodged on land.

Ashburner in his edition of the Rhodian Sea Law expresses the opinion that in the Byzantine ships there were no cabins. He based his argument on the Rhodian Sea Law in which there is a reference to small dwelling places for passengers, three cubits in length and one in breadth.12 I believe that this was actually a general accommodation, but there is positive evidence that as in earlier times the captain and the most wealthy passengers who paid higher entrance fees secured special cabins.13

The Geniza documents written in the 10th - 11th centuries A.D. supplement the information we get from the Byzantine sources. S. Goitein states in his book Studies in Islamic History and Institutions (1966): “One gets the impression (from
the Geniza documents) that in many cases the passengers actually slept on top of the bales entrusted to them”. Thus a Jewish merchant writes in a tenth century letter, “I intended to travel in it (boat) upon the consignment of my lord”. In another letter of the same period we read, “He let someone else (instead of himself) travel on top of his consignment and go to Mahdiya”. Thus we notice the existence of assigned spaces for the goods and passengers in the Mediterranean bound ships. But Goitein in a later work (1973) mentions a Geniza document of the 10th - 11th century, referring to a mediterranean ship where there are clear indications of a cabin: “We three stood on a cabin on the uppermost part of the ship and did know how to escape. People from below, called us saying come down quickly”.

Unfortunately, underwater archaeology does not offer us any clues on the problem of the cabins. Living quarters for example were pinpointed in the Serçe Liman shipwreck of the early 11th century, but no details about them could be detected.

The cabins which were a rarity in the Mediterranean seemed to be a common practice in the Indian Ocean going vessels. In the Geniza documents there are many references to such cabins in the Indian Ocean going vessels, which are usually called “bilj”. In the modern Arab ships of the Red Sea bound to India—in which some obvious similarities with the old vessels obviously appear—passengers are placed in closed cabins called dabusa, on the poopdeck.

Moslem iconographic evidence provides us with ample information concerning cabins of the Red Sea-Indian Ocean vessels, but it is mute on the cabins of the Mediterranean vessels. Interestingly enough depictions of passengers on uncovered decks of Phoenician two-banked ships appear in a relief from the palace of Sennacherib, dated from the 7th c. B.C. (Fig. 3). It is not known whether this Phoenician tradition of placing passengers on the second unsheltered bank of Mediterranean transports was transmitted to the Moslems. Arabic iconography offers us two excellent illustrations from the 13th c. manuscript of Harivi. (Figs. 4, 5). In both we notice two overimposed decked floors, and on the upper level well defined round windows where the busts of wealthy merchants are portrayed.

It should be noticed that in a manuscript of the Materia Medica, dating from the 13th century, which presents a boat on a river, there are two superimposed covered decks above the lower level of oarsmen (Fig. 6). In the two illustrations of Hariri’s manuscripts we notice over the main deck a luxurious pavillion for the shipowner and/or his agent. The same type of pavillion appears in a Persian manuscript illumination of an India bound ship (Fig. 7).

One illumination of the Hariri manuscript and that of the Persian manuscript (Figs. 4, 7) clearly depict the look out man on a small box-like structure on the top of a pole, which is often the main mast of the ships. References to such look out men frequently appear in the Arabic sources as well as in the Byzantine, but no artistic depiction of look out men appear in Byzantine iconography.

While the use of watchmen mounted on the top of a mast are common in the Mediterranean Sea in ancient and Medieval times, the emphasis placed on them in
the India bound vessels depicted in the Moslem manuscripts betray the great importance they had in these ships.

The last problem to be examined is now the use of oarsmen in the Mediterranean and Red Sea merchantmen. It is well known that in contrast to the Mediterranean warships which were propelled mainly by oars, the Mediterranean merchantmen moved by sails and only a small number of oarsmen were used for the special maneuvering needed when the ships entered the ports or in cases of emergencies. Small boats attached to the mediterranean merchantmen also frequently appear in iconography and are mentioned in the literary sources (fig. 1).

The India bound Red Sea ships were traditionally accompanied by such little boats but in an illumination of the Hariri manuscript we also notice a number of oarsmen (Fig. 5). A careful examination of this illumination reveals that the oarsmen, whose use in the Indian Ocean was usually avoided because of the shortage of drinking water, were in action because of an emergency, i.e., the obvious breaking of the sails (Fig. 8).

This discussion will continue in the second Symposium on “Ship Construction in Antiquity”, to take place in Delphi, in August 1987.

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Notes


2. Plutarch, Lives, Antony, LIX, 3: «τοῦ γὰρ εἰργοντος ὥσπερ τὴν ἐρυθρὰν ἀπὸ τῆς κατ’ Αἴγυπτον ὀθάλος καὶ δοκοῦντος Ἀσίαν καὶ Δυσῆν ὀρίζειν... ενεχειρήσαν ἀράσα τὸν στόλον ὑπερνεώλησα, καὶ καθεῖσα τὰς ναῦς εἰς τὸν 'Αραβικὸν κόλπον μετὰ χρημάτων πολλῶν καὶ δυνάμεως ἐξω κατοικεῖν, ἀποφυγοῦσα δουλεῖαν καὶ πόλεμον. ἐπὶ δὲ τὰς πρώτας ἀνέλκομεν τῶν νεῶν οἳ περὶ τὴν Πέτραν Ἀραβεῖς κατέκαυσαν...».

3. Dio, Roman History, LI, 7: «Ἐν δὲ ταύτα ἐγίγνετο, τὰς τε ναῦς τὰς ἐν τῷ Ἀραβικῷ κόλπῳ πρὸς τὸν ἐς τὴν ἐρυθρὰν ἠλάσαναν πλοίου ναυπηγηθείσας οἱ Ἀράβαιοι, πεισθέντες ὑπὸ Κυντου Διδίου τοῦ τῆς Συρίας ἀρχιτός, κατέκαυσαν...»


5. Strabo, 16. 780.


Novembris (Brussels, 1902), 390-91.


11. Athenaeus, 5.207c - 207f.


17. According to Goitein (above note 14, p. 481), the word “bilij” is Malayan.

18. For the Arab navigation in the Red Sea and the Indian Ocean see my forthcoming articles “Milaha” in EP and “Moslem Navies” in the Dictionary of the Middle Ages.

19. According to T.M. Johnstone and J. Muir, “Some Nautical Terms in the Kuwaiti Dialect of Arabic”, BSOAS 27, 303, these cabinets are only for women; but see H. Grosset-Grange, “Comment naviguent aujourd’hui les Arabes de l’océan Indien? Arabica 19 ( ), 61: “dabuseh, chambre sous dunette, seu local fermant à clef; on y dépose les vivres et on y loge les passagers.”

Captions

Fig. 1. Cargo vessel entering the harbour of Rome. Cover partly sheltering the passengers. Ca. A.D. 200 Relief in the Torlonia Museum, Rome. Casson, Ships, Fig. 146.

Fig. 2. Modern Arab Dhow. A. Villiers, Men, Ships and the Sea, Washington D.C. n.d., 44-45.

Fig. 3. Phoenician two-banked transports, ca. 700 B.C. The passengers are placed on the upper deck. Relief from the Palace of Sennacherib. A. Fayard, The Monuments of Nineveh (London), 1849, pl. 78.

Fig. 4. Moslem merchant ship illumination. The Hariri Ar. MS 5847, A.D. 1237. National Library of Paris, Axial stern rudder, Look-out man, Well defined Cabins, Long raking stern. The World of Islam, ed. B. Lewis (London, 1976), Fig. 15.

Fig. 5. Passengers in clearly defined cabins. Crew of a cargo ship. Illumination. Hariri Ar. MS. The World of Islam, ed. B. Lewis (London, 1976), Fig. 23.

Fig. 6. Arab boat on a river. Passengers on the upper sheltered decks. MS of the “Materia medica” Mesopotamian, 1222/23. M. S. Dimand, A Guide to an Exhibition of Islamic Miniature Painting and Book Illumination, (New York, 1933-1934), Fig. 4.

Fig. 7. Moslem vessel endings in an animal’s head. Look-out boy. Special pavilion. Persian MS. A.H. 924.

Fig. 8. Simplified form of the Hariri illumination, fig. 5.

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THE TRIERES, ITS DESIGN AND CONSTRUCTION

Until the construction and shape of ancient Mediterranean round ships had been established by underwater archaeologists and that knowledge had been extended to some long ships by Honor Frost, a number of possible designs for the trieres could have been, and were, reasonably proposed. Increasing evidence for substantially uniform and widespread ship forms and building techniques in the Mediterranean, modified only slowly over the centuries, supports the view that these forms and techniques were employed in building triereis.

The hull of a trieres must accommodate three files of 27, 27 and 31 oarsmen on each side of the ship at a known longitudinal spacing between each man. The length and breadth of the ship was limited by the known size of the ship sheds in which triereis were kept. Given that the Greek trieres had an outrigger for the thranite oars, the weight and centre of gravity of a suitable hull conforming with the underwater archaeological evidence can be calculated within usefully close limits.

To the weight of the hull has to be added that of 200 men, hull furniture, oars and equipment, raising the preliminary estimate for total weight to between 45 and 55 tonnes. To be strong enough in longitudinal bending, the undocked wooden hull of a ship of that displacement and about 37 metres long would have to be more than 2 metres deep: 2.5 m. was a more likely depth.

Turning to the arrangement of oarsmen (Fig. 1), each working an oar generally of the same length in each file, it became necessary
1. to limit the slope of the thranite oars to the water
2. to avoid top heaviness of the whole ship.

As oar length was known, taking $35^\circ$ as a reasonable limit for that slope and an oar gearing of about 3:1, thranite seats could be placed about 1.4 m. above the water, as a maximum. The draft of a hull of the ancient shape displacing about 50 tonnes with the length and breadth required would be about one metre, so it looked as though the hull proper would have to extend upwards as far as the thranite seats if it were to be strong enough. It would follow that zygian oars would have to work through ports in the side of the hull.

It was also evident that oarsmen in each file must overlap the others vertically and to the greatest possible extent. That called for tholepins to be from a quarter to half a metre outboard of those in the file below. If then, as evidence on the Greek triereis requires, thranite tholes are placed in the outrigger which can be no more than 2.7 m. from the middle line of the ship, and looms of oars are one metre long, the thranites could sit no more than two metres from the middle line. Hence, working down the files and allowing for other interferences, the thalamians would be no more than one metre from the middle. Their tholes would be no more than 1.9 m. from the middle of the ship. Those tholes would be well inside a hull of ancient section and of the right displacement and gunwale beam. Such a position
for thalamian tholes would explain the extraordinary size of the ports near the waterline shown in the Ruvo Vase. The large ports also emphasize the need for askomata to keep the water out.

The waterline beam of this conjectural hull would be 3.8 m + 0.1 m. Now beam on the waterline is the most powerful factor governing the stability of a ship. In a slender ship like a trieres with plenty of weight high in the ship, it is a crucial dimension, and it already appeared to have been closely determined by the permitted overall beam and the necessities of the arrangement of the oarsmen. Would the trieres have to be ballasted to be reasonably stable?

Elementary dynamics indicate that a ship whose principal weapon is a ram should be as agile as possible and therefore have the smallest possible mass and mass moment of inertia relative to available propulsive force. Ballast would be most undesirable.

Fortunately it transpired that the emerging design for the trieres, with a waterline beam of 3.8 m. had a satisfactory metacentric height of over half a metre. On a displacement of about 50 tonnes, such a ship could carry a sail of nearly 100 square metres, rigged in the manner of the time.

It may be expected that the stiffness required of a trieres is determined by its sail carrying capacity, because no great numbers of soldiers were carried on board. It appears therefore that the trieres needed nor carried ballast as a general rule. Triereis would not then have sunk to the bottom, as laden merchantmen would, when overwhelmed by wind or seas or when rammed in battle. That could explain why no wrecked triereis have yet been found and why the chances of finding any in future are not very great. It also diminishes objections to building a replica before such a wreck has been found.

There is little scope for much alteration in waterline beam. By straightening the side of the hull and pushing the shell away from the thalamian tholes to the practical limit, the waterline beam could be increased to 3.9 m. If less than 3.7 m. stability is deficient.

Thus the mid-section of the trieres hull is closely determined with a fair degree of certainty by four factors:
1. the given overall beam
2. the arrangement of oarsmen necessary to accord with evidence in a practicable manner
3. the close determination of the waterline beam
4. the wineglass hull section of the ships of the period. There is plainly scope for variation, as there must have been from ship to ship, but it does seem that that scope, for Greek triereis housed in the Piraeus sheds, is confined to variations of the order of centimetres.

The hull lines of bow and stern are determined by
1. the room needed to accommodate the oarsmen at each end of the two lower files
2. long keel cut-ups to assist rapid turning and reduce hull bending on launch
or slipping.

3. an easy run of planking, erected shell-first.

4. the need for sharp ends to avoid unnecessary wave-making at higher speeds.

That the last is a real determinant is shown by the effective propulsive power required to achieve the known maximum speed that could be maintained for 24 hours or so continuously. Ship model towing tests of the replica made here in Athens recently indicate (Fig. 2) that at 7.5 knots an effective power of 10 kilowatts will be required. At a somewhat conjectural propulsive efficiency of 60% that would call for 100 watts (0.13 H.P.) from each oarsman, a demanding performance. As wave-making generates a significant part of the total resistance at that speed, bow and stern do need to be as sharp as other factors allow.

The hull shape is indeed extreme for an undecked wooden vessel of 50 tonnes. Length is 15 times the depth, a ratio far exceeding any ever allowed by any ship Classification Society. Such a hull must be very well built if it is to survive longitudinal bending actions caused by waves at sea. The development of such an extreme design, at appreciable cost, must have been driven by a demand for the performance that could be obtained in no other way. It is likely that, in their developing years, triereis were built longer and longer until the expensive effects of length were found to outweigh its advantages, mainly speed.

The triereis could not have been made so long unless the planks of the hull had been joined edge-to-edge by large numbers of tenons as was usual in the ancient Mediterranean. Calculations of shear forces in the shell inseparable from variation of bending moment along the hull show that the plank tenons were heavily loaded in waves of heights which a triereis would certainly wish to avoid but which it could well encounter and survive. In this connection it may be recalled that in the Marsala long ships tenons were both thicker and more closely spaced than in the numerous round ships which have been excavated, reflecting the higher shell stresses in long ships. Loads on tenons due to bending of the hull are those necessary to resist the sliding of one plank upon the next. In parts of the triereis hull these loads are heavy, so we have tested specimens to investigate how tenons behave under such loads.

There are many references to triereis becoming heavy in the water, probably mainly owing to leakage caused by overloading of tenons and consequent working of seams as one plank did slide upon the next. Such troubles seem to have afflicted older ships more severely, as might be expected, and it may be surmised that naval sailors collectively paid a high price for the length of their ships in the labour of bailing, beaching, drying out and repitching their hulls. One may observe that no triereis would have survived for long if it had been frame-built: the later galleys of medieval times were indeed so built but they were not so slender, were fully decked and internally braced: they were altogether much heavier, slower, vessels.

The hypozomata, two loops of heavy rope 'well twisted from within', have long been a puzzle. It is clear from the attested length of each rope that the loops
extended over the length of the hull. The simplest and structurally most effective use for these ropes is to act as a stretched tendon straight down the middle of the hull, just under the beams and about half a metre above the flexural neutral axis of hull section. The tension carried by the four ropes twisted as in a tourniquet could be as high as 300 kilonewtons (30 tonnes force) and its effect is to reduce the maximum tensile stress in the gunwale when the ship hogs on the crest of a wave by about a third. In the keel, the corresponding compressive stresses are increased by about a fifth. What however is probably more important in the day-to-day working of a trieres, is the general longitudinal compression applied to the hull by the hypozomata. Plank butts would remain in compression in all but the more severe sea conditions which occur relatively rarely. Thus working of joints and so leakage would be reduced.

It is remarkable how the trieres emerges (Fig. 3) as a ship whose size and proportions were developed to the technical limit in all main respects, namely length, slenderness, propulsive power, stability, strength and weight. The interlocking nature of these attributes in any extreme design makes it hard to believe that any fundamentally different design of trieres conforming to the same evidence is possible.

To give a more general visual idea of the replica, here are some perspective projections made from the building drawings:

Fig. 4 — The replica coming out of conjectural fourth century B.C. Munichia.

Fig. 5 — A thranite's view as he works his oar.

Fig. 6 — A thalamian's view.

Fig. 7 — The stern with helmsman and trierarch.

Fig. 8 — The stern in the ship shed. The embarkation ladders are here being used by the dockyard workmen.

Fig. 9 — The bow of a trieres on a slip. here, to show the epotis beam and its heavy brace, the side deck and its bulwarks are shown removed for repair.

The construction of the ram follows the evidence of the ram found at Atlit. Fig. 10 shows a model of the timber structure in the replica, with the upper ram planking removed to show the stem of the hull proper: the ram in the replica is entirely external to the watertight hull. That scheme was adopted on account of the steep slope of the top surviving plank of the Atlit ram, (the foremost of the sloping planks in the detached portion in Fig. 10) indicating that it was not a plank of the hull proper.

Much the largest part of the development programme for the replica was the building in England of a tenth of the hull on full scale and to the specification of the replica itself. This was done to be certain that the replica could in truth be built today.

Fig. 11 is a view of the bottom shell, where may be seen the temporary steel fastenings used to enable the whole to be dismantled if that had been required by the builders in Greece. Lastly, Fig. 12 shows the trial piece afloat on the river.
Thames at Henley with the 15 oars manned and ready to be pulled. Like the small mock-up made in 1983, the trial piece has demonstrated that the oarsystem works if oarsmen can keep in time. The oars of the trial piece have been pulled at 40 strokes to the minute and with real power.

The trial piece is now here in Greece to assist the builders of the replica herself in their great task of building the whole vessel.

Those wishing to examine the design of this replica of the trieres in more detail are recommended to refer to the building specification for the vessel and its accompanying drawings. They are available from The Trireme Trust.

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THE PROBLEM OF THE BILGE AND THE PUMP IN ANTIQUITY

Perhaps the oldest reference about the use of a bilge pump is from Archimedes, when he attempted to use the water screw, which bears his name, for this purpose in the big ship built for Hieron II at Siracusa (ab. 250-220 BC). This could mean, that at the end of the third century BC there was no proper solution of how to get water out of ships, as this screw is not a satisfactory pump for this work.

Therefore we could date the invention of the chain pump to some time in the second century BC, since we have archaeological proof for this type of pump at la Cavalière, about 100 BC, and, for the second half of the first century BC, also at Los Ullastres and Cap del Volt. All these finds correspond to the simplest type of this pump, which had the disadvantage of squirting much water around. The wreck at Port Vendres I, first century AD, shows the solution to this problem; a second pipe in which the pistons return to the bilge, without wetting the hold. At Saint Gervais II, the wreck of ab. VI century AD, the use of this construction is confirmed and we can say the same of all later chain pumps, as there is only a substitution of materials; iron takes the place of wood for the pipes, and the chain the place of the rope. The system remains unchanged for bilge pumps till the beginning of the XIX century. It has, therefore been used for about 2.000 years. I have been informed verbally by Comandante Cazorla of the Instituto de Historia y Cultura Naval, Cartagena, Spain, that from the notes about spare parts which Columbus bought in the Canary Islands, one can see that his ships had chain pumps.

It is astonishing that there is no information about older bilge pumps, considering that big ships had been built for a long time in the BC period, as we can see from the one found near the Cheops pyramid and which is of ab. 2,500 BC. But this was a flat bottomed ship, without a bilge. The water had to be bailed with bailers or sponges, as the pumps, either the screw or the chain pump, leave a depth of about 10 cm. of water which they are not able to absorb and this would have
left much water and a big wet surface within the ship.

The situation changed when the ships became round bottomed and the water concentrated near the center, but the possibility of reducing considerably the wet surface within the ship came with the invention of the bilge, which demanded the use of a keel.

We have to remember that the keel did not exist at the beginning of any type of shipbuilding. Neither the flat-bottomed Egyptian ships, nor the ancient Chinese junks, or the oldest, but relatively modern Viking ships had a keel.

Construction by the shell first method does not need a keel. The reinforcement with floors and futtocks is sufficient, so long as they have flat or rounded bottom.

It was the necessity to construct a bilge that compelled the use of a thick central timber to take all the holes and mortises at different angles to fix the succeeding strakes. With the keel the ships got also the garboard on each side of the keel, a strake of special form and generally thicker than the others.

In principle we have the same problem and the same solution which the shipbuilders found when the ships changed from flat to rounded bottom: Thick timbers, the stem and stern posts received the ends of the strakes and offered the possibility of fixing them, closing the ship at both ends. The wrecks at Los Ullastres and Cap del Volt show this first construction. What we actually call the keel of these ships is only a central plank, thicker than the others, just sufficient to allow the union with the thick timbers forming the stem and stern posts.

One could even think that the water collecting in the narrow pit at the foot of the stern post, as soon as the ship raised the stem, gave the idea for the bilge.

If we observe the bilges of the Roman wrecks we know, we get the impression that these have been simply hung under the ship as something supplementary. In most cases there does not exist any union of the keel and the bilge with the floors, and often there are irregularities in spacing, leaving the floors without contact with the keel, and the limber holes without use, as the water can flow freely under them.

Once the ships had a bilge, the surface of water in the hold was reduced and therefore also the humidity. As soon as the water accumulated in the bilge it reached adequate depth to be bailed out with a pail. Later, with the ships getting higher, some sort of pump was necessary. This was so effective, that pumps were erected even in ships without bilge, as we have seen at Los Ullastres and Cap del Volt.

In the Roman wrecks we know, republican or imperial, we can see three different constructions:

One, ships without keel nor bilge, only with the thicker central plank to connect the posts at stem and stern (Los Ullastres, Cap del Volt), two, ships with a broad bilge, the keel without rabbet, only the upper edges cut oblique at 45° to receive a garboard of special form (La Cavalière, Palamós), three, those with a deep bilge, keel with rabbet and garboard rising ab. 65° (Dramont, La Madrague
de Giens). All these details refer to the central part of the ship.6

The Nemi ships do not enter exactly into this classification, but are similar to the type with a broad bilge.7

As we have now established the probable relation between pump and bilge, we can follow with other details, such as the possibility of use of other types of pumps, known in Roman times, of which four were found in the Dramont wreck.8 All these are of a special type of bronze force pump not known elsewhere. The lack of pipes or other elements and the insecurity of their situation in relation to the keel, leave the question open, whether these were equipment of the ship, or cargo. Technically it is improbable that there would be in a ship a group of four expensive pumps forming one unit, operated by two "sentinatores", as the more usual two piston fire pump would have done the same work better. From literary evidence (St. Paulinus of Nola ep. 49) we know of only one "sentinatores" in a ship and therefore we have to suppose that the type of pump used was driven by a single man.

This brings us to the question of the driving system of the wooden chain pump. The lack of illustrations showing the "sentinatores" working, and the literary evidence obliges us to suppose that the driving system was in the hold. We have therefore to think about a pump of limited height, sufficient to get the water out, but not bring it up to deck. This would be in concordance with the finds at Los Ullastres, where two fragmented lead pipes, which conducted the water from the pump to both sides of and outside the ship, as we can see from the ends of these pipes, were found resting on the amphoras of the lower layer, in a space where there was no upper layer. We suppose that this free room was occupied by these pipes, the upper part of the pump and the driving system, whether this was by hand or by foot.

Finally, we can consider the question of the humidity in the hold, probably the most important for this association of pump and bilge. We have shown that there have been bilge pumps in ships without bilges and that, owing to the construction of the pump, a residue of water, with a depth of ab. 10 cm. could not be taken out. In these flat rounded ships without bilge, 10 cm. could cover the floors. Even in the case when the water concentrated near the stern, the wet surface and the moisture in the hold would be excessive for many wares, especially if grain was transported under deck.

Only with a bilge could this wet surface and the moisture in the hold be reduced. Therefore we can suppose that the decisive motive for the creation of the bilge was the transport of grain and the use of a pump the logical result. This could explain why Archimedes tried in Siracusa, one of the grain exporting ports of antiquity, to use the screw to get the water out of the bilge of a big ship.

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Notes

1. Moschion, Archimedes, waterscrew in the ship build for Hieron II at Siracusa, probably 250-220 BC.
3. Foerster, F., 1979 Los Ullastres, Discovery of objects which may be a bilge pump in the wreck of the 1st. century BC. IJNA 8.2.: 172-4.
   1984 Considerations on the capacity of the Roman Bilge pump IJNA 13.4: 327-328.
   1981 Iberische Schiffe aus Christi Zeiten, Das Logbuch 1: 7-10.
   1982 El pecio de Cap del Volt, Vida Submarina 5; 47-56.
6. Foerster, F., 1983 Roman Naval construction, as shown by the Palamos wreck. IJNA 12.3: 219-228.

Captions

Fig. 1. Pieces recovered from Lake Nemi, after G. Ucelli.

Fig. 2. Inferior part of the pump recovered at Los Ullastres, IJNA, vol. 8. n. 2, may 1979.

Fig. 3. a. Reconstruction of a bilge pump based on the finds of Los Ullastres, IJNA, 8/2, pp. 172-174.
3. b. Reconstruction of a pump with pistons and chain with a combination of the parts found at Los Ullastres and Nemi.

Fig. 4. Bronze bearings recovered from Los Ullastres, 1980. Measurements in milimeters.
"PYRAMIDAL" STONE ANCHORS; AN INQUIRY

As with Trade Fairs, the success of Symposia is measured by the volume of goods or information exchanged. The information I gained at Piraeus, particularly through Capt. Anastassios Tzamtzis has modified my original title: "Ancient Warship Anchors; an Inquiry" by focusing the same ideas on a distinctive form of anchor which relates particularly to Athens, ancient and modern; I would—if he will permit me—like to associate Capt. Tzamtzis with this inquest on a new phylum.

It is now archaeologically axiomatic that each lost anchor marks the passage of a ship, consequently if the periods and "nationalities" of anchors can be established and their find-places marked on marine charts, this would give a picture of the sea lanes of antiquity and—even more interestingly—the nature, or the kinds of the ships that plied them. It is, for instance obvious that Bronze Age stone anchors weighing in the order of half a ton (one example weight well over a ton!) must denote giant craft, because: a, even one such anchor would sink a small boat; b, pierced-stones being very inefficient as anchors, it was impossible to use them singly: square-sailed ships had to carry complements of several anchors. Consequently in addition to the correlation between anchor-weight and ship size, the huge amount of space occupied by six large, flat slabs of stone is easily visualized.

The same does not apply to ships propelled by oars: a, because oars (and on occasion lowered mast) occupied most of the available space; b, being capable of rowing to shelter in an emergency oared ships were not forced to drop anchor in dangerous places as soon as wind turned against them (as were "round" ships with square sails); c, what deck-space there was often had to be kept clear, because again, unlike "round" sailing ships "long" oared ships were, potentially, fighting ships.

Various designs of ancient anchor would have been suitable for use on oared ships eg: the Byzantine iron anchors that could be used like grappling irons, space-saving lead and wood anchors with removable stocks (which lay flat when dismantled) and the identical "twin" stone anchors which are such a striking feature on certain Bronze Age sites on land (fig. 1) where it is evident that they were deliberately placed in architecturally symmetrical positions. What did this pairing represent? The answer is suggested by a 5th century BC simile in Pindar's 6th Olympic Ode, when he likens the athlete Aegesias of Syracuse to a ship: "Two anchors are good for a swift ship to rely on in a stormy night". The absence of identical pairs of stone anchors undersea on the many "anchor graveyards" (those ancient forced mooring places known to Mediterranean divers) is, of course, already explained by the fact that storms would not force swift oared ships, but only square-sailed "round" ones to moor on the nearest shallows. The Israeli coast being shelterless is, however, one long "graveyard" for every kind of wreck, which explains the single exception to date: the discovery there of a pair of
anchors, respectively inscribed with a port and a starboard steering oar (fig. 2). Within this general context, it was almost as a side issue that I drew attention to a neglected phylum of anchor: the pyramidal stone. These were anchors whose shape well qualified them for use on oared "long" ships. The design is reminiscent of the broad based Port-wine decanters introduced into the British Navy in the 18th century: unlike ordinary bottles they cannot topple over in heavy seas. Similarly, pyramidal anchors could stand upright on a moving vessel where unlike the archaic, bed-shaped eunae (ἐὐναι), they occupied —weight for weight— far less space.

Archaeological evidence relating to pyramidal anchors is —as yet— scarce, despite the fact that many of them “stared us in the face” even before the advent of archaeological diving. The 6 “pyramidal” stones standing outside the entrance of the Hellenic Maritime Museum’s first home: the charming villa on Akti Moutsopolou, were among the first stone anchors I noticed in 1959 (fig. 3). An elderly, retired sailor (by then a Museum guard) told me they were “trireme anchors” which had been dredged from Zea Liman. Probably he was repeating tradition.

I can still find no reason to dispute his words, although until now I have failed to trace any contemporary, written record which specifically mentions the discovery of these stones. The marine growths they bear certainly prove a long sojourn undersea and since they are both heavy and lacking in commercial value they were unlikely to have been brought from afar (their registration cards give no provenance beyond “the Ministry of Education”). Many trireme sheds existed at Piraeus in the 5th century BC, only those at Zea Liman have been archaeologically investigated. The sheds themselves were destroyed in 404 BC, so only their rock-cut foundations could be excavated in 1885 by Dragatsis and Dörpfeld and only partially, since the lower ends of the slipways are underwater consequently knowledge of their dimensions is incomplete; conscious of this Dragatsis and Dörpfeld intended to continue their investigations. But for some reason published information ends at this point. Nevertheless everyone on the spot had been made aware of the slipways, so when routine dredging took place in front of them and anchors were found, these would have been recognised and set aside, then when an Archaeological Museum finally materialized at Piraeus, they were probably moved into it.

Thereafter, lack of comparisons contributed to the indifference to pyramidal stone anchors. Circumstances have changed even since I first saw them: votive Bronze Age anchor stones excavated in temples have been steadily accumulating during the past 25 years, while even larger numbers of anchors have been raised from the sea. A mass of evidence now shows the Piraeus anchors to be both exceptional and restricted in their diffusion. No pyramidal stones have been reported in countries such as Bulgaria and Israel, where coastal museums are so filled with stone anchors as to give the impression of a neo-cultic revival!

The shape is also unknown in other much-dived parts of the Mediterranean.
including France and Spain; indeed on present evidence, the distribution of the pyramidal form seems to be Hellenic with some diffusion in Magna Graecia. In period these anchors apparently coincide with the peak of Greek naval power: the 5th to 4th centuries BC. Such a late date is surprising since lead stocks had already been current for over 200 years and so great were their advantages over stone, that sailing ships carrying valuable cargoes over long distances could not have afforded to be without the former. In any case, pyramidal anchors contain a filling of lead, which in a stone anchor is very anachronistic... why was a small quantity of the metal used in this way? There is no clear economic answer: the poverty of small-boatmen is no argument, since the weight of pyramidal anchors shows they came from larger boats... the very merchantmen that were using lead-stocks! already current. The evidence needs to be mustered and reviewed.

The design which I call for convenience “pyramidal”, is in fact a foursided stone tapering upwards from a quasi square base, but with the apex cut off leaving a flat top with (in the larger sizes) a central, vertical piercing running down into the anchor’s horizontal “rope hole”. The latter is larger than most “normal rope-holes”. The design is in fact exceptionally complex, although at first glance this may escape notice, because unfortunately all pierced-stones tend to look alike in photographs and drawings (since the strict conventions used for drawing and photographing pottery are not yet applied to the documentation of stone anchors).

Careful examination of pyramidal anchors makes it seem unlikely that cables passed through the so called “rope hole” (as I myself once thought), instead a stout bar of wood was probably lodged in it, and it is this bar which explains the connection between the apical and the horizontal piercings. Further, in some such anchors the lead that fills the apical piercing contains traces of corroded iron bars, nails, or pins. The function of this lead (and when present the iron embedded in it) must have been to prevent the wooden bar from moving. The bar’s projecting ends probably served as handles for lifting the anchor and casting it overboard. As to the anchor’s cable: instead of passing through the “rope hole”, it would have been looped, externally, round the bar (fig. 4).

Providing the projecting “handles” were secure, well-drilled sailors could cast quite heavy anchors, although mechanical means would have had to be used for those weighing hundreds of kilos. As early as the Bronze Age giant anchors were lifted mechanically by a kind of boom, as shown on the well-known Cypriot vase painting. On an oared ship with its mast down, some alternative such as a windlass could have done the job, especially as this exceptional design of stone anchor might have been hung externally, over the bows, its wooden “handles” resting on cross-beams protruding at either side of the prow.

At Volos, a large pyramidal anchor, inscribed on one face with a swastica (fig. 5a and b), can be seen in the garden of the Archaeological Museum. Capt Tzamtzis was kind enough to draw it to my attention. The stone is grey and seemingly volcanic, with faint orange-brown overtones; according to the Museum
personnel it is local to Thessaly and possibly Macedonia and elsewhere in the north. It does not, however, appear to me to belong to the region around Athens. I hope lithological determinations, by microscopic examination of thin-sections of samples of the Piraeus anchors, can soon be compared with relevant quarry stones. If the Volos anchor does match the grey stone anchors from Zea Liman now in the Piraeus Archaeological Museum (fig. 6), this would raise a specific historical question (see below), while in general, thin-sections of stone from any anchor with a reasonably secure provenance, would help to identify similar anchors found undersea and out of context.

The Volos anchor bears no registration number, but again traces of marine growths, combined with its great weight and lack of commercial value, give credence to the local tradition that it was raised from the town's harbour.

I will not dwell on the limestone anchors in the Hellenic Maritime Museum (fig. 3), because the similar group in the lapidary collection in the grounds of the nearby Archaeological Museum of Piraeus (fig. 6), is more varied and completer in regard to lead fillings etc. I had forgotten that I had mentioned this group in 1962 so I am grateful to Professor Michael Katzev (again at the Symposium) for reminding me of them, then even more beholden to the Museum's Director, Dr. G. Steinhauer and his staff for their generous help. I am particularly indebted to Dr Steinhauer for checking the Museum's first Inventory made in 1912, wherein the objects are not only admirably described, but also accurately named (which is rare with anchors). The inventory was made some time after the nucleus of the new Museum's collections had been formed; the provenance of the anchors is not mentioned, perhaps because the writer did not know it, or more probably because he regarded it as too obvious to state, for the anchors bear marine growths, again proving a long sojourn on the seabed; Zea Liman is periodically dredged, while the neosoikoi, or "trireme sheds", are a stone's throw from the Museum.

Nine of the Archaeological Museum's anchors are of that grey stone similar to the Volos anchor, but foreign to the Athenian countryside.

Excluding the 2 smallest anchors in this group (which because of their size have no secondary piercing) half the remaining anchors have lead fillings still in situ; of the remainder, four are broken in such a way as to suggest the lead had been deliberately removed from their apical holes. In the fifth anchor the apical hole is intact but empty. As so often in archaeology, the breaks are informative, for without them the possibly diagnostic shapes of the apical piercings would not have been noticeable.

Evidence from the Sea already corroborates—to a limited extent—the origin and surprisingly late period of this phylum: pyramidal anchors having been found within the areas of two dispersed cargoes of mid-4th century Attic pottery. Both sites are near the coast and in shallow water: the first off Syracuse (Ognina) was investigated by various divers including Gerhard Kapitän (fig. 7). The second, off Taranto, was excavated by Peter Throckmorton and published by Dr. A.M. McCann (fig. 8). In both cases the anchors may be intrusive, the connection between
the Syracusan anchor and the Attic potsherds being the more tenuous, given the number of other dispersed cargoes in that area. Nevertheless the contexts in Magna Graecia,⁶ the neosoikoi of Zea Liman and the port of Volos are striking in their similarities.

The possible intrusiveness of the anchors on the two wreck-sites is surprising from another point of view besides date. The presence of stone anchors on cargo-carrying sailing ships, which would normally have been equipped with lead-stocked anchors, remains to be explained. It would be easier to justify the presence of anchor stones on the Greek oared ships of the period (less dependent on anchors than sailing vessels and lacking the space for a full complement). Two space-saving “pyramids” would have sufficed for an oared ship, while occupying less cubic space than a single long-shafted wooden anchor with a lead-stock firmly fixed at right angles to its arms. The removable lead-stocks (which allowed a dismounted anchor to lie flat) appear a century later, and in Phenico-Punic rather than Attic contexts.

As to the presence of pyramidal anchors amidst merchant-cargoes of Attic pottery close to beaches in Magna Graecia: it is possible—even probable—that while the cargo-carriers were foundering, oared vessels came alongside in some capacity. Whether they did so before, during, or after the crisis, and whether as escorts, as pirates, or as salvors... the difficulty of manoeuvring beside, or over, an inshore wreck could have lost them their anchors. Stone anchors were by nature dispensable.

Two minor characteristics, seemingly common to the four Magna Graecia anchors, are hitherto unknown in Greece. The tentativeness of this statement is due to lacunae in their recording, which now needs to be rechecked. In 1965 I made hasty notes on the Syracuse anchor, while Gerhard Kapitän published it in 1982, but not in every detail. I never saw the Taranto anchors; in Dr. McCann's short, general article on the site, pottery datings etc. the anchors do not feature in great detail. I am therefore drawing on memory from conversations (with Peter Throckmorton and members of his expedition) which took place shortly after the event; I would be most grateful now for further information.

I recall no description of the rock, or rocks from which the Taranto anchors were hewn. When I examined the grey stone of the Syracuse anchor, 20 years ago, I assumed it to be the local volcanic rock of the region, but microscopic examination of thin-sections might now show it to match, not the Etna rock, but the grey stone of the Volos and/or the nine grey Piraeus anchors. A wrecked ship’s ports of call can be devined from its cargo, but only a build-up of information about anchors could eventually indicate where the ships originated, thus giving “nationality” to the various shapes of ancient craft and filling a serious gap in marine archaeological knowledge.

Reverting to the special characteristics of the Magna Graecia anchors: the first (judging from the photograph in Dr. McCann’s article, also Lionel Casson’s fig. 187 in Ships and Seamanship) is a seemingly functionless cupule. A similar
cupule, about 2 cm deep, is cut into a "frontal" face of the Syracuse anchor, below the horizontal piercing, it matches two Taranto anchors (on one the position is the same, on the other the cupule is cut into an un-pierced face of the pyramidon). A cupule may exist on the third Taranto anchor, but if so, it does not show in the photograph.

All four Magna Graecia anchors have lead in their apical piercings. If my memory serves, their second common feature is the traces of iron bars, rods, or nails embedded in this lead. I recall a suggestion that the iron represents the remains of apical rings, presumably for lifting the anchors. Technically, this seems unlikely, but interpretation must wait on both verification and more evidence. To this end it is useful to list the queries.

In conclusion, the pyramidal anchors of Zea Liman raise an interesting and specific historical question. I am grateful to M. Lucien Basch for illuminating it for me. Assuming that the period of these anchors is the 5th to 4th centuries BC, and that the grey stone of 9 of them is Northern, not Athenian, what could this signify? Athens having no wood for building triremes, imported it from the forests of the North, through the port of Olynthos (which Philip of Macedon annexed in 349 BC, forcing Athens to treat with him). Given that the Athenians imported their wood, where were their shipyards? The military slipways of Zea Liman were not designed for building triremes. Assuming the anchors are of northern stone, did they arrive at Zea Liman on cargo ships bringing timber? or on oared vessels built in a foreign shipyard and subsequently delivered to the military dockyard? This will remain idle speculation until more archaeological evidence is collected; a promising step in this direction would be better documentation of more anchors, and above all of obtaining lithological determinations of those pyramidal anchors that are already well known.

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Notes

* My thanks go to the President Rear Admiral E. Markis and the staff of the Hellenic Maritime Museum for their great helpfulness, and to Mr Harry Tzalas whose kindness and organization made possible extra research.


4. I am indebted to Miss Yael Sneh of the centre for Maritime Studies, Haifa University, for a photograph of another pyramidal anchor, probably around 60cm. high, in the Museum on the Island of Linosa (south of Sicily) and for the information that it too is a grey volcanic stone which she naturally assumed was local (the Island itself being volcanic).

5. A.M. McCann, "A 4th Century Shipwreck Near Taranto", Archaeology (U.S.) 25, 3, (1972),
Captions

Fig. 1. Twin anchors symmetrically placed, in situ in "Temple 2", Kition, Cyprus, Late Bronze Age.

Fig. 2. Twin anchors incised with a ship's port and starboard steering-oars, probably Late Bronze Age, found undersea off Tell Megiddo, now in the Maritime Museum, Haifa.

Fig. 3. Limestone (Athens region?) anchors, probably dredged from Zea Liman (all bear traces of marine growths), Maritime Museum Piraeus. In every case the lead has been removed. Note the variations in the apical piercings, the slot-shaped variant in no. 5, exceptionally, runs parallel with the horizontal piercing. For Museum numbers see the italics: 1/70, 2/73, 3/71, 4/27, 5/26, 6/54.

Fig. 4. The proposed rigging of a pyramidal anchor.

Fig. 5 a & b. The Volos Anchor (by the sea wall of the Volos Museum garden). Volcanic stone, charcoal grey tinges with orangy-brown patches, pock-marked with holes; said to be local to Thessaly. Marine growths. Lead still present in the apical piercing; no trace of iron pins. The front of this anchor is well preserved and bears an incised swastica. The back is worn, especially at the top and inside the lower part of the horizontal piercing.

Fig. 6. Anchors of various stone; probably from Zea Liman (marine growths); garden of Archaeological Museum, Piraeus. Museum numbers are expressed in italics and when there are none, the numbers in inverted commas refer to my note book.

Anchors 1-4 (313, «5», «9», 312) are of coarse, dark grey, volcanic stone similar to the Volos anchor Fig. 4. The Syracuse anchor Fig. 7, which is described in my own 20 year old notes as "grey volcanic stone" may fall into either this group, or the lighter grey less coarse stone of nos. 5-9 (315, «2», 317, 311, 310). Nos. 10-12 (319, «11», «10») are light coloured stones: —"white limestone", light buff, layered limestone and a light grey stone, more compact than the rest, but possibly volcanic. In general, the grey stones do not seem to be from the region of Athens.

Five of the anchors still contain lead in the apical piercings, but without trace of iron inclusions. Lead may have been removed after salvage from some anchors, such as no. 6, to judge by the recent break. There is only one example of a round apical hole (no. 10) this, like the smallest anchors without apical piercings, is of possibly Athenian stone.

Fig. 7. La Madonnina, Taranto. Schematic reconstruction from the published photographs and measurements (stone is not mentioned) of the 3 anchors from a dispersed cargo of mid 4th century BC Attic and Corinthian pottery.6 Lead is present in all three anchors and (from recollection of a verbal communication) iron bars, or
pins were embedded therein. Compare the cupule on the central anchor with Fig. 7. Fig. 8. Ognina, (in deposit: Syracuse Museum), Sicily. As with the Taranto anchors Fig. 6, the context is a dispersed cargo of Greek 4th century BC pottery. My notes on this anchor, made some 20 years ago, specify that the stone is coarse, grey and volcanic. I recollect traces of iron in the lead. As with the Taranto anchor, there is a large cupule some 2 cm. deep, in this case under the horizontal hole.

Fig. 9. Thin-section of 6 stone anchors from the Hellenic Maritime Museum, Piraeus, Greece.

PHOTO-ANCHORGRAPH No.

   The stone is composed largely of micrite casts of small gastropods and the cavities left by the solution of? bivalve shell fragments. Terrigenous material is represented by rare silt grade angular quartz grains.
   A sparse microspar cement leaves numerous cavities.

27. Pale grey cellular biosparite packstone. Worn shell fragments and foraminiferal remains are common. Terrigenous material, possibly of volcanic origin is fairly abundant, and includes angular quartz grains, fragments of? chert or argillised volcanic ash, and noticable grains of angular colourless pyroxene.

54. A pale oo-intrasparite, packstone. Composed of poorly sorted limestone fragments commonly with an oolitic coating and moderately well sorted ooliths. The limestone fragments are themselves oolitic. The fragments are bound by a cellular sparry cement. Terrigenous material was not noted.

70. Poorly sorted, porous sandy limestone, composed of angular fragments of fine-grained? volcanic ash or chert, common grains of neutral coloured augite and minor quantities of quartz set in a generally micritic cement.

71. A medium grained porous oopelsparite packstone.
   Ovoid pellets and ooliths, commonly with large rounded shell fragments cores. Some pellets appear to be compound. Rounded grains of quartz are very rare. The cement is of sparry calcite thinly coating the grains.

73. Coarse fraction. A coarse grained, poorly sorted oosparite packstone. This rock contains large abraded grains of pelmicrite and fragments of argillised micaceous volcanic ash.

73. Finer fraction. This material appears to be identical with that of anchor No. 71
MEASURE: at appropriate points, as shown above (if underwater, sketch then transcribe measures later).

DRAW: Make a preliminary drawing (life-size or any convenient scale)

PHOTOGRAPH
a) always showing a centimetre scale;
b) whenever possible, take from back, front and side.
c) If found unexpectedly underwater use makeshift scale, eg. diving-knife

STONE: chip off a small sample for thin-sectioning (making sure it is not just surface concretion).
Write visual description (colour, inclusions etc.), stating whether examined wet or dry.

TOOL-MARKS? WEAR? describe distinguishing features.

WEIGHT
If a stone cannot be put on a weighing-machine, calculate its weight as follows, from its measurements (taken as shown above):

Multiply average breadth = 1/2 (A+C+D+E), by height = B,
subtract the round area of the piercing = 22/28xDxD,
multiply by average thickness = 1/2 (I+J),
then multiply the result: the anchor's volume in (cm³),
by the SPECIFIC GRAVITY of the stone in question, eg. limestone= 2.7
(the result will be in grammes).

N.B. The main objective being to find out the number of men needed to lift an anchor-stone this simple calculation is adequate. Should greater accuracy be needed, more complex calculations are possible.

CARD-INDEX
For convenient indexing on small, standard cards (12.8 x 8.2 cm.), reduce preliminary drawings to scale of 1:20 and paste onto top left corner.
Index under geographical, or site name; give date of entry, adding information under the above headings, leaving space for eventual stone-analysis, bibliography etc.

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Περίληψη

«Πυραμιδοειδείς» λίθινες άγκυρες: μία έρευνα

'Η σημείωση σε ναυτικούς χάρτες της θέσης άνευρεσης και τής «εθνικοτήτας» των άγκυρων μπορεί να βοηθήσει στη γνώση των αρχαίων ναυτικών οδών και του είδους των πλοίων που τις διέσχιζαν.

Οι μεγάλες λίθινες άγκυρες άνηκαν κατά κανόνα σε μεγάλα έμπορικά ιστιοφόρα πλοία, ένα τα μακρά κωπήλατα πολεμικά πλοία πρέπει να ελέγξει τον τύπο της άγκυρας με σχήμα τετράγωνης κόλουρης πυραμίδας, που άπατεί μικρότερο χώρο για να αποθηκευθεί.

Γνωστά παραδείγματα αυτού του τύπου είναι 6 πυραμιδοειδείς άγκυρες του Ναυτικού Μουσείου Πειραιά, που ανελκύσθηκαν πιθανότατα από το λιμάνι της Ζέας, καθώς και λίγα δείγματα του είδους από άλλα μέρη (1 στο Μουσείο Βόλου, 1 από την Ογνίνα των Συρακουσών, 3 από τη θάλασσα του Ταραντος και 1 από τη νησίδα Λινόσα, νότια της Σικελίας).

Τό άλλο των πυραμιδοειδών άγκυρων είναι κατά κανόνα τεφρός ήφαιοστειογενής λίθος και χρονολογούνται γενικά στον 5ο-4ο π.Χ. αιώνα. Έχουν μια μεγάλη δριχόντα δηληκοτά στην άνω απόληξη τους και συνήθως μια μικρότερη κάθετη δηληκοτά, που ξεκινά από πάνω και καταλήγει στην πρώτη. Από την μεγάλη δηληκοτά πρέπει να περνούσε έξωνυσια διανομής που βοηθούσε στην εύκολη μετακίνηση της άγκυρας. Ο έξωνυσια διανομής οροφής στεφανώνταν με καρφιά μολυβδοχημένα στη μικρότερη δηληκοτά. Μια ιδιομορφία των άγκυρων από την Μεγάλη Ελλάδα είναι ότι έχουν επί πλέον μια φαινομενική άρρητη κοιλότητα στην επιφάνεια τους.

'Επειδή το ύλικό των άγκυρων δεν υπάρχει στην Αττική, είκοσιτα πως οι πυραμιδοειδείς άγκυρες έστησαν στην 'Αθήνα μαζί με πολεμικά πλοία που ναυπηγήθηκαν άλλού, ή ότι έθασαν μαζί με φορτία ναυπηγικής ξυλείας από τον βορρά.
LA CONSTRUCTION NAVALE ANTIQUE DE TYPE ALTERNÉ: EXEMPLE D'UN MODE DE CONSTRUCTION

Les progrès techniques, dans le domaine de la plongée subaquatique au cours de ces dix dernières années ont permis d'étendre considérablement le champ d'exploration de l'archéologie sous-marine. Les résultats de cette recherche nous ont conduits plus particulièrement à une meilleure connaissance du commerce maritime et de l'architecture navale dans l'antiquité.

Si l'archéologue peut saisir, à partir de l'étude du matériel, les aspects les plus concrets de la vie quotidienne antique, l'architecte naval, lui, en examinant les vestiges des navires eux-mêmes, peut non seulement restituer le profil complet des embarcations et de leur superstructure, mais aussi en comprendre les méthodes de construction.

C'est ainsi qu'est apparue une différence fondamentale entre les procédés de l'antiquité et ceux de l'époque contemporaine dans l'élaboration d'une carène, même si le matériau, le bois en l'occurrence est identique. (Fig. 1).

De nos jours en effet, l'édification d'une carène s'effectue en appliquant des planches de bordé de faible épaisseur sur une structure squelettique déjà en place, très élaborée, constituée d'un ensemble de varangues, membrures et allonges, rendus monoxyles par un jeu complexe d'écart, de chevilles métalliques et de clous. Dans l'antiquité au contraire, ce sont les planches de bordé qui tiennent le rôle prédominant: d'épaisseur variable, elles sont non seulement plus épaisses au niveau des prétences et des virures proches de la quille, mais aussi taillées dans des essences plus denses, telles que cyprès, mélèze, chêne ou orme. La quille quant à elle demeure d'épaisseur modeste, proche de celle d'une prétence: les couples sont constitués de varangues, membrures et allonges rabotées sans écart, assujetties toutefois solidement au bordé.

Il s'agit donc de savoir dans quel ordre précis étaient posés, à partir de la quille, les divers éléments de la coque, planches longitudinales du bordé d'une part, couples transversaux d'autre part.

A partir de l'épave du navire de la Bourse, actuellement conservée au Musée d'Histoire de Marseille (ce qui rend toute observation contrôlable), nous pouvons apporter une réponse claire et complète.

Nous avons observé, sur cette épave, que les chevilles qui verrouillent les clés ou languettes liant les planches de bordé sont pour la majorité d'entre elles, coniques; certaines cependant —et c'est la première fois qu'on distingue cette particularité— sont cylindriques. Les chevilles coniques ont été enfoncees de l'intérieur de la coque vers l'extérieur de la coque; les chevilles cylindriques sont enfoncees au contraire, toutes, de l'extérieur vers l'intérieur. Et l'on n'enfonce des chevilles de l'extérieur vers l'intérieur, ce qui est moins favorable pour l'étanchéité, que dans le cas où l'on ne peut faire autrement: dans le cas seulement où un élément de la membrure déjà en place, masquant la paroi interne, s'oppose à ce que l'opération s'effectue depuis l'intérieur. On a choisi alors des chevilles
cylindriques parce qu’une cheville enfoncée de l’extérieur, si elle est conique, a tendance en gonflant à s’extraire d’elle-même (fig. 2 a et 2 b). Les chevilles cylindriques ne présentent pas cet inconvénient; et pour plus de sûreté, certaines d’entre elles sont rendues encore plus stables par l’insertion à leur extrémité d’un coin de bois qui assure l’expansion de la tête lorsque celle-ci vient se heurter au couple déjà en place (cheville épitée) (fig. 2 c et 2 d.). Il convient cependant de prendre garde à un détail. Le charpentier, qui avait préparé les surfaces de contact et creusé des mortaises en correspondance pour les clés de liaison, munissait la planche nouvelle du bord, à sa partie inférieure, de ces clés avant de la présenter à l’assemblage: chaque clé était alors assujettie par une cheville conique enfoncée du côté interne: voir la figure 3 a. Mais la planche nouvelle une fois mise en place, la cheville de chaque clé tombant en face d’un élément de membre ne pouvait être enfoncée de l’intérieur; cette impossibilité est mise en évidence sur la figure 3 b. C’est donc une cheville masquée sur deux qui, enfoncée de l’extérieur, dans la partie haute de la virure, se révèle à l’examen cylindrique; voir la figure 3 c.

A partir de cette remarque nouvelle, et essentielle, et grâce à une inspection étendue, attentive, très souvent reprise, et bien contrôlée, de la coque, nous avons pu reconstituer toutes les phases qui se sont succédées dans la construction méthodique du navire. L’édification du bordé par niveaux successifs, l’ordre dans lequel ont été mises en place les pièces de la membrane qui, progressivement, servent d’appui et de guide pour cette édification, sont maintenant apparents. Pour plus de clarté, nous fournirons d’abord le principe simplifié de ce montage, illustré par une série de dessins montrant la construction d’un navire idéal dans cette technique; ce sont nos figures 4 a à 4 f qui pourraient se suffire à elles-mêmes, et qu’il suffit de commenter très brièvement.

Première phase, figure 4 a: sur la quille où sont déjà greffés étrave et étambot, pose des varangues courtes assujetties par des chevilles de métal et, éventuellement, travail simultané de pose du galbord.

Deuxième phase, figure 4 b: pose des premières virures jusqu’à l’extrémité (en gros) des varangues en place. Dans cette opération au fur et à mesure, le bordé est lié aux varangues par chevillage (gournables).

Troisième phase, figure 4 c: a) pose des varangues longues, non liées sur la quille, dans les intervalles entre les varangues courtes. Elles sont chevillées aux planches du bordé posées dans la première phase; b) suit la pose du bordé jusqu’à l’extrémité de ces varangues longues. Le chevillage de ces varangues longues, dans la partie extrême, se fait par des gournables au fur et à mesure de la construction du bordé.

Quatrième phase, figure 4 d: comme on ne peut plus trouver de varangues assez longues, on a recours à des demi-couples. Pose des demi-couples intercalés entre les varangues, chevillés à la partie du bordé déjà en place. Edification d’un troisième niveau de virures, les couples étant chevillés à ces virures nouvelles, au fur et à mesure.

Cinquième phase, figure 4 e: pose d’allonges aux varangues. On procède
comme précédemment pour le chevillage et l'édification du bordé.

Sixième phase, figure 4 f : on procède comme précédemment, jusqu’au niveau du pont. C’est à la phase 5 et à la phase 6 que l’on pose les serres et l’emplanture et peut-être une partie du vaigrage pour consolider la coque.

Sur le navire de la Bourse à Marseille, ce schéma d’ensemble a été appliqué, et l’on a pu se rendre compte de ces observations de détail, à la fois de la cohérence des principes et des adaptations que leur mise en œuvre entraîne dans la pratique.

Pour connaître avec précision le mode de construction nous avons étudié la coque dans la partie conservée du secteur central sur l’espace occupé par une soixantaine de membrures (fig. 6).

Nous avons pu déterminer d’abord l’existence de varangues directrices brochées, mises en place les premières sur la quille (fig. 5 a). Elles sont fixées par des chevilles de métal à tête matée sur rivet. Ces varangues, au nombre de sept, ont guidé la pose des trois premières virures, qui se distinguent par l’essence du bois employé : elles sont en mélèze, tandis que les autres sont en pin d’Alep. Ces sept premières varangues sont de longueur variable, inégale ; une telle irrégularité est favorable à une utilisation optimale des bois, mais aussi à la cohérence générale, évitant une ligne de rupture.

Après la pose des trois premières virures assujetties à ces sept varangues directrices, on a intercalé sept autres varangues, que l’on a fixées par des gournables au bordé existant (fig. 5 b). On a monté ensuite, en s’appuyant sur elles en même temps que sur les sept varangues brochées, le bordé jusqu’à la deuxième ligne de joint. Cette deuxième ligne de joint ne correspond pas non plus exactement avec les abouts des varangues, de longueur toujours un peu inégale.

On a introduit ensuite, en les intercalant, quatorze demi-couples (fig. 5 c). Certains de ces demi-couples chevauchent par leur extrémité basse la quille. Assujettis au bordé en place, ils guident par leur extrémité supérieure libre la pose du bordé entre la deuxième et la troisième ligne de joint.

Enfin on a intercalé à nouveau des demi-couples, au nombre de 28, qui par leur extrémité ont joué le rôle de support et de guide du bordé entre la troisième et la quatrième ligne de joint (fig. 5 d à 5 f). Ces demi-couples sont parfois constitués de plusieurs tronçons mis bout à bout mais non liés ; et il arrive que le rôle de certains de ces tronçons soit uniquement de renfort et non de guide — un simple remplissage en apparence. Mais si l’on prend chaque demi-couple comme un ensemble, il n’en est aucun qui n’ait un rôle actif.

Jamais encore, nous semble-t-il, par l’analyse de la trentaine d’épaves, souvent bien mal conservées, ou mal observées, à cause de conditions difficiles, dont l’étude fonde notre connaissance de l’architecture navale antique on n’a eu la chance de parvenir à une pareille netteté dans la détermination du mode de construction d’un navire. On doit en tirer une conclusion théorique.

Les débats conduits sur cette question, où l’on peut citer les noms de Casson, Basch, Christensen, et les résultats acquis sont résumés parfaitement par Patrice Pomey dans la récente synthèse qu’il a fournie dans l’ouvrage écrit en collabo-
ration avec P. Gianfrotta, *Archeologia Subacquea*. Trois techniques sont envisagées en théorie: construction du squelette; construction "coque d'abord" (shell first) avec insertion secondaire des couples; construction d'un type mixte. La première technique serait moderne et non antique, à l'exception des bateaux recouverts de peau connus seulement par des sources écrites. La deuxième, mise en évidence par L. Casson serait rendue possible par la liaison étroite des planches du bordé, spécifique de la construction antique, technique ancienne des vaisseaux méditerranéens, dérivées peut-être de bateaux du Nil décrits par Hérodotte. Cette technique "shell first", la plus ancienne et la plus noble, serait en définitive celle du navire de guerre de Marsala, et celle de nombreuses épaves de navires de commerce: Titan, Chrétienne A, la Roche Fouras, County Hall, etc. Les couples y seraient toujours mis en place après l'édification du bordé. Quant à la technique mixte, observable à la Madrague de Giens, elle ne donnerait un rôle actif qu'à certaines varangues.

Ainsi, nous observons sur l'épave de la Bourse, un schéma très cohérent de construction que nous qualifierons "d'alternée" où se tisse peu à peu la structure du navire par va-et-vient entre la membrure et le bordé, tous les couples ayant en définitive un rôle actif et prioritaire.

L'édification d'une carène antique demeure fondamentalement différente de celle d'époque moderne, dans ses procédés techniques comme dans sa structure. Pour l'antiquité, nous tenons à le souligner, la construction de type alterné ne représente qu'un procédé parmi d'autres. Il a cependant à nos yeux le mérite d'avoir été clairement établi à partir d'observations pratiques et confirmé depuis par l'étude récente de l'épave antique des Laurons II.

La découverte du procédé de construction du type alterné est due à M. J.-P. Cuomo, charpentier de marine (CNRS, Centre Camille Jullian) Aix-en-Provence, le 13 Juin 1986

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Notes: 1.

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Fig. 1 Figure de gauche, représentation d'une construction suivant la technique actuelle. Figure de droite, représentation d'une construction suivant la technique antique (clés - chevillées et gournables).

Fig. 2 Chevilles cylindriques et chevilles coniques: a et b: dessins de coupe (détails pris sur l'épave de la Bourse à Marseille); c et d photographies des 2 types de chevilles de bordé.

Fig. 3 a, b, c, schéma de montage du bordage et des couples dans le système de construction alternée.
Fig. 4 a Construction théorique d’une coque: phase 1 (non représentée: pose éventuelle, simultanée, du galbord, première virure au contact de la quille).

Fig. 4 b Construction théoriques d’une coque: phase 2 et début de la phase 3.
Fig. 4 c Construction théorique d'une coque: phase 3.
Fig. 4 d1 et d2 — Construction théorique d’une coque: phase 4.
Fig. 4 e Construction théorique d'une coque: phase 5.

Fig. 4 f Construction théorique d'une coque: phase 6.
Vue générale des vestiges du navire de la Bourse à Marseille en cours de dégagement dans la corne du port antique. Etambot au premier plan.

Photographies de 2 types de chevilles de bordé (navire de la Bourse). A gauche tourillon épité.


Navire de la Bourse. Membrure M. 147 1/2 couple. Une clé liaisonne les deux virures, inférieure et supérieure. Cette clé est chevillée de l'intérieur, à l'avance pour la virure supérieure et de l'extérieur (par un tourillon) pour la virure inférieure (section apparente différente).

Navire de commerce romain, épave des Laurons II, IIème apr. J.-C., le pavois, le pont et l'amorce du barrot et surbarrot. Longueur de tête en tête: 16 m restitués.
Deux types de chevilles tronconiques et cylindriques de bordé sur l’épave des Laurons II, partie arrière.

Maquette du navire des Laurons II, longueur tête en tête, 16 mètres.
THEORIES ON SHIP CONFIGURATION IN THE BRONZE AGE AEGEAN

It is only natural, I think, for one who is in the business of designing seacraft to be very curious about the origins of ship construction and the very closely associated shapes of the earliest of vessels. It is natural also to seek those origins here in the Aegean Archipelago believing as we do that here were sailed the earliest seagoing watercraft of Western cultures. Ships from the islands of Crete and the Cyclades pushed back their horizons to seek trade with neighbors and explore lands from which no ships yet sailed.

It is surely no revelation that existing evidence of ships that did these things is far from abundant. There is of course no written record, for the time was earlier than script. There is no record in poetry or song that we can reliably understand. There is only the graphic hand of the people in their art, and that is perhaps the best. For this we have the support of the well-known 19th century English philosopher, John Ruskin, who said: “Great nations write their autobiographies in three manuscripts, the book of their deeds, the book of their words, and the book of their art — but of the three, the only trustworthy one is the last”.

It would be most interesting if time and space permitted to include a full study and analysis of the variety of iconographic sources for ancient Aegean ship reconstruction. However, because of the associated inconclusive and controversial nature and the fact that most consist of the work of artisans and not artists, we will go on to another and better source. It is time to put more confidence in the finest form of expressive Minoan art, their fresco painting. Consequently the major portion of this paper will deal with the development of the ship configuration of the Bronze Age ships illustrated in a remarkable fresco.

Until less than fifteen years ago none of all the beautiful Minoan period frescos from Crete or elsewhere brought forth any scene containing watercraft. During the 1972 season of archeological excavation on the island Santorini, ancient Thera, under the direction of Spiridon Marinatos, this condition of ignorance was suddenly ended. In one of the excavated structures called the West House, later the House of the Fisherman, which was already rich in frescos, there was a remarkable find, done in a miniature style for a continuous fresco frieze containing a procession of ships. This procession was also attended by smaller watercraft and dolphins, among many other things, — a scene by now that is familiar to all of you who share this interest in ancient ships. It is, as you know, typical of other graphic art of this time, quite flat as it projects the subject, with all of the objects in profile. There is no need to describe this most valuable as well as beautiful fresco. One cannot help but notice that the artist was not only skillful in his craft but also familiar and knowledgeable about the sea. The painting is full of
many details particularly of the ship as well as their surroundings. We are convinced of the artist's reliability by the objects we recognize, each painted correctly. Of the various leaping dolphins, there are two recognizable species, for example.

It is most important to compare the profile features of the seven large vessels in procession as well as the seven small craft for similarity in shape. They all have the same identifiable sheer line and distribution of body bulk. They are not simple symmetrical crescent-forms as might first appear. The larger vessels disguise their basic profile form perhaps more than the smaller, being as they are, in full parade dress. Strip off the decorations visually — the flower garlands, bow-extended antennae, paper-like butterflies, stern-draped animals and perceive the ship! The form is clear.

Now it is possible to concentrate on the clearest, most intact ship in this fragmented fresco. This painted ship needs little, if any, restoration having only insignificant missing fragments. The illustration here is from the archaeological report by Professor Marinatos and is the approved archaeological construction. The fragmentation of the other fresco ships is individually considerable but collectively their basic configuration matches the nearly intact ship, and they have each been so restored. The hull profile shows a distribution of body volume which is concentrated toward the stern. One whose center of volume is *aft* rather than forward of the midship division. As a part of such shape the stern rises more steeply or, in terms of the sheer line’s after portion, it shows a shorter radius of curvature than the forward line. These significant characteristics are repeated in *all* of the vessels, large and small, in the fresco. Such a profile is a *significant* identity that relates these ships to other ships of this time and even others of more recent time. This feature of profile, as will be observed, is most important in establishing the cross-sectional body distribution of the Thera ship.

There is little doubt that the ships of Thera in this late Minoan period had some kinship with Egyptian vessels in hull configuration. I believe that this similarity however was simply the result of the “state-of-the-art” of shipbuilding for this time and general part of the world. There are discernible differences that will be seen that indicate purely Aegean development. The feature that shows most clearly however in this stripped down profile is the previously noted unsymmetrical crescent-form. As applied to variously known vessels, the shape may be extensively drawn out longitudinally or it may be concentrated toward the median axis, depending upon the vessel’s required bulk. This configuration recognized by the sternward concentration of volume is a classical one. It is a concept that shipwrights understand and control for proper and practical reasons. It carries with it identifiable and measurable indications, the most apparent and perhaps simplest of which is the variation of ship’s breadth, both at sheer level and at any chosen waterline. The whole hull tends to reach its maximum breadth aft of the middle section and this greater breadth diminishes at a lesser rate when going sternward than when going toward the bow. A sailor or shipwright or designer
would describe this shape as “fine forward with a good broad run aft”.

With such a hull and broad after deck as this and a sheerline that sweeps up in the stern, the helmsman occupies a traditional and necessary platform for steering control with good lateral visibility. On the larger boats this station is adequate for other important members of the crew for sail-handling and command. The whole vessel with sailing rig, over-hanging ends, with the weight and volume aft of center will ride more comfortably and steer more easily. One can become convinced that the ancient shipwrights were aware of these things and shaped their ships accordingly.

With the recent disclosure of the underwater discovery of the 14th century B.C. “Kas”* ship we now have some confirmation of Bronze Age hull structure. While this paper does not intend to explore the broad question of ship construction of this period, it cannot be ignored. The manner of joining the hull’s parts is undeniably related to the hull configuration. At this time it is too early for conclusive statements on the “Kas” ship. However, the first evidence from the remaining wood of the hull’s structure indicates that planks were joined edge-to-edge by an early form of mortice and tenon. This would indicate that the well-known method of shell construction has been used surely for at least an additional millennium. It further suggests that the Thera ship, which was closely contemporary with the “Kas” ship, may well have had an embryonic keel timber.

At any rate it should not be ruled out that while the Bronze Age hulls were most certainly of shell-first construction some may also at the same time have been edge-fastened by fiber lashings in a sewn seam structure. There may have been, quite possibly, the combination of lashings and tenon fastenings with the lashings to attach partial frames and internal truss in place of a heavier central keel. In either type of structural fastening it can surely be stated that the process was a tedious one and the form of hull was generated by a skillful shipwright by his hand and eye.

Knowing more closely the nature of the hull’s structure as well as its distribution of volume, it is a shorter step to move from the dimensional profile to a three-dimensional presentation in the conventional architectural projection.

The first additional line to be added to the profile was the necessary waterline. This line was simply determined by locating the water surface level where the paddlers’ blades seemed to be properly immersed. The true waterline must be close to this. The leading paddlers forward seem to have their blades immersed slightly deeper than the others in graduated order. This conforms to the style of multiple in-line paddling as opposed to rowing where the crew remove and dip their blades sequentially. The sequence of immersion begins forward and moves aft following an elongated wave of progression. The location of this ship’s water line is thus one of direct approach.

The stem of the ship was terminated at a point where the color of the bow

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projection in the fresco changes from red to light blue. It seems to indicate by this and other markings that the further extension is an apparent antennae-like attachment, most likely temporary and functionally detachable. This strapping technique indicates the same sort of functionality as the stern appendage fastenings.

With the profile of the ship well-established we have some basic dimensions assigned that are all derived from the proportionality as it exists in the original ship’s painting and from the convincing degree of realism provided by the ancient artist. With twenty-one paddlers along the side requiring a reasonable working space for each we can logically establish a length between the hull’s ends of 24 meters and a length on the waterline of 16.2 meters.

The missing dimension, breadth, can be derived empirically through the knowledge of conventional proportionality between waterline length and breadth. In this case the proportion from ships of antiquity, of which adequate examples exist, as well as sailing vessels of similar size generally. The sources include Egyptian tomb models, burial ships, and underwater archaeological finds all of which bracket the Thera time frame. The indication is clearly that the proportion (excluding war galleys) falls somewhere between 3.5 and 4.0 breadths to the length on the water. This is also consistent with the limits of modern sailing vessels under 25 meters. The Bronze Age sailors of the Aegean must have recognized and demanded a successful and ageless beam-to-length proportion for sailing capability. The beam at the waterline is thus 4.2 meters and the maximum beam is 5 meters.

The midsection of the Thera hull was also developed with an ancient inheritance, similar to Nile ships with a rather flat but flaring rise to the sides on a rounded bilge of good radius. Some dead-rise to the bottom was given amidships and increased toward the ends to favor the idea that an embryo keel form was possible and appropriate. This presumption is reinforced by the “Kas” ship discovery where planks in shell-tenon fastenings most functionally begin in a centerline timber even though it may be merely a heavier single center plank. The shape of the midbody sections develop toward both ends where the planks will naturally rise and at the same time meet in a “V” form ridge rather than the old spoon form of Egypt. This becomes then an exclusively “Aegean form”. While it conforms to the progressive shipbuilding techniques of the era, it geometrically contributes to the structural strength in the hull for the sea requirements.

The hull form as shown in the three conventional projections is submitted with the lines drawing complete, as described. It is seen as a three-dimensional ship projection that provides a subject for dimensional criteria and limited analytic hypothesis.

As the ship is shown her dimensions are:
- Overall length = 24.0 meters
- Length on waterline = 16.2 meters
- Draft of water = 1.0 meters
Beam extreme = 5.0 meters
Displacement = 24 tons
Sail area = 61.5 square meters

From these dimensions it is helpful to examine several coefficients:

- The prismatic coefficient is 0.48
  \[ \frac{A}{(0.01 \times L)^3} = 157.1 \]
- Sail area-displacement; \[ \frac{SA}{\sqrt{2/3}} = 7.19 \]

These values compared to those of other ships and boats of history, (actually so much later history that we are comparing ancient to modern), do make some notable statements. The first of worthy notice is the displacement-length ratio: it is a number without dimension that is telling us that among all vessels this ship of Thera is a light-displacement boat. Like a successful racing yacht where the contest is nearly assured in the boat of the least weight; modern values generally for highly efficient ocean racing vessels is between 150-190. And in the past this value for boats noted for speed, the fellucas, the war galleys, the clipper schooners, was always less than 200 where the average for merchant and cargo vessels is nearer 500.

It is all very well to have a low indicated displacement-length coefficient for great sailing potential but the vessel derives its sailing energy from the wind on the sail. The sail area-displacement coefficient of the Thera ship is comparatively very low. This is not surprising. There is but one sail and it is on a low mast and is also of a low aspect ration (sail’s height:mean width). Consequently the numerical coefficients computed and listed above quite probably confirm our visual presumptions. This vessel, essentially a sailing vessel for the Aegean and environs has potential for higher speed than can be realized with her low moderate single sail. The coefficients also tell us indirectly that with low prismatic coefficient (0.48) and with steering blades well aft that the vessel is highly maneuverable. Further, their relative lightness and the low moderate sail area indicate the practicability of operating cautiously in the seasonal winds of this sea, at the same time being able to seek shelter easily while partially beaching sternward in shoaling water. These features perhaps have been assumed or presumed. But it is now possible, I believe, to depend upon the science of ship design for authoritative assurance.

The additional illustrations accompanying this paper are presented as further visual examples projected by a competent marine artist to depict the functional activity of some Minoan 1500 B.C. styled vessels.

Fig. 4 is of an undetailed but accurate scale model of the hull and rig which conforms to the lines and profile of Figures 2 and 3. It shows a very typical and satisfying hull shape, as described earlier, together with mast and yards and probable basic rigging. The rigging is workable using the halyard-eye lashings at the mast head of the fresco ships, allowing the yards to be braced freely around through 160° of arc. The lower yard forward braces lead through the deck-edge
fair-leads, clearly evident in the fresco ship, which make possible the hardening down of an effective windward sail, shown in the artist's interpretive portrait in Figure 7.

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Figure:
1. Thera Fresco Ship - Archaeological Reconstruction, Prof. Spiridon Marinatos.
2. Dimensional profile of the Thera ship, T. Gillmer.
4. Scale Model of Thera Ship (from fig. 3) with basic rig. Model builder, Thomas Harsch, 1982.
8.-11. Artist's drawings of Thera-Minoan type boats in various operational activity, Artist, William Gilkerson.

Note: The artist, Mr. Gilkerson, together with the author developed the scenes of the renderings.

References
L'ÉPAVE II DE L'ANSE SAINT-GERVAIS A FOS-SUR-MER (BOUCHES-DU-RHÔNE): UN NAVIRE DU HAUT MOYEN-ÂGE CONSTRUIT SUR SQUELETTE.

Cette épave a été découverte en 1978 à l'intérieur de l'anse Saint-Gervais, (Fig. 1) à 200 mètres du rivage. En raison de la faible profondeur à laquelle repose ce navire, 2,50 mètres, une grande partie de la cargaison a disparu, probablement récupérée à l'époque du naufrage. Toutefois l'examen du matériel retrouvé sur l'épave lors des fouilles permet de proposer une datation vers la fin du VIème siècle ou dans le premier quart du VIIème siècle. En effet des fragments d'amphores du type Beltran 60 ont été découverts en association avec les formes les plus tardives de la céramique africaine à vernis rouge, à savoir 104C et surtout 108 et 109 et également avec une lampe à huile du type Hayes II B.2 La cargaison du navire se compose de blé chargé en vrac à l'arrière du navire et de poix transportée dans des amphores retrouvées dans la partie centrale de l'épave. Aucune trace d'une quelconque cargaison n'a été relevée dans la zone avant.

Description des vestiges

L'épave est conservée sur une longueur de 9,50 mètres, une largeur maximale de 4,50 mètres et une hauteur de 1 mètre depuis la face supérieure de la quille jusqu'au niveau du bouchain. (Fig. 2). Une partie de la muraille tribord du navire est conservée, à une distance d'une cinquantaine de centimètres, du fond de carène ce qui permet de restituer une hauteur sous barrot de 2,60 mètres au moins, pour une longueur totale estimée entre 15 et 18 mètres et un tonnage compris entre 40 et 50 tonnes métriques.

La quille est conservée partiellement, sur l'arrière du navire, sur une longueur de 3,90 mètres. Elle a disparu, arrachée peut-être au moment du naufrage, sur tout le reste de l'épave. Une pompe de cale, du type pompe à chapelet,3 a été découverte à l'arrière du navire au point où la carlingue arrière, d'une longueur totale de 4 mètres, s'interrompt, et juste avant le départ des deux carlingots maintenant le massif d'emplanture conservé sur une longueur de 1,50 mètre. (Fig. 3). Un des deux carlingots est intégralement conservé; sa longueur est de 4 mètres.

Une deuxième carlingue vient renforcer l'axe longitudinal du navire depuis l'endroit où s'arrêtent les carlingots jusqu'à l'avant. La pièce a disparu mais les traces de son assemblage sur les membrures sont encore visibles: il s'agit d'une feuillure pratiquée sur la face supérieure de chaque varangue pour un encastrement à mi-bois du même type que celui observé pour la carlingue arrière. (Fig. 2).

Les couples sont distribués selon une alternance 1/1 de varangues et de demi-couples se croisant sur la quille.

Elements caractéristiques de la coque du navire

La coque est constituée d'un simple bordé, assez mince, 2,5 à 3 cm d'épaisseur, sans revêtement externe de plomb, chevillé et cloué sur les membrures.
Celles-ci sont caractérisées par une hauteur importante. Les varangues atteignent 40 cm de hauteur en leur centre, sur la quille. (Fig. 4). Ceci est en partie dû à la forme très pincée de la carène; vers les extrémités babord et tribord, les membrures, varangues ou demi-couples, ont encore une hauteur moyenne de 15 cm. En principe la hauteur des membrures est établie en fonction des dimensions du navire, or, en ce qui concerne l’épave Saint-Gervais II, on constate que les couples ont des dimensions aussi importantes que les couples du navire de la Madrague de Giens dont la longueur était deux fois et demi supérieure à celle du navire de Saint-Gervais.4 D’autre part la maille de la membrure est importante; elle est de l’ordre de 25 cm en moyenne atteignant 36 cm par endroit, comparable en cela à celle observée sur les épaves de Pantano Longarini, de Serçe liman et du Dramont F. Elle est bien supérieure à celle observée sur les navires de l’Antiquité classique, à l’exception du navire de la Bourse à Marseille.5

La quasi absence de languettes d’assemblage entre les virures du bordé est un élément tout à fait remarquable. En effet on trouve quelques languettes dans les parties basses du navire et seulement aux extrémités avant et arrière. Ces languettes sont dispersées et séparées par un intervalle excédant le plus souvent 1 mètre. De plus on constate une absence totale de languettes entre le galbord et la quille. Par ailleurs les quelques languettes existantes6 ne sont jamais chevillées dans les virures. Ceci a déjà été observé sur l’épave I de Yassi Ada et sur celle de Pantano Longarini, sur lesquelles les tenons d’assemblages sont très espacés7 mais présents sur toute la longueur des navires. Par contre on trouve une absence totale de liaison entre les virures sur des épaves plus tardives comme l’épave arabe d’Agay datée du Xème siècle, l’épave de Serçe Liman datée du XIème siècle et sur une épave byzantine découverte en Grèce près d’Alonessos et datée du XIIème siècle.8 Sur l’épave II de Saint-Gervais on observe également la présence de mortaises destinées à abriter des languettes d’assemblage, taillées dans le can d’un ai de virure mais n’ayant pas d’équivalent dans l’ai situé en vis-à-vis.

Si les virures du bordé ne sont pas assemblées entre elles, elles sont, par contre, solidement fixées sur les membrures au moyen de clous de fer et de chevilles de bois. On trouve soit des clous seuls, à raison de trois clous par virure (la largeur moyenne des virures est de 20 cm), soit une alternance de clous et de chevilles carrées. Dans les parties hautes du navire des chevilles seules sont employées.

D’autre part de nombreuses membrures sont fixées sur la quille au moyen de broches en fer. Ainsi toutes les varangues sauf une sont brochées sur la quille et cinq couples formés de deux demi-couples le sont également; dans ce cas les demi-couples sont assemblés transversalement, entre eux, à leur intersection, en plus de l’assemblage sur la quille de un d’eux. (Fig. 5). Au total 17 membrures sur les 27 conservées, soit les deux-tiers, sont brochées sur la quille. Ce nombre est bien supérieur à celui observé sur les navires antiques présentant cet assemblage.9

Il est important de remarquer que les mêmes broches relient également les deux carlingues aux membrures et à la quille. (Fig. 5) Dans la partie centrale du
Le principe de construction

La première étape a vraisemblablement consisté en la pose de la quille, de l'étrave et de l'étambot. La construction, s'est ensuite poursuivie par la pose et la fixation de certains couples sur la quille. En effet le bordé n'a pas pu être monté avant la mise en place de certaines membrures en raison du trop faible nombre de liaisons observées entre les virures et surtout de l'absence totale de liaison entre le galbord et la quille. Puisque les mêmes broches unissent la quille, les membrures et la carlingue, cette dernière a été mise en place dans la même phase de construction.

La troisième phase a dû consister en l'assemblage des virures du bordé sur les couples déjà mis en place, couples qui doivent être considérés comme de véritables membrures actives puisque ce sont eux qui déterminent les formes du navire. Les virures sont au fur et à mesure cloutées et chevillées sur les membrures. Lorsqu'elles ne s'adaptent pas exactement sur les couples, des lattes de bois sont insérées entre le bordé et la membrure afin de faciliter l'assemblage. Ceci ne s'observe que dans les parties basses du navire pour lesquelles il est plus difficile d'obtenir les formes désirées à partir de la mise en place des couples.

Une fois le bordé des œuvres vives monté, il a fallu poser les allonges des membrures avant de procéder à la mise en place du bordé de la muraille. Ceci implique un assemblage des allonges sur les couples mais cet assemblage n'a pas pu être observé en raison de la destruction partielle de cette portion de la coque.
La présence de préceintes rapportées et non pas intégrées dans le bordé prouve que le rôle principal dans la structure du navire est tenu par les couples et non pas par le bordé comme cela était le cas pour les navires antiques. Ainsi les membrures jouent deux rôles fondamentaux. Elles sont à la base de l'élaboration des formes du navire et elles constituent, avec la quille et les carlingues, l'élément essentiel de la structure de la coque. Toutefois dans ce type de construction, sans plans préalables, les membrures ne sont probablement pas les seuls éléments intervenant dans la détermination des formes du navire; l'utilisation de lisses ne doit pas être exclue.

Tout ceci permet de conclure à l'utilisation d'un procédé de construction sur squelette au début du Moyen-Age. En effet la hauteur considérable des membrures et leur maille importante se retrouvent dans la construction sur squelette telle qu'elle est pratiquée de nos jours et également sur des épaves médiévales pour lesquelles l'emploi de cette méthode est attesté. La présence dans certaines virures, de mortaises logeant des languettes d'assemblage servant à guider la mise en place du bordé prouve qu'au début du VIIème siècle la construction sur bordé était encore pour le moins connue en Méditerranée. Les mortaises repérées dans certaines virures et n'ayant pas de réplique dans la virure suivante permettent d'envisager la taille préalable de certains bordages en vue d'une utilisation suivant la méthode sur bordé, pour un autre navire, dans le même chantier.

L'apport essentiel de l'épave II de l'anse Saint-Gervais réside dans la preuve de l'emploi en Méditerranée à la fin du VIème ou au début du VIIème siècle de la construction sur squelette déjà connue mais non utilisée par les Romains. A la même époque, en Méditerranée Orientale, le navire byzantin de Yassi Ada, contemporain de celui de Saint-Gervais est construit suivant le procédé dit "mixte" dont l'esprit est encore celui de la construction sur bordé puisque l'élaboration des formes dépend au départ de la mise en place des premières virures. Ainsi, alors que des navires sont encore construits en Méditerranée Orientale suivant une méthode utilisée à l'époque romaine, le monde occidental est peut-être le premier à adopter la méthode de construction sur squelette qui va ensuite se généraliser pendant le Moyen-Age et qui est encore de nos jours la méthode la plus fréquemment employée.

Il n'est malheureusement pas possible de déterminer avec certitude l'origine du navire de Saint-Gervais. Le matériau céramique retrouvé à bord correspond à un faciès caractéristique à cette époque de tout le bassin Méditerranéen. Du blé et de la poix constituent la cargaison. Si le Sud de la Gaule n'est pas une région productrice de blé, il possède par contre des ressources naturelles abondantes en résineux permettant la fabrication de la poix. La coexistence de ces deux marchandises laisse envisager un trafic de cabotage le long des côtes provençales et dans ce cas une construction locale du navire peut être envisagée.

Les raisons de l'adoption de cette méthode dès le VIIème siècle sont d'ordre économique et surtout social. Le principe de construction sur bordé exige une main d'œuvre abondante pour la taille minutieuse des éléments d'assemblage des
virures et surtout une main d’œuvre habituée à cette pratique. Par ailleurs il nécessite une quantité importante de bois, surtout de bois durs pour les tenons. La construction sur squelette ne nécessitant pas la réalisation de ces pièces, permet une économie de bois appréciable. Et surtout après la disparition de la main d’œuvre accoutumée à la pratique de la construction sur bordé, la construction sur squelette est plus simple et plus rapide. Ceci peut expliquer son adoption par la civilisation arabe et peut être aussi par les Mérovingiens alors que la méthode romaine reste encore en usage au VIIème siècle dans le monde byzantin, héritier des traditions romaines.

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Notes
   G.F. Bass & F. Van Doorninck An eleventh century shipwreck at Serçe Liman, Turkey J.J.N.A., VIII, 2, 1978, Fig. 2.
6. Six languettes d’assemblage ont été observées mais l’ensemble de la coque n’ayant pas été démonté afin de la repérer systématiquement, leur nombre peut être supérieur.
La Bourse: J.M. Gassend *op. cit.* note 5.
Port-Vendres: *ibid.*

Sur l'épave de Giens, une membrure sur quatre à une membrure sur six est reliée à la quille; sur l'épave de la Bourse à Marseille, une sur huit; sur l'épave de Port-Vendres, une sur cinq; sur l'épave de Monaco, une seule varangue; sur le Dramont F, une seule membrure sur les cinq observées; sur la Luque B, 2 varangues pour l'ensemble de l'épave.

10. R. Steffy *op cit.* note 8.
11. Il s'agit des épaves suivantes: *Serce Liman* (cf. supra note 8), Agay (cf. supra note 8), *Pelagos Island* (cf. supra note 8).
Coupe longitudinale sur l'arrière de l'épave
ARCHAEOLOGICAL EVIDENCE FOR RITUALS AND CUSTOMS ON ANCIENT SHIPS

Summary

Our knowledge of rituals aboard ancient ships is basically derived from literary sources and from some pictorial evidence. New perceptions have now emerged from several decades of research under water. A considerable number of objects have been recovered from the bottom of the Mediterranean which either can be related to such rituals or bear direct witness to the religious beliefs and customs of Greek and Roman sailors.

The following groups of marine archaeological artifacts are considered:
1. Cups thrown into the sea as offerings when setting out on a voyage.
2. Altars and parts of altars.
3. Louteria which were possibly used as perirrhanteria for ritual hand washings during religious ceremonies aboard.
4. Lead horns that were cast in natural ones in order to make a more durable attachment to the ship of the animal horns which were on board as a apotropaic mascot.
5. Figured reliefs which stood for good luck and/or the averting of danger on the leaden stocks of Hellenistic and Roman wooden anchors. These may have been connected with the use of the sacred anchor, i.e. the sheet-anchor to be dropped when the ship was in danger of running aground.

Offering cups

Among the rituals celebrated in antiquity on board departing ships was the deposition of an offering in the sea in order to obtain the favour of the powerful sea gods or to appease the evil spirits of the deep. This ritual is mentioned by Polemon of Ilion, the Perihegete, whose literary activity in Alexandria dates to the early 2nd century BC, in the context of voyagers leaving from Syracuse. Polemon's works have been lost, but the passage is cited in the “Deipnosophistai” of Athenaeus (late 2nd century AD) where we read (11.426): “And Polemon in his book on Morychus says that at Syracuse, at the furthest point of the island, near the sanctuary of Gē Olympia, outside the wall, there is an altar. People departing by sea, he says, keep aboard a cup from it until the shield on the temple of Athena is no longer visible; they then throw the cup into the sea, after putting in flowers, honey, lumps of incense, and along with these some other aromatics”.

The temple of Athena on the island of Ortygia still exists inside the present cathedral, and where the baroque entrance now faces Piazza Duomo stood the western main pediment of the Greek shrine. The shield mentioned by Polemon was probably that of the statue of the goddess, standing either on top of the pediment or within it. In the latter case the shield would become invisible to
spectators when they crossed the line of the pediment in an easterly direction. The prolongation of the line of the pediment to the south passes about 100 to 200 metres west of Castello Maniace at the entrance of the Great Harbour, that is to say close to the submerged rocks around the southern point of Ortygia. (Fig. 1). If the statue was on top of the pediment, the line beyond which the shield became invisible, would be more towards the east and would perhaps pass just over the south end of the island where, according to Polemon, stood the shrine from which the offering cups were acquired.

Ships leaving the harbour and heading north would turn around this point and pass through these relatively shallow waters. Consequently this could well have been the area where the reported ritual took place. And, indeed, it is there that isolated cups have repeatedly been found by divers since the first underwater archaeological research campaigns at Syracuse in the fifties. Among the cups which were brought up there are a few large ones of diameter up to 65 cm (Fig. 2) and also some small ones (Kapitan, 1967-68: 175 note 17), and most of them were found well preserved. These common terracotta cups have usually flat bottoms and simple rims. Two handles are attached horizontally either at the rim or shortly beneath it; and generally they can be dated to the Hellenistic period.

Such cups have also been found, together with other material, in another part of the sea at Syracuse, namely in an area which corresponds to the outer part and entrance of the ancient Little Harbour, the Lakkios, which is situated east of the present Small Harbour. (see Fig. 1) The original embankments of the Little Harbour submerged completely, probably already more than a millenium ago, by reason of the eustatic sea level rise or and by bradism. The cups found there are largely of the same kind as those from the entrance of the Great Harbour. However, only smaller ones with diameters up to about 25 cm were discovered there. Among them are two medium-sized cups with nine handles each (Fig. 3) and a fragmentary one which probably had five handles originally (Kapitan, 1967-68: 175, note 18, plate VIII).

These finds, in my opinion, testify that the same ritual was held on craft departing from the Lakkios. The deposition of offerings in the sea at departure was probably also practised in other ports of the Graeco-Hellenistic world, and perhaps these first results at Syracuse will stimulate such research elsewhere.

Altars

The Torlonia relief of a Roman merchantman shows on the after deck the helmsman sitting under the goose head, and, standing close to him three other persons. These are engaged in a thanksgiving ceremony which is celebrated on returning from the voyage while the ship enters the harbour of Rome. Casson describes this ritual as follows:

"The altar has a fire ablaze on it. Three people stand about it: a woman holding the accera, or incense box; on her right a man who is sprinkling
grains of incense on the fire, on her left another who holds a patera and bowl for a libation..." (Casson, 1971: 182, note 69).

In D. Wachsmuth's description of the scene (Wachsmuth, 1967: 145 ff) the altar is called portable, as indeed one would expect it should be, considering that a fixed mounting on deck would be cumbersome, especially on small ships. Finds of altars from clear-cut contexts in ancient wrecks are still wanting. There is however from the waters off the beach Mezza Praia at Terrasini, Palermo, a small rectangular terracotta altar. The dimensions are 24×14 cm in plan; the height is 15,5 cm. On its front side it is adorned with a relief representing Herakles, strangling the Nemean lion. (Fig. 4) According to Giustolisi, the religious significance of this scene is the victory of the intellect over the obscurity of death, — an idea matching the religious ceremony at the end of a successful voyage. The style of the relief dates the well preserved altar to the 4th century BC (Giustolisi, 1973, 64, 69, f, pl. XXXV, 1; 1975:37, pl. XXIV, Inv. no. 68).

The terracotta altar was found among the remains of at least two different dispersed ship cargoes. It may have belonged to a ship of the 3rd century BC with a load of Greco-Italic amphoras. In this case, however, it was either an old piece, retained out of a feeling for tradition, or it has to be considered a product of a mould which was used over an unusually long time. From the same shallow site at Terrasini comes a fragment of another terracotta altar with exactly the same figurative decoration (Giustolisi, 1975: 37 and pl. XXII, Inv. no. 222).

Probably likewise portable, because detachable, were the elements of a marble altar from the 2nd century BC Roman shipwreck at Spargi in Sardegna. There are two almost identical marble supports which are rectangular in plan and have base mouldings on three sides. Of one piece, found during the first excavation of the wreck in 1958, the upper part has been completely destroyed by erosion (Lamboglia, 1961: 156 and fig. 19). The other, 60 cm high and about 15 cm thick, and apparently well preserved, is only known from a photo, made available by private divers who looted the wreck and made off with this and other particularly valuable artifacts (Lamboglia, 1964: 261, fig. 2; Roghi, 1966: 1060). The supports were probably used as a pair and then would have carried an altar slab of uncertain length, but of at least some 50 cm width. Of the marble slab nothing was found — if not perhaps by the looters. However, as this slab was probably relatively thin, it may have been destroyed completely by the action of the salt water, especially if it was made of the same calcite marble from Carrara used for carving the supports. These remained preserved as far as they had lain protected under sand. In open water only dolomite marbles are not subject to erosion in the sea.

The fact that most marbles are usually destroyed in sea water, may be the reason why until now no other marble altars or parts of them are known. Some poor marble fragments certainly have been found in one or the other ancient wreck, but were almost unrecognizable.

The altar find in the Spargi wreck and the contemporaneous discovery of a
graffito at Pompeii of a large Roman sailing ship inscribed with the name **Europa** *(Maiuri, 1958: 18 ff., fig. 2)* which on the after deck shows a small cabin-like structure, has given rise to the conception of a stationary shrine or altar niche at the stern of Roman merchantmen. However, as yet there is no archaeological evidence to confirm this assumption. The structure on the graffito may be indeed a cabin, but the object inside rather than an altar seems to be a human figure, as it is drawn in substantially the same way as the other persons shown on deck, though with the difference that this figure carries something broad on its head. Is it perhaps a hat? — Of a lady? — The skipper's wife? — Europa?... Often details of graffiti allow fantasy to take a free course.

**Louteria**

From the Archaic period on, the louterion, a washing basin on a stand, was used in Greek and Hellenistic households. Terracotta louteria are either made of one piece (Fig. 5) or have a detachable basin. Those carved from stone consist of two pieces, or more often of three; a separately worked square bottom plate is then put under the base of the stand.

On sea, too, louteria may have been used for profane purposes, but from the marine archaeological evidence the conclusion must be drawn that aboard ships the louterion was mainly employed as a **perirrhanterion** for ablution rites, i.e. for the ritual hand washing which precede the offering ceremony. On this I refer to the more detailed statements in my study of 'Louteria from the sea' *(Kapitän, 1979: 97, 114 ff.)* which follows suggestions kindly received from D. Wachsmuth, including a passage in Tzetzes, *Exegesis ad Illiam*, which reads (1.314):

"*It was customary, when setting out on a voyage, to pour into the sea during the sacrifice, the water that had been used for the ceremonial washing*" *(Wachsmuth, 1967: 309).*

Obviously this requires that the water, before being poured away, must be caught, and this can be done properly only in a large vessel. The basin of a louterion, especially if detachable, was doubtless the most suitable device for that purpose. Sailors, however, accustomed to heavy work, could also easily manage the pouring with a louterion, of which basin and stand are made in one piece. By the way, on this occasion it may have happened sometimes that a basin or a complete louterion fell unintentionally overboard, turning up then in our time as isolated finds from harbours and anchorages.

At present my list of louteria found in the Mediterranean Sea comprises 22 pieces of all types, complete ones and fragments.¹ 11 come from sites of shipwrecks or were found among their dispersed remains, and 4 can be attributed with more or less certainty to shipwrecks of which dispersed cargoes survived that were already examined (see details in Table I). 3 must be considered isolated finds, while 4 terracotta louteria collected at Bodrum, each very similar to the other, may
have belonged to a louteria cargo still to be located, perhaps somewhere north of Marmaris in the eastern part of the Kerme Gulf. Holes in the shafts of their stands for a fixed mounting, probably to be accomplished on wooden posts, as are also applied in various terracotta louteria found on land sites, and in no. 2 of my catalogue, are perhaps a hint that they were made for households.

Only one louterion from a wreck site was found in a very clear and revealing context, the one from the the 300 BC Greek ship at Kyrenia, Cyprus. (Fig. 6) It is a marble louterion made in three parts (Kapitan, 1979: 111 ff., fig. 25). These are rather eroded, especially the basin, but allow one still to recognize the original shapes, though not ornamental details. More important than these, however, for us are the state and the position in which the louterion was discovered. The excavator, Michael Katzev, who kindly made available to me the photo which illustrates my article, also stated that it had been found stowed away dismantled in the stern locker of the ship. In my opinion this argues for ceremonial employment rather than for some ordinary profane use. Now, we remain very eager to learn soon from the final excavation report the very details of this interesting in situ context.

**Horns of lead**

It is not possible to celebrate a ceremony on the voyage when danger is immediately at hand. Precautions for the ship's maximum safety have to be taken in good time, appropriate technical measures as well as those which give the crew confidence. Sailors are superstitious and have always been so, though probably not more than other social groups. One of their beliefs is that horns of bulls and other strong animals avert mischief and disasters. Consequently such horns are fixed on ships. Danièle Mouchot has shown with some photos that this custom is still alive in our days, especially among Mediterranean fishermen (Mouchot, 1970:315 ff., fig. 8-10). As a pictorial testimony for it in ancient times Mas has published the coin of Dertosa which shows a Roman sailing ship with two horns protruding from the fore deck over the bow stem (Mas, 1979: fig. 116). (Fig. 7). The archaeological evidence for this custom in antiquity consisting of lead horns found in the sea was first compiled by Danièle Mouchot (1970). That the lead was cast in natural horns is shown by a find of a lead horn with pieces of the real horn adhering, from the site of a mid-2nd century BC wreck at Punta Scaletta, Island of Giannutri, Toscana (Lamboglia, 1964b: 252 ff., fig. 18) (Fig. 8). The casting of lead in horns was obviously done in order to obtain a better hold for the nails with which the horns were fixed to the structure of the ship. Small square nail holes are found in all examples of lead horns. Lead, however, was probably not the unique material used for this purpose. A wooden plug, roughly carved until it fitted the cavity of the horn, may well have done the same. The employment of another technique, perhaps still more common, would explain why only a few lead horns were found, while the custom of applying horns to ships was probably wide-
spread, especially in Roman times. To the 5 examples in Danièle Mouchot's list (1970) only three more need to be added for the moment.2

The tusk of a boar assembled in a bronze sleeve, originally together with the second tusk of which only rests survived in the opening of the sleeve, should also be mentioned here. The piece was found in the wreck Mateille A at Gruissan (Solier, 1981: 192 f.). The apotropaic signification of tusks was probably the same as that of bull horns, especially when they were assembled like horns as in this case here. (Fig. 9). In my view, the nautical context of this discovery does not exclude the possibility that this talisman was used in some way aboard the ship, perhaps also mounted.

Anchor stocks with figured reliefs

In the ancient world the anchor was probably the most important safety device on sea-craft. When a coast was without harbour and beaching was not possible, the ship had to ride at anchor and all depended from this fitting. This is still more true when in stormy weather a drifting ship came in danger to run aground. If a steering or sail manoeuvre could not avoid this, the last-minute rescue from being wrecked was sometimes achieved by dropping the anchors. This is why in antiquity the anchor was generally considered to be sacred, and why, together with a certain number of anchors, a particularly sacred sheet-anchor (or more than one) was kept aboard seagoing ships.

In Hellenistic and early Roman times two-armed wood anchors with a lead stock, either fixed or removable, were in use (Kapitán, 1984). A considerable number of these stocks bear inscriptions and symbols of religious or apotropaic significance. With these the anchor acquired an additional 'magic power'. The reliefs were applied during casting and almost always set in such a way that they are legible or recognizable from the rope side; for it was the anchor rope that was in danger of being cut off, as ancient sailors believed, by evil spirits. These, however, would realize their powerlessness when arriving at the anchor. From an inscription they would learn that the anchor was under the protection of a powerful deity, or sometimes even of two deities. Their names given in the genitive or the dative signify the anchor as their property. Inscriptions in the nominative involve the gods or goddesses as protectors and saviours.3 Anchor stocks bearing symbols would make clear that good luck, protection, vigilance, power and deterrence, and so safety and victory, were on the side of the anchor and ship.

Which symbols were used? Among 111 lead anchor stocks with figured reliefs recorded in my files, 76 are with representations of astragali, (Fig. 10) knuckle-bones that were used in antiquity for games of dice, especially in the Graeco-Hellenistic world. Some more numerical data is given in table II. 19 anchor stocks with astragali also bear other symbols; these are listed in Table III. What is striking here is the relatively high number of stocks with pictures of shells. Most of
these are small smooth or ribbed shells, mussels and cockles. One stock shows a
single larger shell of a scallop type. On four stocks the cockle and mussel shells are
arranged in lines of four, (Fig. 11) and on a fifth stock in two groups of three.4
This means that they are mostly shown in the same quantities as astragali. Are not
the reliefs of shells perhaps the representation of another game? This would be a
game with only two different throws; if the shell fell with the outer side upwards,
this would be a winning throw, while four shells thrown in this position would be
an exceptionally lucky throw. As far as I know, this game is not mentioned. It is
however very easy to infer its existence from the evidence of these anchor stocks.
As yet no other explanation has been given for the significance of these small
shells shown on anchor stocks and always together with the knucklebone game.

However, the hypothesis of a game with shells is not needed in order to draw
the following conclusions from all the symbols which are met with in the figured
reliefs of lead anchor stocks, as listed in Table IV. The prevailing conception is of
a joyful win due to good luck, as we see it expressed e.g. in a gambler’s smiling
gesture when he wins a game of chance. Moreover there is the belief in victory
thanks to the assistance of helpful creatures, in the first place the dolphins (Fig.
12) so charming and so similar to humans, which also sometimes seem to smile, at
least in man-made pictures of them. This joyful victory over the malevolent
powers of the deep expresses the same way of looking at life as does the open,
unworried smile of the victorious young men in the kouroi of the Archaic period.

Notes:

1. To my published catalogue of louteria from the sea (Kapitän, 1979:99-112)
I add the following more recent finds which are however already comprised in the
numbers given above, with the exception of the last find mentioned here.

In addition to the listed louteria in Bodrum, no. 9 of the catalogue and the
basin with small portion of the stand described in the postscript, I recorded there
in 1982 two more fragmentary terracotta louteria with shapes very similar to the
former. One is a stand without a basin (which is broken off and missing); it is kept
in the Bodrum Museum, (Inv. No. ?). The other consists of only about the lower
half of the stand. It is now used upside down as a flower-pot in the Körfez
Restaurant on the harbour bay, not far from the Castle.

Moreover, in one of the amphora depots near the ‘Medieval Hall’ the
Bodrum Museum keeps also a fragmentary stand of a carved louterion which
seems to be made of a kind of basalt. From its round base up to the break it
measures 27,5 cm in height. The shaft has 16 flutes. Marine concretions
demonstrate that it was found in the sea; perhaps it is not known where.

In summer 1979 four fragments belonging to two different terracotta louteria
were found on the site of a scattered Greek amphora cargo of still unknown
provenance, but probably datable to the late 4th century BC, on the shallow of
Cape Ognina, Siracusa (Kapitän & Naglschmid, 1982: 231 ff. and fig. 4). One basin
fragment is of fine clay similar to that of the amphoras of the cargo. Two matching basin fragments and a sherd from the base of the stand belong to the other louterion, as the typical coarse ware shows. It is likely that this second louterion belonged to the ship with the examined cargo. However an uncertainty remains as the complete shapes and dating of both louteria are unknown. Many intrusive pottery fragments on the site allow the hypothesis that one louterion belonged perhaps to another Greek ship among those wrecked at the same shallow.

A basin and a base carved from bluish-grey striped marble which were privately excavated and lifted from the 1st century AD shipwreck with amphoras of type Dressel 7/8 near or between the Pontian islands S. Stefano and Ventotene (Cappelletti, 1981:110) are at best reminiscences of the original carved Hellenistic louteria. Was this basin still used for ablutions as a *perirrhanterion* or did it serve for another purpose? As yet a stand has not been reported from this site.

Postscript (to note 1)

According to a kind information of August 2, 1986, which I received from Mr. John Wood, 18 Park Road, Sherington, Bucks. MK16 9PG, a complete terracotta louterion very similar in shape and size to the complete one in the Museum of Bodrum (Kapitan, 1979: 106, fig. 14; and above in Table I, no 9) is kept in the Monastery of St. John in the island of Patmos. As to its provenance no answer could be obtained for the present. However, the photograph illustrating Mr. Wood's communication shows the same type of marine concretions covering the louterion in a very similar sporadic way. Therefore, and because of the vicinity of Patmos to the Kerme Gulf, Turkey, it seems possible that this louterion and the other four corresponding vessels at Bodrum, all may come from one and the same wreck site and belonged to a ship-load of louteria, probably wrecked, as is said, somewhere in the eastern part of the mentioned gulf. The dimensions of the louterion at Patmos, as calculated from the photograph according to the known size of a small object put to the vessel as a scale, are the following: diameter at the base about 0.36 m, at the basin about 0.70 m. height about 0.57-0.58 m. In table I this louterion *is to be added* as no. 23 and probably to be marked under letter 'L', though at present with a point of interrogation. (September 1986)

2a. Lead horn from Savellettri (Brindisi, Apulia) discovered in 1971 near a dispersed Corinthian amphora cargo of about 300 B.C. It was found some 20-25 metres east of the centre of the scattered amphora fragments, in an area from which also a few pottery sherds of later date were lifted. Hence its attribution to the ship with the Corinthian amphora cargo remains uncertain. The lead horn (mentioned in Kapitan, 1973: 186) is 23 cm long; it is kept in the Museo Provinciale at Brindisi.

2b. Lead horn from the area of Cabo de Palos (south-east of Cartagena) found as an isolated object at the Farallon Rock of Isla Grosa, on the side of the rock which faces the shallow 'de la Campana'. According to the published scale drawing (Mas, 1985: 165, fig. 6.4; cfr. also 1975: 118, fig. 115) the length is 25 cm.
According to a verbal communication by P.A. Gianfrotta, Rome, a lead horn, as yet unrecorded, was found in the sea off Monte Circeo, Latium. It is said to be kept in a house of the finder in the same area.


4. An example of four ribbed cockle shells on an anchor stock found at the Island of Ventotene, Latium, bearing *astragali* on the other half of the stock, is illustrated in Gianfrotta, 1980: fig. 8.

References:


Giustolisi, V., 1975, Le navi romane di Terrasini e l'avventura di Amilcare sul monte Heirkte. (= *Sicilia Archeologica che scompare 3*) Palermo.


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**TABLE I: Context of the louteria found in the sea**

1. Catalogue number, site and collection.
   A. found on the site of an excavated or surveyed shipwreck
   B. found together with the surveyed remains of a shipwreck consisting of a dispersed cargo
   C. found on the site of a shipwreck not officially located or surveyed but identified and dated
   D. found together with other shipwreck remains, details unknown
   E. found without context in open water, but doubtless lost from a ship or on the occasion of a shipwreck
   F. attributable to a shipwreck, known from the remains of a dispersed cargo
   G. perhaps attributable to a shipwreck, known from the remains of a dispersed cargo
   H. perhaps attributable to some scanty dispersed remains of a possible shipwreck
   J. probably isolated find lost from a ship
   K. isolated find, possibly originating from a land site partly fallen into the sea
   L. perhaps from a wrecked cargo of louteria
I. ABCDE FGH JK L

2. Punta Castelluccio, coll. Siracusa
3. Terrasini, Palermo, coll. Terrasini
4. Stentinello-W, coll. Siracusa
5. Stentinello-E, coll. Siracusa
6. wreck Cabrera 2, Museum of Lluc
7. off Hvar, coll. at Hvar
8. Losinj, near Mali Losinj, priv. coll.
9. coll. Museum of Bodrum
10. wreck Capo Graziano F, coll. Lipari
11. Terrasini, Palermo, coll. Terrasini
12. Cape d'Agde, coll. Museum of Agde
13. Terrasini, Palermo, coll. Terrasini
14. ancient Little Harbour, coll. Siracusa
15. Kyrenia wreck, coll. Museum of Kyrenia
17. coll. Museum of Bodrum
18. coll. Museum of Bodrum
19. private property at Bodrum
20. coll. Museum of Bodrum (carved stand)
21. shallow Cape Ognina, coll. Siracusa
22. shallow Cape Ognina, coll. Siracusa

<table>
<thead>
<tr>
<th></th>
<th>ABCDE</th>
<th>FGH</th>
<th>JK</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
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<td>1</td>
<td>2</td>
<td>1</td>
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<td>3</td>
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<td>4</td>
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<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11 4 3 4 =22

157
### TABLE II: Lead anchor stocks with reliefs - number of examples

<table>
<thead>
<tr>
<th>Types of stocks: fixed</th>
<th>removable</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. with reliefs of <em>astragali</em>:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <em>astragali</em> only</td>
<td>35</td>
<td>13</td>
</tr>
<tr>
<td>- <em>astragali</em> and other figured reliefs</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td>- <em>astragali</em>, other figured reliefs and inscription</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>- <em>astragali</em> and inscriptions</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>63</td>
<td>14</td>
</tr>
</tbody>
</table>

B. with other figured reliefs:

- one kind of figured relief only: 25 3 28
- several kinds of figured reliefs: 3 - 3
- figured reliefs and inscriptions: 3 - 3

**Total**: 31 3 34

### TABLE III: Other symbols on lead anchor stocks with representations of *astragali:*

<table>
<thead>
<tr>
<th>Additional symbol</th>
<th>number of examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>figures of deities</td>
<td>1</td>
</tr>
<tr>
<td>busts or heads of deities</td>
<td>1</td>
</tr>
<tr>
<td>dolphins</td>
<td>2</td>
</tr>
<tr>
<td>lion heads</td>
<td>1</td>
</tr>
<tr>
<td>shells</td>
<td>6+2(?)</td>
</tr>
<tr>
<td>caduceus</td>
<td>-</td>
</tr>
<tr>
<td>oil lamps</td>
<td>1</td>
</tr>
<tr>
<td>keys</td>
<td>1</td>
</tr>
<tr>
<td>rings</td>
<td>1</td>
</tr>
<tr>
<td>rosettes</td>
<td>1</td>
</tr>
<tr>
<td>unidentified elevations</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>19</td>
</tr>
<tr>
<td>TABLE IV: Numerical list and preliminary classification of symbols met in figured reliefs of lead anchor stocks:</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>number of examples</td>
<td></td>
</tr>
<tr>
<td>stocks</td>
<td>additional symbol</td>
</tr>
<tr>
<td>A. Symbols of good luck in games</td>
<td></td>
</tr>
<tr>
<td>astragali</td>
<td>75</td>
</tr>
<tr>
<td>shells</td>
<td>—</td>
</tr>
<tr>
<td>B. Symbols of protection, help and vigilance</td>
<td></td>
</tr>
<tr>
<td>deities (figures and heads)</td>
<td>3+1 (?)</td>
</tr>
<tr>
<td>caduceus</td>
<td>2</td>
</tr>
<tr>
<td>eyes</td>
<td>1</td>
</tr>
<tr>
<td>dolphins</td>
<td>10</td>
</tr>
<tr>
<td>keys</td>
<td>2</td>
</tr>
<tr>
<td>oil lamps</td>
<td>2</td>
</tr>
<tr>
<td>C. Symbols of power</td>
<td></td>
</tr>
<tr>
<td>columns</td>
<td>2</td>
</tr>
<tr>
<td>hammers</td>
<td>—</td>
</tr>
<tr>
<td>D. Deterrent symbols</td>
<td></td>
</tr>
<tr>
<td>heads of Medusa</td>
<td>1</td>
</tr>
<tr>
<td>decapitated human heads</td>
<td>1</td>
</tr>
<tr>
<td>lions and lion heads</td>
<td>1</td>
</tr>
<tr>
<td>sharks</td>
<td>1</td>
</tr>
<tr>
<td>swordfish</td>
<td>1</td>
</tr>
<tr>
<td>jellyfish</td>
<td>1</td>
</tr>
<tr>
<td>E. Symbols of uncertain interpretation</td>
<td></td>
</tr>
<tr>
<td>fish (small stamp)</td>
<td>1</td>
</tr>
<tr>
<td>sea-slugs (?)</td>
<td>—</td>
</tr>
<tr>
<td>purple shell (Murex)</td>
<td>—</td>
</tr>
<tr>
<td>three leaves</td>
<td>1</td>
</tr>
<tr>
<td>rings</td>
<td>2</td>
</tr>
<tr>
<td>rosettes</td>
<td>1</td>
</tr>
<tr>
<td>F. Unidentified reliefs</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>2</td>
</tr>
</tbody>
</table>

111
"KYRENI A II": BUILDING A REPLICA OF AN ANCIENT GREEK MERCHANTMAN

The site of the Kyrenia ship was discovered by Andreas Cariolou off the north coast of Cyprus at a depth of 30 meters. Its excavation yielded the best preserved hull of the classical Greek period yet found. The ship's timbers were raised, preserved and reassembled for exhibition in the Crusader Castle at Kyrenia.

The merchantman carried a cargo of approximately 400 amphoras: Samian jars presumably filled with oil, and pitch-lined jars from Rhodes which probably contained wine. Part of the ballast consisted of hopper-type millstones, quarried on the island of Nisyros, weighing over 1,650 kilograms in total.

We believe that the ship was manned by a crew of four, since the excavations recovered 4 salt cellars, 4 oil jugs (gutti), 4 similar pitchers, 4 drinking cups (kantharoi), 4 casserole bowls, and fragments of 4 wooden spoons. Most of the crew's crockery was made on Rhodes, which suggests the ship's home port.

These remains were found about one kilometer off the coast in open water. The cause of sinking was not clear until eight iron spears were found underneath the hull, several still in contact with the ship's lead sheathing. On the basis of this data and for other reasons we believe that the ship was sunk by pirates. The numismatic evidence indicates that the sinking took place sometime between 310 and 300 B.C.

The hull was remarkably well preserved; about 60% of its area survived and more than 75% of its representative timbers were recovered. After the meticulous recording of the physical evidence in situ and following the laborious documenta-
tion of the fragments when lifted, J. Richard Steffy undertook the reconstruction of the hull, using both graphic and physical procedures. We can all agree that the results of his many years of work are a brilliant achievement.

In 1982 Harry E. Tzalas, President of the Hellenic Institute for the Preservation of Nautical Tradition, proposed to us to build a full-scale replica of the Kyrenia ship. The American Institute of Nautical Archaeology located at Texas A &M University decided to cooperate in such an example of experimental archaeology. The American Institute agreed to provide the necessary data and consultation while the Hellenic Institute committed its resources towards the logistics and funding of the project. Manolis Psaros volunteered his shipyard in Perama for building the replica and on November 1st of that year initiation of “Kyrenia II” was announced to the public.

In building “Kyrenia II” our primary objective has been to replicate the original lines of the ancient 14 meter merchantman as closely as possible. However, that fourth-century hull was assymetrical in configuration; the port side had approximately 5% more wetted surface than the starboard. This fact is not surprising in shell-first construction when the shipwright built by eye based upon generations of experience and apparently without plans. But in Psaros’ shipyard the shipwrights would be working from plans and detailed drawings. Rather than seeking to duplicate exactly the assymetry of the ancient hull— a difficult, time consuming and more expensive endeavor—we compromised and decided to build a symmetrical hull following only the lines of the better preserved port side of the original ship. Even following the plans as accurately as possible, working in wood and using the shell-first method has yielded a replica which is very slightly assymetrical in shape.

Another priority of the project has been to use materials comparable to those in the ancient ship. Keel, planking, frames and interior scantlings were of Pinus halepensis Mill. This Aleppo pine is no longer readily available in Greece. Our pine (Pinus brutia Ten.) is very similar. It came from Samos and is the most commonly used shipbuilding timber in Greece today. Since logs of sufficient diameter or length were not always available, occasionally we had to alter slightly from the widths of the planking or relocate scarf joints. However, for the most part we have been faithful to the ancient hull. Wherever possible naturally curved timbers were used for the frames. As in the original, tenons and tenon pegs are Turkey oak (Quercus cerris L.). All the nails, fastening the frames, were hand-forged from rods of pure copper.

The construction of “Kyrenia II” was, of course, done in the shell-first method, a process probably not practiced in Greece for over 1,000 years. Initially, our shipwrights found it difficult to relearn the techniques for this old-fashion type of construction, and they were uncertain of their own ability to reproduce accurately the ancient design using the shell-first method. Also they were skeptical of the hull’s ultimate strength and seaworthiness. Gradually though difficulties gave way to skill, uncertainty was replaced by confidence, and skepticism by
admiration for the labor-intensive shell-first process.

At various stages of the building the workmen did experiment with hand tools. Saws cut planks. Mallet and chisel opened mortises. Adzes trimmed surfaces. However, considerations of time and money rapidly caused these hand tools to be replaced by the band saw, an electric mortiser (beginning with strake 4), and various powered planers.

The keel of the Kyrenia ship was 9.3 meters in length; its average height was 20.3 centimeters, and its average width was 12.2 centimeters. This keel was rockerced over its length, and the heartwood followed this curve through its entirety. It had been hewn from a single log which came presumably from a naturally curved trunk. To duplicate these specifications was Psaros' first task, and this challenge proved to be a difficult problem to solve. Samian shipbuilding timber today is usually cut to shorter lengths, and modern shipwrights prefer these logs to be of straight-grained wood. After cutting the first log, it was decided that the heartwood did not curve sufficiently through the length of the rockerced keel to give it adequate strength, and the piece was scrapped. The second log when cut revealed nests of tiny woodworms, and it was discarded. A third log was cut down, but when its bottom sided dimension ended up being 2 centimeters too thin we agreed to abandon it too. A fourth log was found; perfectly curved and of proper size, it was cut down to meet our exact specifications; and finally, after more than six months of part-time labor by two or more men, the keel was ready to be joined by stem and sternposts and set up.

The ancient shipwright had made the stempost of two timbers. Inner and outer planks were joined together by mortise-and-tenon joints and with nails. It is doubtful that he lacked properly curved or sized wood since no where else in the original hull did we find such a similar economic use of timber. Furthermore, joining of two planks would not seem to add strength to the stem, and such joinery would require considerable additional labor. Why it was done, we do not know. This procedure remains an enigma. Since Psaros had a naturally curved timber of the correct size in the yard, he and Steffy decided to make the stempost of "Kyrenia II" of one plank. It was connected to the keel by a simple hook scarf locked by keys.

The forward most part of the stempost of the Kyrenia ship did not survive. The bow configuration of "Kyrenia II" is therefore conjectural, but based on ancient representations, sailing tests and common sense. A near vertical cutwater was dove-tailed into the end of the stempost and reinforced by a substantial knee.

Fortunately a portion of the aft end of the keel of the Kyrenia ship had survived giving us the initial angle of attachment of the sternpost. A small fragment of the sternpost itself was identified but contributed little evidence to our knowledge of its configuration. A major part of the stern knee was found, permitting us to install a massive knee in "Kyrenia II". The curvature of the sternpost of "Kyrenia II" is somewhat hypothetical, but we are confident that it is reasonably correct considering extension of planking lines as well as illustrations.
of merchantmen from antiquity.

After the rabbets were cut along the upper edges of the keel of "Kyrenia II", mortises were opened along its lower bevel, or shoulder, using mallet and chisel. These mortises were centered in the slope of the shoulder and spaced about 12 centimeters from center-to-center; each mortise was between 4.5 and 5 centimeters wide, about 6 millimeters thick, and their depths averaged approximately 8 centimeters. These dimensions for mortises remained more or less consistent while they were being cut by hand. Moreover, in the case of the keel-to-garboard strake seam, as well as the garboard to strake 2 seam, the angle of entry of the mortises had also to be carefully judged in respect to the considerable curvature of these planks and the possibility of the planks splitting when secured upon tenons.

The planks for the garboard strakes were then cut, or in light of their cross-sectional curvature it might be more appropriate to say that they were carved. The edges were shaped to fit the configuration in the keel's rabbet. This was an unfamiliar task for the workmen, and as a result of their inexperience the result was not a snug fit between the surfaces of the lower edge and inner face of the garboard with the shoulder and beard face of the rabbet. However, the exterior seam appeared tight enough to be waterproof. So the planks, temporarily held in position by clamps, were marked by pencil for the placement of mortises on their lower edges. These mortises were opened, as were the mortises on the upper edges of the garboards. Tenons were prepared of almost the same width and thickness as the mortises, but of course twice as long as the mortises' depths. These tenons were also slightly tapered in their thickness towards the ends, and their corners were rounded. They were then set into the mortises of the keel.

Setting a mortised plank onto more than 50 tenons is not easy, especially when the plank must be twisted in several directions over its length. Slowly from one end to the other the plank is fitted over each tenon and gradually driven down—an application of animal (pig) fat over the exposed portion of the tenon eases the process—until the plank is completely in place and the seam light tight. After several days in position—during which the wood has settled in place, dried and shrunk, the plank is again pounded down to tighten the seam. Holes are drilled into the wood through each half of a tenon, and tapered tenon pegs are driven home to lock the joint in place. Again, after a few days, the tenon pegs are re-hit to be absolutely certain that they are dead tight. Later, the protruding ends of the pegs are adzed flush to the surfaces of the hull's shell. In the case of the keel-garboard seam, tenon pegs were driven in from the outside. However, in virtually all other cases (the exceptions being near the stem and sternposts, where there was not enough hammering space) tenon pegs were driven in from the interior of the hull, as the ancients had done.

The garboard strakes of "Kyrenia II" were finished during October of 1983, almost one year after the beginning of construction. With this experience of mortise-and-tenon joinery successfully completed the shipwrights became more confident in their capability to handle the method of shell-first construction. But,
they found work on the second strake still to be difficult, since it was almost as radically curved as the garboard. However, with chocks temporarily placed on the garboards to serve as a guide for obtaining the correct curvature, they did proceed more assuredly and certainly more quickly. The second strakes were done by two men working part-time within the period of two months.

Now totally persuaded that a ship could be built in the shell-first method, the builders considered the almost flat third strakes to be relatively easy. But due to the severity of the winter of 1984, these strakes were not finished until March. Alas, due to a lack of financial resources work on “Kyrenia II” came to a virtual halt during the spring and early summer of last year.

Then in July, 1984, two members of the Hellenic Institute volunteered their labor for work on “Kyrenia II”: Michalis Oikonomou, a 56 year old master shipwright, and Sokrates Kavalieratos, a young apprentice naval architect. Devoting their full time to the building, progress on the hull rapidly accelerated, not least because with the fourth strakes an electric mortiser began to be used.

Strake 4 of the Kyrenia ship made the most extreme curve over its length; from an almost vertical alignment at the stempost, it turned to about a 30 degree above horizontal position at amidships. Duplicating this almost 60 degree turn in the planking of “Kyrenia II” was not easy, but we want to emphasize that absolutely no steaming of planks was ever employed in the building of the replica. Wet pine, that is to say wood still heavy with resin, can be twisted without too much difficulty. However, once in place, as the wood progressively dries and shrinks, more and more space opens in the seam between planks. Using dry, seasoned timber minimizes this phenomenon, but wood too dry cannot be twisted into position without cracking. Therefore, timber of just the right temper, not too wet with resin or too dry to have become brittle, had to be selected. Because of Michalis Oikonomou’s 40 years of experience in wooden boatbuilding, he immediately appreciated the situation and selected perfectly the appropriate log to meet satisfactorily the requirements of this 4th strake.

Strakes 5 through 7 of the ship represent the turn of the bilge. Here we might pause for a few general observations. The thickness of the planks, except for the wales, of “Kyrenia II” ranges from 3.5 to 4 centimeters. Plank widths vary from 18 to 28 centimeters at amidships and average about 23 centimeters. Lengths of the main plank in each strake run from over 7 meters to close to 10 meters. With the exception of the wales, the planks of each strake are joined by a simple diagonal scarf having on the average three mortise-and-tenon joints.

Michalis and Sokrates quickly became comfortable with the method of mortise-and-tenon joinery in shell-first construction. By the end of August they had finished the seventh strakes and were remarkably impressed by the extreme stiffness of the shell. Nevertheless, they wondered whether it would not be prudent to add some temporary frames as braces to make certain that the shape of the hull remained fixed.

By the time work began on the eighth strakes Oikonomou was so familiar
with the design and construction of the Kyrenia ship that he virtually had become the *alter ego* of the ancient shipwright. One example of this kinship was the way he faultlessly replicated the widening of port strake 8 towards the stern. In turn port strake 9 narrowed to join this scarf-like configuration short of the sternpost. We believe that the original shipwright made this modification thinking that it would balance the sheers of both port and starboard sides in anticipation of his setting the first wales. However, such an alteration was not deemed necessary on the starboard, and Michalis identically as the ancient shipwright gradually narrowed the starboard strakes 8 and 9 towards the sternpost.

The first wales, the tenth strakes, are planks 8 centimeters thick, at least twice that of the lower planking. This increased thickness, doubling the weight of the planks, made working with them all the more difficult. A third workman, Spyros Exarchos an apprentice shipwright, was assigned to the crew to ease the burden. These planks were joined one-to-another by more complex, Z-shaped scarfs. The greater length of the scarfs and increased thickness of planks provided more space so that additional mortise-and-tenon fasteners could be staggered in two rows to yield stronger scarf joints. Indeed, the wales acting as girdles added such extraordinary strength to the shell that the workmen no longer felt the need of internal framing in order to maintain the rigid shape of the hull. These main wales were completed by the end of November, 1984.

Port strake 11 in the Kyrenia ship was the widest found in the hull's excavation, almost 29 centimeters wide at amidships. Logs of that great a dimension were not available in Psaros' shipyard. Therefore, for "Kyrenia II" it was decided to make the eleventh strakes of narrower boards, let us call them lower strakes 11 and upper strakes 11 to remain consistent with the strake numbering of the original ship. In the replica each of these strakes was made up of two planks joined by a single diagonal scarf, and these planks are notable in "Kyrenia II", since in each strake there is a plank 9.7 meters in length — the longest planks to be found in the replica.

We believe that the Kyrenia ship had only the two wales we found. In "Kyrenia II" the upper wales, strake 12, are almost 7 centimeters thick. Each strake is composed of three planks joined like the main wales by three-planed Z-scarfs, there being two such scarfs in each strake 12. It should be noted that in the wales the tenon pegs were also driven from the inside, but because of the greater thickness of these planks the pegs did not extend to the outside surfaces. However, in the scarfs the outside staggered row of tenons was pegged from the exterior of the hull, and similarly these pegs did not penetrate to the inner surfaces of the wales. The upper wales acted like a second band of girders, belting tight the hull at this level and adding even more intrinsic strength to the shell. On February 20, 1985, by which time the twelfth strakes were finished, we had the great pleasure to welcome to Psaros' shipyard Melina Mercouri, Greece's Minister of Culture. Indeed, may we take this opportunity to express personally how grateful we are to Mrs. Mercouri and her administration for their considerable interest and generous
financial contributions towards the successful completion of “Kyrenia II”.

When Mrs. Mercouri saw the ship it stood 12 strakes high, without a single frame. It was now time to begin the framing of the replica. The Kyrenia ship had a system of framing which we now know to have been commonly employed in antiquity: floors alternating with half-frames, futtocks continuing the arms of the floors, and what we call top timbers extending beyond the ends of the half-frames. Chocks fill the cavity within the keel, garboard and second strakes. The floor timbers are secured to these chocks by two to four mortise-and-tenon joints, pegs locking the tenons in place. But at no point do the chocks actually touch the keel. Rather, that potential area of contact has been cut, forming limber holes for bilge water to flow through.

All frames are virtually square in cross-section over most of their lengths: floors 9 to 8 centimeters on a side, half-frames an average of 8 centimeters, futtocks about 7 centimeters, and top timbers 7 to 6 centimeters. The lengths of the frame timbers are, for the most part, comparable to their counterparts in the original hull, although there are occasional variances due to the different availability of sized and curved logs in Psaros’ shipyard compared with that of his ancient predecessor. The distance between floor and half-frame timbers (center-to-center measurements) averages 25 centimeters.

In the replica floor timbers alternate consistently with half-frames as in the Kyrenia ship. But there is one exception to this rule. In the stern are two adjoining half-frame pairs. The ancient prototypes of this peculiarity were labeled frames 6 and 7 during the hull’s excavation. Also, port frame 6 was found to have 6 regularly spaced mortises with broken tenons in its upper surface. Later we will return to this situation in more detail.

Work on the framing proceeded relatively rapidly, in part because of the use of the band saw and power planers, in part due to Michalis’ eye to hand dexterity, and because a fourth man was put on the team: Michalis’ older brother, Kostas Oikonomou — he too being an experienced and skilled wooden boatbuilder. In fact, aside from sawing and chiseling to open the watercourses, the only by-hand work on the frames was adzing their lower surfaces to fit them tight against the inner face of the shell.

It is now appropriate to cite a few statistics. Four men working 8-hour days for 13 days made 18 floor timbers and 16 pairs of half-frames. This averages about 8 man hours per frame. After one month of beginning the framing all the 23 floor timbers (plus 5 futtocks), and 25 pairs of half-frames for “Kyrenia II” were in place. However, since the copper nails were not yet made, these frames were temporarily held in position by lag bolts.

After a month’s interruption of progress on the replica, the nailing began in earnest. Holes 2 centimeters in diameter were drilled from inside the hull through frames and planks. Each successive hole through a frame was started alternately slightly forward or aft from the center-line of the frame and angled back in the opposite direction to minimize the chance of the frame’s splitting. When
effectively done, the holes on the exterior of the hull lined up in vertical rows. Depending on the width of the strake, either two or three holes were drilled through the frame into a given plank. Pieces of pine for treenails were cut square in section with straight grain running down through their lengths. Each piece 16 centimeters in length was then turned round on a lathe so that its diameter tapered. A hole was drilled down through the center. These treenails were inserted, of course narrower end first, from the exterior of the hull through planks and frames. The center holes guided our modern nails through true. We believe that the ancients had no need of such holes and that they simply whittled their treenails to shape.

Most of the nails were made from 10 millimeter round rods of pure copper. Lengths ranged from 20 to 25 centimeters. Rose heads were hand-forged and varied in diameter from 2 to 2.5 centimeters. The pointed ends were tapered over a length of about 4 centimeters. After the nails were driven home, the excess portions of treenails protruding above the inner surface of the frames was chiselled or adzed away. About 2 centimeters of a nail’s tip was turned down. Then the remaining end of the nail was clenched down with a hammer. Clenching was done downward in the direction of the keel, and each successive clench was slightly angled in an opposite direction in order to avoid splitting the frame. This method of nailing created a herringbone pattern and made a staple-like fastener the strength and tightness of which cannot be overstated.

Meanwhile, the 13th strakes were being worked on spasmodically. Only a small portion of port strake 13 survived from the ancient hull. Therefore, in the replica we were now building in an area where sizes had to be based more on conjecture than the physical evidence from the Kyrenia ship. Since we were now presumably above the level of the load waterline, we decided to make the planks thinner — about 3.5 centimeters thick, and 25 centimeters wide. Each strake 13 of “Kyrenia II” is made up of two planks joined by a simple diagonal scarf.

At this stage, everyone connected with the project agreed that it would be a useful learning experience to give “Kyrenia II” a trial launching. Up until now the wood had been periodically coated with a mixture of 50% linseed oil and 50% turpentine. But, since no evidence of caulking was found in the seams of the ancient hull, no caulking material had yet been used in the replica. However, because the keel-to-garboard joint was not that snug a fit, it was thought prudent to caulk this seam with a combination of hemp and cotton, which was continued up the stem and sternposts as far as the first wale.

On May 9th, 1985, at 12:43 p.m., “Kyrenia II” floated into the sea for the first time. Wood which had been drying and shrinking for over two years provided openings in the strakes’ seams of one to two millimeters for water to rush through. After one hour so much water had filled the hull that the ship’s main wale was almost submerged; after two hours she was down to the upper wale. But, after 24 hours the water was pumped out, and except for a few minor leaks, “Kyrenia II” remained high and dry. Within that short a period of time the wood had swelled
sufficiently to close those opened seams. The hull seemed very solid, and sat even in the sea. Estimates were made as to the level of the sheer strake.

"Kyrenia II" was hauled out, and during the next six weeks building proceeded at a considerably accelerated pace. As many as ten men were working on the replica at once, and some even on Saturdays and Sundays. We planned to have the ship ready for official launching in conjunction with the inaugural ceremonies of "Athens Cultural Capital of Europe 1985".

Having decided that about 30 more centimeters had to be added to the heights of the sides to prevent the vessel from shipping too much water in heavier seas, the 14th and final strakes were installed, being the same size as the 13th. Later, a five-centimeter-high cap rail was made and completed the shell. And the rest of the futtocks were nailed in place, as were some of the top timbers; but not all of the latter were in place by launch time.

As in the Kyrenia ship, shelf clamps were placed inside the hull at the level of the 10th strakes, reinforcing these main wales and providing some longitudinal strength. Each clamp consists of three planks, the ends of which are diagonal scarfs nailed to frames. Limber ledges support rectangular boards simply laid in place athwart and easily removable to gain access to the bilge. Between shelf clamps and limber ledges are ceiling planks lightly nailed onto frames. In the ancient hull these planks ran from frame 6 to frame 40, defining the limits of the hold, and protecting frames from the wear and tear of ballast and cargo.

Now let us return to the oddity of the two adjoining half-frames, frames 6 and 7, and recall that frame 6 had remnants of tenons in its inner face. Considering this evidence, and also that the ceiling planks, limber ledges and boards ended atop this frame, as well as the fact that the distribution of millstone ballast and amphora cargo stopped abruptly here, we believe that a bulkhead once extended athwart at this point. Because of the high probability of the existence of this bulkhead and the type of objects found behind it, we also presume that a deck ran from frame 6 aft, enclosing a stern locker and providing a platform for the ship’s helmsman.

The builders of “Kyrenia II” closely copied our hypotheses, while also relying considerably on their own boatbuilding experience. In the stern a deck 3.8 meters in length was constructed with a hatch opening cut in its forward starboard quarter, giving access to the locker below. However, in the rush to finish the replica a minor error in the placement of the bulkhead was made. Rather than being placed atop Frame 6, it was built against its forward face.

The Kyrenia ship’s excavation did not yield any substantial evidence for locating a bulkhead forward of the hold. Perhaps there never was one. However, common sense dictates that a deck must have existed in the bow to serve as a platform for lowering anchors and handling the sail. After lengthy discussions during which Michalis contributed his expertise, we all agreed that for “Kyrenia II” a bow deck should run aft to above floor frame 44. As built, the length of this bow deck is 3.3 meters. There is no bulkhead at its aft end, leaving easy access to
The pine mast step of the Kyrenia ship was found relatively well-preserved, and the stanchion steps just forward and to each side of it were also in good condition. These have been exactly replicated in every detail for "Kyrenia II". The mast step sits upon floor timbers 33, 35 and 37, rabbets having been cut in the upper surfaces of these frames to fit the notches in the bottom of the step. The mast step is secured by nails driven through it into each of the frames, two nails per frame. The cuttings around the mast box are somewhat of an enigma, but in time "Kyrenia II" should better explain their function. Portions of two cross beams were found to the port of the Kyrenia ship's mast step complex. Their ends were nailed to the top of the shelf clamp. Steffy has identified them as mast partner beams and ingeniously interpreted their use in supporting the mast. Following his plans and drawings the builders of "Kyrenia II" have restored his concepts in three-dimensions. The aft partner beam spans the hull and is supported at its center by rectangular stanchions tenoned into the after cuttings of the mast step. Partner shelves run parallel to each side of the mast step; at their stern ends they are nailed to and supported by the aft partner beam; at their bow ends they are supported by round stanchions tenoned into the stanchion steps. The forward partner beam does not span the hull; rather, its center is cut away to leave room for the foot of the mast to swing out when the mast is being lowered aft. The inner ends of the forward partner beam are rigidly held up by being nailed to the bottom of the partner shelves. Atop these shelves should be removable pieces of a collar helping to support the mast. Forward of the collar a removable brace would add rigidity to the entire complex.

Part of a third cross beam was found just aft amidships in the Kyrenia ship. Although substantial in size (cross-section: 10 cm high and 12 cm, wide), it was not nailed at its port end but simply rested in a notch in the top of the shelf clamp. Therefore, it does not seem that it could have provided much athwart strength. What its purpose was is a mystery. Perhaps "Kyrenia II" will give us an explanation.

The false keel on the ancient hull was Turkey oak. But searching high and low we could not find this wood available in Greece except in lengths less than about 50 centimeters. So in the replica we have used another hard wood; beech. But, like her ancestor, the false keel on "Kyrenia II" is held in place by tapered square pegs driven into round holes.

Professor Steffy has already spoken to you about his restoration of the steering assembly and quarter rudders for "Kyrenia II" based in part on the one surviving steering oar blade from the Kyrenia ship. We will only add that the looms of beech are probably about 35 centimeters too short, because longer lengths of beech were not available. This will be corrected. Also, a satisfactory method of lashing the steering oars secure has not yet been implemented but should evolve after future sea-trials of "Kyrenia II".

Aside from the replication of a few items of block and tackle found in the
Kyrenia ship, the remainder of “Kyrenia II” has been built based on conjecture following our interpretations of ancient representations of ships, literary testimonies, and the experience of our shipwrights, rigger and sailmaker. Therefore, our verbal descriptions will not be so detailed, and the subjects may be more effectively conveyed through visual presentation.

As has been said, the strake seams of the hull have not been caulked, but they have been covered with a mixture of fat from around the kidneys of oxen, pine pitch, and fine saw dust, to make the seams more water-proof.

The hull from the keel to the top edge of the main wale has been coated with a mixture of pig fat, pine pitch and soot, giving the effect of Homer’s black-hulled ships, and providing some protection against bacterial growth.

The end of the stempost and the finial of the sternpost were finished in the simplest yet graceful way. One concession for decorating “Kyrenia II” was made. I asked my wife to design and paint apotropaic eyes on the ship’s bows. Stanchions and railings also consistent with those depicted on vase paintings were built around the stern and bow decks for safety.

Channels for belaying pins have been placed slightly aft the mast for securing the shrouds. The stern bits are for lashing a variety of lines: backstay, braces, sheets and brailing lines.

No fragments of the mast or yard were found in the Kyrenia ship’s excavation. Following Theophrastus’ advice we decided to make them of silver fir for “Kyrenia II”. The mast is 10.5 meters high and tapers upwards from 25 centimeters to 10 centimeters. The yard is a single piece 10 meters long, 18 centimeters at its center, tapering to 12 centimeters near its ends. A more flexible three-piece yard will be tried next.

The sail should have been made of linen, but this material was not available in Greece. It should have been made up of horizontal strips. For a preliminary experimental sail we decided to use cotton canvas which is readily available here. But the sailmaker, Kostas Kafetzidakis, has a mind of his own and made this sail of vertical strips. It is wide and low in configuration, measuring 9.6 by 4.9 meters, or 47 square meters. Our early sailing tests have suggested that this sail is too small. For the proper linen one we are considering a sail as large as 11 by 6 meters (66 square meters) made up horizontal strips, in no. 7 linen canvas.

We advised that the sail should have 10 brailing lines, each line having perhaps as many as 10 lead guide rings (176 were found in the excavation), these rings being sewn to the leeward side of the sail. But the rigger, Yiorgios Kasanis, also has a mind of his own, and used fewer rings sewn to the windward side of the sail. After a couple of sailings the mistake was appreciated, and the rings transferred to the lee side.

The standing rigging of “Kyrenia II” consists of a forestay, backstay, and two shrouds to both port and starboard. The running rigging, in addition to the brailing lines, consists of a halyard, two topping lifts, braces and sheets. Manila line, roughly comparable to fragments of rope found in the excavation, has been
used. Wherever possible pulley blocks and heart thimbles, like those found in the Kyrenia ship, have been used in the rigging. The function of the toggles resembling yo-yos that were found in the ancient hull is still uncertain, but future sail tests of "Kyrenia II" will experiment with their use.

"Kyrenia II" was christened by Mrs. Melina Mercouri and Susan Womer Katzev the morning of June 22, 1985, and officially launched. Since that date I have learned that five sea-trials have been performed. From brief reports received on the earlier trials, I understand that "Kyrenia II" in a following wind of 5 to 6 Beaufort moves at over 4 knots. She has also sailed as close as 70 degrees off the wind.

Mr. Harry Tzalas informs me that, to date, the Hellenic Institute for the preservation of Nautical Tradition has spent 8 million drachmas, or a little over sixty thousand U.S. dollars, at current exchange rate, for building and testing "Kyrenia II".

The project of building a replica of the ancient Kyrenia ship has taught us much. We have learned that modern shipwrights can readapt to the method of shell-first construction and relearn the mortise-and-tenon joinery method last used by their ancestors almost a thousand years ago. We have shown that the shell of a hull can be built up to its load waterline by mortise-and-tenon alone, without virtually any internal bracing. And we have proven that Steffy's lines drawings of the Kyrenia ship can be precisely duplicated. Professor Steffy calculated the distance between the rabbets in the stem and stern posts of the Kyrenia ship to be 13.86 meters. In "Kyrenia II" it is 13.76 meters - a difference of 10 centimeters. He calculated the moulded beam to be 4.2 meters. In "Kyrenia II" this distance is 4.20 meters!

We have also learned that "Kyrenia II" floats and can be sailed. Gradually we are learning the performance characteristics of this replica. But, changes are already dictated, and many more sea-trials must be undertaken before we can properly analyze the accumulated data.

"Kyrenia II" is an authentic replica of a Greek merchant ship dating to the 4th century before Christ. I hope that at the 2nd Symposium on Ship Construction in Antiquity we will be able to report to you about her seaworthiness, sailing capabilities, and success in carrying bulk cargoes through the eastern Mediterranean.

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ΝΕΑΙ ΠΑΡΑΤΗΡΗΣΕΙΣ ΕΠΙ ΤΗΣ ΠΑΡΑΣΤΑΣΕΩΣ ΠΛΟΙΟΥ
ΤΗΣ ΥΕ ΙΠ Γ: 1/2 ΠΥΞΙΔΟΣ ΕΚ ΤΡΑΓΑΝΑΣ ΠΥΛΟΥ

Πλοίο χωρίς πατρίδα, καλλιτέχνημα, ἱσως, ἀπὸ περιπλανώμενο καλλιτέχνη, μνημείο, τὸ ἱδίο, περιπλανώμενο μὲ παράσταση περιπλανώμενου πλοίου. Ὅχιμα πελάγιον, πορεῖν διαλόπτικο, ἱστοφόρον, γέμοντο τῇ ἱστήρ, κολύμ τῇ ἱστήρ, πλῆρει τῇ ἱστήρ, ἐκ πρώμης ἐπιπέδους του ἀνέμου ἐν θαλάσσῃ σταθερά, πλέον διὰ γαλάζης καὶ δὲ εὐδαίας (Πολυδεύκους Ὀνομαστικόν Α 82-113, ἱδία 106-107).
Τὸ δὲ πλοῖο νοεῖτα πλεῖν, ἐμπλεῖν ἢ ἐκπλεῖν; (98). Οὐδὲς ἐμπλέκον, οὐδὲς κυβερνήτης, οὐδὲς πρωτάτης, οὐδὲς ναύτης, οὐδὲς ἐβάτης, οὐδὲς πρόασφος, οὐδὲς ἐπίκοπος, οὐδὲς αὐτερήτης, οὐδὲς ἐπιβάτης... (93). Οὐδὲς φόρτος, οὐδὲ φορτία, οὐδὲ ἀγώγα, οὐδὲς ῥόπος, οὐδὲς γόμα, οὐδὲ παρενθέθηκαι (99). Ἡ χρήση, ἡ σημασία τῆς πυξίδος ἄδηλα. Αὐτά εἶναι τὰ θέματα τοῦ ἐνδιαφέρον, ὅσον ἀφοῦ εἰς τὴν ἐρμηνείαν του ἀπεικονιζόμενου πλοίου, τοῦ ἐπιχειρημα, διὰ νὰ ἀπαρξῇ ἀπάντηση καὶ σ᾽ αὐτά τὰ ἐρωτήματα.

Πρῶτον θέμα: ἡ καταγωγή του πλοίου καὶ, συγχρόνως, τῆς πυξίδος. Ἐκ ποιὰς περιοχῆς τοῦ Ἀλγαίου ἢ τῆς ἐλλαδικῆς περιοχῆς προέρχεται; Ἐλλείπει συγκριτικὸν ὑλικὸν εἶναι ἀδύνατος ὁλιγήποτε ἀπάντηση. Τὸ αὐτὸ ἵσχυε καὶ ὡς πρὸ τῆς τεχνικῆς κατασκευῆς τοῦ ἀγγείου: παραμένει ἄδιερνήτη ἐλλεῖπε συγκριτικὸν ὑλικοῦ. Ἐπισταμένη μελέτη τοῦ κεραμεικοῦ, δηλ., διακοσμητικοῦ ὑλικοῦ, ἐνδείκνυται ἐπὶ τῇ βάσει, μάλιστα, τῶν προσφάτων εὐρημάτων πρὸς διευκρίνησιν τοῦ θέματος.

Δεύτερον θέμα: ἡ χρήση τῆς πυξίδος; ἄδηλος. Πῶμα δὲν ἀνευρέθη. Ἡ ἐσωτερική ἐπιφάνεια δὲν παρέχει στοιχεία πέρα τῶν κατασκευαστικῶν. Ἱσως, εἰς τὸ μέλλον, ὡς κτὶ τῆς εἰς βραδύ κεραμικὸ τροχό κατασκευῆς τῆς. Σημασία ἀμφισβητούμενη. Ὕπήρξεν ἀπλῇ ἀπόδοσι πλοίου ἐποχῆς; ὥστε ὁ κάτωχος τοῦ (ἐστὶ ὁ ἄρχος) ναυτικὸς; Ἐξει σχέση διὰ τὴν μετὰ τὰν τελεύτη την νήσο τῶν μακάρων; ἄρκον δίᾳ παρομοίων ἔρμηνειν τὰ ἅλλα παραπεπίματα;
Κατὰ ταῦτα, αὐτοτελεῖς καὶ αὐτονομοὶ μὲ σφιγγὸς προτερήματα ἐνδιαφέρει κατ᾽ αὐτῇ τῇ φάσῃ τοῦ παρεισόμενο πλοῖο ἀπὸ πλευρὰς κατασκευαστικῆς/ναυπηγικῆς ὡς καὶ διὰ τὰ λοιπὰ τοῦ μέρη. Τὸ σύνολο τῶν προβλημάτων τῆς διακοσμητικῆς, τῆς κατασκευῆς, τῆς χρονολογήσεως καὶ τῆς προελεύσεως τοῦ ἀγγείου, ἔτι ἀντιμετωπισθοῦν στὴν τελική δημιουργία τῆς πυξίδος.

Ἡ ἱστορία τοῦ ἀγγείου δὲν εἶναι συνηθισμένη. Ἀνευρέθη τὸ 1912 ἀπὸ τὸν Κ. Κουρονιώτη κατὰ τὴν ἀνάσκαφή τοῦ θολωτοῦ τάφου 1 Τραγάνας Μεσημβρίας (Θέσεις Βιγλίτσα), βορείως τοῦ Ομοίου τοῦ Ναβαρίνου καὶ ἐδημοσιεύθη στὴν
ΑΕ 1914.

'Η πυξίδα αυτή τῆς Τραγάνας (Ἐθνικόν Ἀρχαιολογικόν Μουσείον Ἀθηνῶν, 6098) εἶναι ἁγγείον κυλινδρικόν, μεγ. ὅψους 15.3 ἐκ. καὶ διαμέτρου βάσεως 13 ἐκ. (εἰκ. 1, πίν. 1). Χρονολογεῖται γενικῶς στὴν ΥΕ III Γ: Ι φάσιν,2 μία περίοδο, δηλ., κατά τὴν ὁποία, ὅπως ἀποδεικνύεται ἀνασκαφικῶς, εἶχε ἐπισυμβητή ὀλοκληρωτικὴ ἀποψίλωσι τοῦ πληθυσμοῦ τῆς Μεσσηνίας.4 Τοῦ ἁγγείου δὲν ὑπάρχει παράλληλο εἰς τὸ σύνολον τῆς Μεσσηνικῆς περιοχῆς καὶ πρέπει νὰ θεωρηθῇ ὅτι εἰσήχθη ἀπό ἄλλη μυκεναϊκὴ-αἰγαίακη περιοχή. Κατὰ τὸν Fr. Schachermeyer προφέρεται ἀπὸ τὴν Κρήτη.5 "Ὅπως ἐσημειώθη, τὸ σχῆμα τοῦ ἁγγείου (πυξίς) δὲν ἔχει παράλληλο εἰς τὸ σύνολον τῶν εὐρημάτων τοῦ νομοῦ Μεσσηνίας καὶ ἔρευνα, ἦτοι ἡ ἀνελαμβάνετο διὰ τοὺς σχετικοὺς πρὸς τὴν πλοίων στοιχεία, που παρέχουν αἱ πινακίδες τῆς Γραμμικῆς Β γραφῆς τοῦ ἀνακτόρου τοῦ λόφου τοῦ Ἐπάνω Ἔγκλαιανου, οὐδὲν νέο στοιχεῖον ἔχει προσκομίση. Πρόκειται, περὶ ἐπεισάγοντος ἁγγείου, που δὲν ἔχει σχέση πρὸς τὴν φθίνουσα Μεσσηνία, παρ᾽ ὄλον ὅτι ἡ Πύλος τοῦ Νησίου καταλόγων φέρεται ὡς ἡ δεύτερη ναυτικὴ δύναμι στὴν αἰγαίακη περιοχή.

Αἱ δυνατότητες τῆς ἀνάσκαφης τοῦ ἑτέρου 1912 ἦταν περιορισμένες καὶ τὸ ἢμισον, τουλάχιστον, τῆς πυξίδος ἔλειπε. Κατὰ τὰ κατοχικὰ χρόνια ἢ κατ᾽ ἄλλη μεταγενεστέρα περίοδο, ἢ πυξίς ἠκολουθεῖ τὴν τύχην καὶ ἄλλον καλλιτεχνικὸν ματίτων τοῦ Ἐθνικοῦ Ἀρχαιολογικοῦ Μουσείου τῶν Τρικάλων, μὲ ἀποτέλεσμα νὰ διαλυθῇ καὶ νὰ ἀπολεῖσθῃ μικρὸ ὀστράκο, ἐπὶ τοῦ ὅπου ἀπεδίδετο τὸ καρχηδόν τοῦ μεγάλου ἱεροῦ. "Αλλα ὀστράκα, ἀνευρέθη ἐκεῖνον στὸν ἱερὸ ὅπου τῶν τάφων τῆς Τραγάνας ἀπὸ τὸν Ἄνδρ. Σκιά (1909) δὲν ἀποκλείεται νὰ ἔχουν παραστάσεις πλοίων.6

Ἡ συνέχεια τῆς ἀνάσκαφης τοῦ αὐτοῦ τάφου διά τοῦ Σπυρ. Μαρινάτου (1955)6 προσεπόρισε ἐπιπέλδον ὀστράκα τῆς πυξίδος, τὰ ὅποια παρέμεναν ἀναζηµοποίητα μέχρι τοῦ ἑτέρου 1977, ὅπως καὶ ἐπεσημάνησαν εἰς τὸ Μουσεῖον Χώρας Τρικάλων.7 Η φροντίδα πρὸς μεταφοράν τῶν εἰς τὸ Ἐθνικὸν Ἀρχαιολογικοῦ Μουσείου τῶν Τρικάλων, μὲ ἀποτέλεσμα νὰ κερδῆθην πολύτιμα στοιχεῖα περὶ τῆς μορφῆς τοῦ πλοίου.7

Τὸ 1978 συνεχίσθη τὸ "κοσκίνησιμα" τῶν ἀπερρυμένων περιέ τοῦ ἀπεικονισμένου τάφον τῶν αὐτῶν τῆς παλαιᾶς ἀνάσκαφης τοῦ ἑτέρου 1912 καὶ πρόεκυψαν καὶ ἄλλα ὀστράκα, μὲ τὴν βοήθεια τῶν ὅποιον τὸ 1983 έλαβε ἡ πυξίς τὴν τελική της κατά τὸ γε νῦν ἔχον μορφή (συγκόλληση τὸ πρῶτον τῶν λαβῶν)7 (πίν. 1-2).

Δὲν ἀπετέλεσε ὀντοπία ἢ ἔρευνα πρὸς ἀνεύρεσι τῶν ἓλλειπόντων ὀστράκων. Τὰ εἴκοσι, τουλάχιστον, ὀστράκα, που ἀνευρέθησαν, συνέβαλαν ἀποφαινόμενος εἰς τὴν συμπλήρωσι τοῦ σχήματος τοῦ ἁγγείου καὶ τῆς μορφῆς τοῦ ἅπακονιζόμενου πλοίου. Περιττὸν, βεβαιῶς, νὰ λεχθῇ, ἐπίσης, ὅτι ἡ ὅλη ἔρευνα διεξήχθη ὀστιστικῶς διὰ τὴν ἀνεύρεσι ἑνὸς μόνον ὀστράκου, τὸ ἐπεισάγον ὀστράκον μετὰ τὸν ἂν ἀποτέλεσμα τῆς πρώτης ἡμέρας τοῦ πλοίου. Καὶ τὸ ἐλλειπὸν τιμήμα τῆς πρώτης ἡμέρας ἀπεδείχθη, τελικώς, ὅτι ἦτο σὲ δύο ὀστράκα, ἐκ τῶν ὅποιον ἀνευρέθη τὸ ἔτερο μὲ πλούσια στοιχεία, ἀλλά δὴ τὸ ἐπούλιον. Προσφάτος, τέλος, ἐγένες καὶ τὸ ἅπακονιζόμενο σχέδιο (εἰκ. 1) μὲ φροντίδα τῆς

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Έφορος τών Προϊστορικών Συλλογών του 'Εθνικού 'Αρχαιολογικού Μουσείου κ. Καίτης Δημηκοπούλου, μετά τή νέα συγκόλληση (τού 1983).  
Επειτά τή βάσει τής μελέτης τού ἄγγειου, μετά τάς δύο προσφάτους συγκολλήσεις, προέκυψαν τά ἀκόλουθα (νέωτερα) συμπεράσματα:  
Τό πλοίο ἀπεικονίζεται ως ἐν πληθ. μέ αναπταμένον τό ἱστιόν χωρίς νά ὑποδηλούνται κουπία. Ὅλοι λεπτομέρεις τῶν μερῶν τοῦ πλοίου ἀπεικονίζονται ἰκανοποιητικῶς, ὅπως ἡ κεντρικός ἱστός καί τό καρχηδόνι, ὁ πρότωνος, οἱ δύο ἐπιτόνοι, αἱ ὑπέραι καί οἱ κερωκάκες, τά ἱκρα τῆς πρώτης καί τῆς πρώτης, τό πηδάλον, τά ἐγκοίλα καί τό «πέτσωμα» τοῦ πλοίου, ή στείρα καί ἡ πρώτα (τό προεξήχον τμήμα τῆς τρόπιδος καί τό καμπύλον «ἀκροστόλιον») (γ.).  
Πρόκειται, ἵσως, περί μεταφορικοῦ ἵστοιοφόρου πλοίου, πού δὲν ἔχει συγκεκριμένα στοιχεία πολεμικοῦ πλοίου (ἐμβολον), χωρίς, ὅμως, καί νά ἀποκλείεται νά εἶναι. Δηλ., τά στοιχεία πού ἄλλοι μελετοῦν θεωροῦν ὅτι εὑνοῦν τήν ἀποφής ὅτι ἀπεικονίζεται εἰδικῶς πολεμικὸ πλοῖο, δὲν εἶναι ἐνδεικτικά / καθοριστικά.  
Ὅπως ἐσπευσμένη, τό προεξήχον τμήμα τῆς τρόπιδος δὲν συνιστά ἐμβολον, λόγῳ τοῦ ἐλαχίστου μήκους του.  
Ἡ προεξήχον αὐτή ἢ ἐχρησίμευσε, διά νά προστατεύεται ἡ στείρα, ὅπως καί δὲν εἶχε ἀκόμη χρησιμοποιηθῇ εὐθέως ἐμβολον στήν περιοχήν τοῦ Ἀἰγαίου στὰ πλοία τῆς Ἕποχής τοῦ Χαλκοῦ.  
Βεβαίως, δυνάτον νά εἶναι καί τυχαία ἡ ἀπόδοση.  
Πά τα παλαιά σχέδια:  
α) Η στείρα καί τό ἐμβολον. Ἡδη πρέπει νά ἀνοιγῇ παράνθεσις καί νά δοθῇ ἐρμηνεία διά τήν πολυκύμαντο ἱστορία τῆς ἐπιχειρηματικῆς ἀναπαραστάσεως τοῦ πλοίου, πράγμα πού διεξετάζεται στής συμπληρώσεις τοῦ Κ. Κουρουνιώτη.  
Πρόκειται, οὔσιαστικῶς, περί παραμορφώσεως, διότι τά προελθόντα λάθη ἀφεφώραν σε περισσότερα τμήματα τοῦ πλοίου, δηλ., στό «ἐμβολον», στήν στείρα καί στό νομιζόμενο ἐμβλήμα τοῦ ἱχθύος. Ἀυτά ὅμως διά ἐξήγησθον ἀναλυτικῶς: Ο Κουρουνιώτης ἀπεμάκρυν ἀνεπιτυχώς τήν στείρα κρίνεις ἡ κάθετος τεθλασμένη γραμμή, κλεισμένη διά γραμμῆς παραλλήλου πρὸς τήν διάθυνσην τῆς στείρας καί προσακολλημένη πρὸς τήν πρώτας, ἐφεξε σύγχυσιν τίνα εἰς τήν ὁμο ἀπόδοσιν.  
Ἐκ τούτου, συνεπεράνε διότι ὑπήρχε ἐμβολον, διότι τό σχηματιζόμενον εξέχον τμήμα τῆς «τρόπιδος» ὅτε ἀρκετῶν ἡ αὐτῶν τῶν σκοπῶν.  
Ἡ ἐνεργεία αὐτή τοῦ Κουρουνιώτη παρέσυρε τό σύνολον, σχεδόν, τῶν ἐρευνητῶν, μέχρι καί τῶν ἠμέρων μας καί παρουσιάσθησαν σχέδια φέροντα πολλά καί ποικίλα ἀνασυσταθέντα τμήματα τοῦ πλοίου (στείρα, ἐμβλήμα) δηλ. οὔτοσ πείδευσε τό πρόσθιο τμήμα τῆς πρώτας (στείρας) ὡς ξένο πρὸς τό πλοίο διακοσμητικό στοιχείο.  
Ἡ τεθλασμένη, ὅμως, γραμμή (ζύγ-ζυγο) δὲν ἀποτελεῖ ξένο διακοσμητικό θέμα πρὸς τήν ΥΕ ΠΠ Γ γάφη καί πρέπει νά θεωρηθεῖ βέβαιον ὅτι ἐπελέγη ἀπό αὐτῶν, ἄκριβῶς, τόν λόγον. Συγχρόνως, ο Κουρουνιώτης ἐπέτευκε τά ποδία τῆς «ἐμβλήματος» εἰς τά ἱκραν πρώτας, τόν ὅποιον, οὔτως, ἤξεσθε τό ὄψις (ΑΕ 1914, 109 σχ. 15).  
Κατ᾽ αὐτῶν τόν τρόπον, ἔμεινε ἀκέφαλη ἡ πρώτα καί ἐσχηματίζετο 179
έπιμηκες το «ἐμβολον». Ἀλλὰ, ἤβεβαιος, εἶναι γνωστό ὅτι ἡ στεῖρα (ποδόστημα - κοράκι) εἶναι «ἡ λαχυστά δοκικός (κάθετος πρὸς τὴν τρόπιδα) ἡ ἀποτελόσια τοῦ πλοίου τὴν τρόπιν, μάλιστα δὲ τὸ κεκαλυμμένον μέρος αὕτης τὸ διασχίζων τὰ κύματα».17 Στὴν λυσία ὁδηγήθη ὁ Κουρουνιάτης, ἐπειδὴ συνεπλήρωσεν ὡς ἤδυν τὸ πτερωτὸν ἐπὶ τῆς πρώρας (εἰδικῶτερον, ἐπὶ τοῦ ἱκρίου τῆς πρώρας) ὅποι καὶ ἤβεβαιος, δὲν ὑπήρχε χώρος πρὸς συμπλήρωσιν τοῦ ἱχθίου, εἰμὶ μετὰ τὴν ἀπομάκρυνσιν τῆς στεῖρας. Διαγράφων, ὅμως, τὴν ὄγκωδη - συμπαγή - γυαλιώδη στεῖραν, ἀφής ἀπροστάτευτον τὸ ἱκρίον πρώρας μὲ ἀποτέλεσμα, τὸ νέο τοῦτο μέτωπο τῆς πρώρας νὰ ἀποτελεῖ λεπτότατον ἐξόλον ἀνίκανον νὰ ἀντιστῆ ἐς τὴν δύναμιν τῶν κυμάτων.18

Τὸ λάθος ἑπετήμανε ὁ L. Cohen: α) the "ornamentation" is really an integral part of the ship καὶ β) Therefore, the last argument for the ram on Minoan ships falls to the ground.19

"Ἡδι, ἀπεδέχθη, κατὰ τὰς ἄρχας τῆς δεκαετίας τοῦ '70, μὲ πρότασι τῆς 'Εφόρου κ. Βαρθ. Φυλακάκη καὶ τοῦ Ζωράφου κ. Κ. 'Ηλίακη, ὅτι, διὸν ἄφορὰ στὸ νουόμενο «ἐμβλήμα» ὑπερθέν τῆς πρώρας (τοῦ ἱκρίου τῆς πρώρας), πρόκειται πρὶν πτηνοῦ καὶ, κατ' ἐπέκτασιν, μὲ τὴν ἀποκατάστασιν τοῦ ἱχθίου ὡς πτηνοῦ, δὲν ὑφισταται, πλέον, προβλήμα χώρος: ἡ στεῖρα ἐπιστρέφει εἰς τὸ σύνολο τῆς (ὡς κυριώς στεῖρα καὶ ὡς στόλος - ἀκροστόλιον), ὅμως, μὲ αὐτὴν τὴν ἐγκλεισμένη διακόσμησιν τῆς YE III Γ: 1-2 φάσεως καὶ τὸ πτερωτὸν δὴν συνδέεται μὲ τὴν πρώραν / στεῖραν καθόλου.20

β) ὁ ἦτος, τὸ ἦτον καὶ οἱ τόνοι (ὑπέραι)

Συνεχίζον τὰς συμπληρώσεις τοῦ ὁ Κουρουνιάτης καὶ, ναὶ μὲν χωρὶς νὰ ἔχη λάβει ὑπ' ὃντι τὸ τὸ ἡδη ἐκδεδομένο παράδειγμα τῶν πλοίων τῆς Φυλακώπης,21 συνέδεσεν ἐν τούτῳ τοὺς δύο τόνους ἀριστερά πρὸς τὸ καρχηδόν καὶ τὸν τρίτον (τὸν κατώτερον) πρὸς τὸ ἦτον, ἐπὶ δὲ τὸ ἦτον συμμετρικὴ τῇ τρόπῳ πρὸς τὸν νουόμενον κεντρικὸ ἦτον.22 Τὸ ἀποτέλεσμα ὑπήρξε νὰ συνδέεται οἱ ἐπίτονοι μετὰ τὸ καρχηδονίου καὶ τὸ τρίτον καλώδιον πρὸς τὴν περιφερειαν τῆς ἐθύνης τοῦ ἦτον.

Ἡ σοφαρωτέρα παρεμπνεύει, εἰς τὴν ὅποιαν ὑπέπεσεν ο Κουρουνιάτης, ὅταν ἡ συμπληρωθείσα μορφή τοῦ ἦτον, διὰ τὸ ὅποιο ἐθάρρησεν ὅτι εἶχεν ἀπεστρογγυλευμένας τὰς πλευρὰς.

Εάν τὸ μεταγενέστερον σχέδιον τῆς καθηγ. κ. Em. Vermeule (1964) ἑξει χαρακτηρισθῆ ὡς τὸ πλέον σάφφον,23 ἐπειδὴ δὲν συμπληρώνονται —ἐλεύθεροι στοιχεῖον— τὰ καλώδια (σχοινία), ἡ προσπάθεια τοῦ Σπ. Μαρινάτου, ἀκολουθοῦντας κατὰ τρόπον σταθερόν εἰς τὰς ὑπόδειξες τοῦ F. Behn, ἑξει ἀποκλίνει ἀπὸ τὰς ἀναγогικὰς καὶ ταυτίσεις τοῦ Κουρουνιώτου.24 Ὑποθέτω, συνέδεσε τὸν ἐπίτονον πρὸς τὸ καρχηδόν καὶ ἔφερε σὲ σχέση τὰ δύο ἄλλα καλώδια πρὸς τὸ ἦτον, τὸ ὅποιον ἐπανέλαβε κατὰ τὴν ἀτυχὴ συμπλήρωσι τοῦ Κουρουνιώτου. Βέβαιος, δὲν ἔχει διασωθῆ ὑποδηλομένη καὶ κεραία τοῦ ἦτον καὶ δὴν ἦτο τὸν ἄνωτόν νὰ ἀποκτήσουν ἀπολύτως ἀρθῆν κατεύθυνε τὰ δύο κατώτερα καλώδια, διὰ τὰ ὅποια εἶχεν ὑποστηριχθῆ ὅτι ἦσαν αἱ ὑπέραι.25 Ἡ παραδρομὴ ὅφειλε ταῖς τὸ γεγονός ὅτι δὲν εἶχε ληφθῆ ὑπ' ὃντι ἐν τῷ ἀπόδοση τοῦ
πλοίου καὶ, εἰδικῶτερον, ἡ πλευρικὴ ἀπόδοσις τῶν πάσης φύσεως λεπτομερείων (μὲ ἀποτελέσμαα νὰ ἀποδίδεται τὸ ἐν μόνον ἐκ τῶν ἐκάστοτε πλευρικῶν καλωδίων καὶ νὰ μὴ ἀποδίδεται ὁ, τιδήποτε προοπτικάς). 

Κατὰ τὰ λοιπὰ, ἐπανελήφθησαν λάθη τοῦ Κουρονιώταυτο, μὲ ἄποτέλεσμα νὰ συμπληρωθῇ ἀδόκιμος τὸ ἱστόν κατὰ σχήμα σύμμετρον περὶ τὸν νουσέμουν κεντρικὸν ἱστόν, παρελείψεις αὐτῆς αὐτῆς ἢ στείρα, μὲ ἄποτέλεσμα καὶ νὰ ἐπεκταθῇ ἢ τροπές (μὲ ἐπακόλουθον τὴν δημιουργίαν ἐμβόλου) καὶ νὰ παραλείψεις τὰ προεκβάλλομενα ἐκ τῆς στείρας στοιχεία καὶ νὰ ἐπαναληφθῇ τὸ «ἐμβόλο» (ἀλλὰ καὶ τὸ «σήμα») τοῦ Κουρονιώταυτο.

Τὰ σχέδια ἄλλων μελετητῶν συμβαδίζουν, ἐν πολλοῖς, πρὸς τὰ τῶν προγενεστέρων, μὲ ἄποτέλεσμα καὶ νὰ ἀναγνωρίζονται ὅρθια καταστάσεις καὶ νὰ ἐπαναλαμβάνονται παρερμηνεῖα. Ἡ ἐπὶ παραδείγματι, ἡ Cl. LAviosa τὸ μὲν συνέδεσεν ὅρθις τοὺς ἐπιτόνους πρὸς τὸ καρχησίου τὸ δὲ 1) συνεπλήρωσε κατὰ τὸ αὐτὸ σύμμετρον σχήμα τὸ ἱστόν, 2) ἀπέδωκε ἑλάχιστα τὴν προεκβολὴ τῆς τρόπθως (σχέδου ἀδέσποτη) καὶ 3) ἐπανέλαβε τὸν ἰξώθυν.26

Τὸ τελευταίον σχέδιον, ποῦ ἔχει δημοσιευθῆ, φέρει συγκεντρωμένους τρεῖς ἐπιτόνους μὲ κατεύθυνση πρὸς τὸ ἄνω τμῆμα τοῦ καρχησίου. Τὸ ἱστόν συμπληρώνεται ὅπως στὰ προγενέστερα σχέδια καὶ δικαίως παραλείπεται τὸ ἀνώτερον ἐκ τῆς στείρας (τοῦ ἀνωτέρου τοῦ τμῆματος) προεκβάλλομενον στοιχείον (τὸ ὁρίζοντα), διότι ἀπετέλεσε αὐτῆς ταύτην τὴν γραμμή θρασσεὶς τῶν ὁστράκων τοῦ ἄγγειου κατ᾽ ἐκεῖνο τὸ σημείον. Νέον καὶ εὐφρενίς στοιχείον, κατὰ τὴν πρότασι τῆς κ. Βαρβ. Φιλιππάκη, τὸ ἀποκαθιστώμενον ἀντὶ τοῦ ἰξώθου ἐπὶ τοῦ ἱκρίου τῆς πράρσας πτηνῶν.27

Αἱ νέαι προτάσεις:

1) Τὸ ἱστίον, οἱ τόνοι καὶ τὸ καρχησίου

2) Τὸ καρχησίουν δὲν ἀποδίδεται κανονικάς κυκλικόν, ἀλλὰ εἰς τὸ κατάτερον ἀριστερὸν τοῦ τμῆμα ἀντὶ τῶν σχήματισται ἐθέδεια, περίπου, γραμμή.

3) Ὡφίσταται καὶ ἀλλο καλώδιο, τὸ ὁποῖον ἀντιπροσωπεύει τὸ ἤξυγος τῶν κεροϊκών. Τὸ ἀποδιδόμενον φαίνεται νὰ καταλήγῃ εἰς τὸ κατάτερον, ἀκριβῶς, τμῆμα τοῦ καρχησίου.

4) Τὸ ἱστίον ἀποδίδεται μόνον κατὰ τὴν μίας πλευράς τοῦ ἱστοῦ καὶ οὐχὶ σύμμετρον περὶ αὐτὸν. (Ἡ παλαιὰ ἀποκατάστασις εἶχε χαρακτηρισθῇ υπὸ τοῦ Behn ἀδάντος.)

5) Ἀντιπροσωπεύονται καὶ αἱ ὑπέρα διὰ τοῦ τρίτου ἐκ τῶν ἀνω καλώδιον. Η ἀποδοδόμησις εἶναι προοδευμένη εἰς τὸν κεντρικὸν πάσασαλον τῆς μίας πλευρᾶς τοῦ ἱκρίου τῆς πρώτης, φαίνεται δὲ νὰ καταλήγῃ ἀκριβῶς ὑπὸ τὸ
καρχισμον εις τον ιστόν. (Νοείται το ἐπίκρινον Ὀδ. ε 271, 318.)

6) Οὐδεὶς ἀπεικονιζεται ἐνδόν/ἐπί τοῦ πλοίου, ἀν καὶ τὰ σχηματιζόμενα ὑπὸ τοῦ πηδαλίου εἰς τὴν ἐπιφάνειαν τῆς θαλάσσης ἀπόνεα μαρτυροῦν, κατὰ τὸν πλέον κατηγορηματικὸν τρόπον, ὡς καὶ τὸ ἀναπεταμένον Ιστόν, ὅτι τὸ πλοίον ἀπαίκονιζεται ἐν πλ. Τὸ αὐτὸ παρατηρεῖται καὶ εἰς τὰς λοιπὰς παραστάσεις τῆς ἐποχῆς (YE ΙΙΙ Β/Γ).

7) Ὅτι ἐκ τοῦ ἀνωτέρου τιμήματος τῆς στείρης, εἰδικῶτερον δὲ τῆς περικεφαλαίας (ἡ στόλου), ἐκπεπεθὰ προεκβαλλόμενον κυρτόν στελεχος ἀγνώςτου εἰσέτη προορισμοῦ κ αἱ λειτουργίας. Ἡσυχα πρόκειται περὶ τοῦ ἀκροστολίου.

Τὰ ἐπὶ μέρους παρατηρήματα καὶ σχόλια, ἀπόρροια τῶν νέων τούτων διαπιστώσεως, δυνατὸν νὰ παρατεθῶν ἐν τοῖς ἐπομένοις:


Ἀρα, ἀποδίδονται, ἐπὶ τῇ βάσει ὅσων ἀνεφέρθησαν ἀνωτέρο, δύο ἐπιτόνοι, ὁ ἀπαραίτητος προτός καὶ ἀνὰ ἐν καλωδίων ἐκ τοῦ ἐξύγους τῶν ὑπέρων καὶ τῶν κεροϊάκων (αἱ δύο ἐκείνες περιπτώσεις λόγῳ ἀποδόσεως ἐν τομῇ κατὰ τὴν πλευρὰν τοῦ σκάφους). Κατὰ τοῦτα, ἐὰν ἀποδίδεται, ὡς καὶ ἐν καλωδίων ἐκ τοῦ ἐξύγους καὶ τῶν ὑπέρων καὶ τῶν κεροϊάκων, αὐτὸ γίνεται κατ’ ὀικονομίαν καὶ ἐπειδὴ νοεῖται ὅτι ἀποδίδεται τὸ ἐκ ἀποκρύχον τὸ ἀντίστοιχον εἰς τὸ βάθος. Ἀντιθετώς, δὲν συμβαίνει τὸ ἄυτο ὅσων ἀφορά εἰς τοὺς δύο ἐπιτόνους, οἱ ὁποῖοι ἀποδίδονται ὡς ἐξύγους λόγῳ ἐπιθυμίας τοῦ καλλιτέχνου νὰ καταστῇ σαφῆς ἢ ἀναγκαιότης τῶν πρὸς διαφάλλον τοῦ ἰστοῦ ἐναντί τῶν ἐκ τῆς πρώτης πνεύμων ἀνέμων, διὰ νὰ τονισθῇ τὸ πλεονέκτημα ἔναντι ἄλλων ἀσθενεστέρων κατασκευῶν.

Χαρακτηριστικόν εἶναι, ἐπίσης, τὸ γεγονός ὅτι τὸ τρίτον ἐκ τῶν ἄνω καλωδίων (ἡ ἑτέρα τῶν ὑπέρων) προσδένεται ἐπὶ τοῦ ἰστοῦ καὶ, ἵνας, διακρίνεται κατὰ τὸ σημείον προσδέσεως/ἀπολήξεως τῶν κεροίακων. Θὰ ἀνέμενε τίς νὰ ὑπεδηλούτο συγκεκριμένον σημείον προσδέσεως, αὐτὸ, ὃμως, δὲν συμβαίνει,
διότι η κεραία (άντεννα) τού ἰστίου συμπίπτει εἰς τὸ σχέδιον πρὸς σημεῖον τοῦ ἰστίου, μῆ προσδιορίσας προοπτικάς, μὴ ἀποτέλεσμα νὰ μὴ διακρίνεται. Δηλ., γενικά, ἰστιοῦ τὰ πάντα ἀποδίδονται ἐν τούτῳ/κατὰ πλαγίαν ὡς καὶ οὐχὶ προοπτικάς, τὰ ζεύγη τῶν ἑπερῶν καὶ τῶν κεφαλάκων ἀποδίδονται ἃς ἐν ἐξάρτημα ἐκάτερον καὶ ή κεραία ἔχεται συμπίπτουσα πρὸς τὸν ἰστόν λογιζομένη ὡς σημεῖον αὐτοῦ. Εἰς αὐτὴν τὴν ἐρμηνεύσει συνηγορεῖ καὶ τὸ γεγονός ὅτι κατάτορον καλώδιον (ὑπέρα) εἶναι προσδεδεμένον εἰς τὸ ἱκρινὸν τῆς πρώτης δεξιάτερον τοῦ σημείου προς τὰ στήφες τῶν δύο ἐπιπόνων εἰς τὸν αὐτόν πάσαλον καὶ ἐγγύτερον πρὸς τὸν πηδαλιοῦχον.

Ὁ Κοινουνιώτης ἦμην τοῦ ἰστίου παχέα καλώδια ἢ ἐπίτονους καὶ τὸ πράγμα ἐπεβεβαιώθη ὡς ἐκ τῆς καταλήξεως τῶν εἰς τὸ καρχήσας, ὡς καὶ τὸ πρότοιος. Διὰ τὸ τρίτον καλώδιον ἀνεγνώρισαν ὅτι ἐχρησίμωσε πιθανότατα εἰς τὸν χειρισμὸν τοῦ ἰστίου». Εἰς τὸ ἰστίον, πράγματι, καταλήγει, ὡς ἀποδεικνύεται διὰ τῶν νέων ὀστράκων, καὶ ἐχρησίμωσεν εἰς τὸν χειρισμὸν αὐτοῦ ἀνάλογος πρὸς τὴν κατεύθυνσιν τοῦ ἀνέμου καὶ τὴν ἐπιθυμητὴν κατεύθυνσιν τοῦ σκάφους.

Ὁ Κοινουνιώτης δὲν ἔλεγεν ἀναγνωρίσει τὴν χρησιμότητα τοῦ καρχήσας. Τὸ τέταρτον καλώδιον, ὡς κεροῖς νοούμενοι, δὲν διετήρησε ἐπὶ τῶν τὸτε διασωθέντων ὀστράκων. Ἡ συμπλήρωσις τοῦ σχεδίου ὑπὸ τοῦ Κοινουνιώτου ἦτο λανθασμένη, ἀλλ᾽ ὦς εἶχεν ἀντιληπτῆς τὴν χρησιμότητα τῶν τριῶν παχέα καλώδιαν. Ο Σπ. Μαρινάκος συνεπελήρωσε τὸν δεύτερον ἐπίτονον ὡς ὑπέραν καὶ τὴν ἐπέραν ὑπέραν μέχρι τῆς περιφερείας τῆς συμμέτρου, ὡς τὴν ἔλεγεν προτείνει ὁ Κοινουνιώτης, θόνην τοῦ ἰστίου. Τέλος, ὑπὸ τοῦ Ἰω. Σακελλαράκη συνεπελήρωσεν ἃς τρίτον ἐπίτονος τὸ κατάτερον τρίτον καλώδιον, ὑπόθεσις ποὺ δὲν εὑρέ τὴν δικαιοσύνην τῆς μὲ τὴν ἀνεύρεσιν τῶν νέων ὀστράκων.

Τὸ ὅπωθιο πλευρικό σχοινί (ὁ κεροῖς), ποὺ ἀποδίδεται λοξῶς καὶ μεμονωμένο, ἐχρησίμωσε εἰς τὸ ἐπάρμα (ίσασάρα, ἀνάψωμος, καὶ εἰς τὴν συστολὴν/ὅποστολὴν (κατέβασμα) τοῦ ἰστίου, ἀσφαλῶς δὲ συνεδέσατο καὶ πρὸς τὸ καρχήσας (κατάτερον τμήμα).

Οἱ πόδες, ποὺ συνεκράτουν τὸ κάτω τμήμα τοῦ ἰστίου, δὲν ἔχουν ἀποδοθῆ, ὡς δὲν ἔχουν ἀποδοθῆ ἢ κεραία καὶ ἢ κορυφαίαι πλεύρα τῆς θάνης.

Ἄντιστασιον παράδειγμα προσφέρουν τὰ δύο ὀστράκα μὲ παράστασι πλούτου ἐκ Φυλωκηπησῆς, ὃς ἐμφανίζονται ὁ πρότοιος, ὁ ἐπίτονος καὶ τὸ δύο καλώδιο τοῦ καταβεβεμμένου ἰστίου. Αὐτὰ τὰ καλώδια, ἀκριβῶς, νοοῦται νὰ ἐπιτελοῦν τὶς «μανωβρίες» μὲ τὸ μὴ φαινομένου καρχησίας ἢ μὲ μηχανισμόν εἰς ὄντην σημεῖον τοῦ ἰστίου ἢ καὶ κατάλληλο περιδέσιο τὸν σχοινίων.

Ὅσον ἀφορᾷ εἰς τὸ σχήμα τοῦ ἰστίου, διήλ. τῆς θάνης τοῦ ἰστίου, εἶναι σαφὲς ὅτι εἶναι τετράπλευρο, παρατηρήσει δὲ ὅτι συμπίπτει ἡ χορδή («πλευρά») τοῦ καλόλου τῆς θάνης σχεδιαστικώς πρὸς τὸν ἰστόν καὶ παρουσιάζει μίαν εἰστὶ ἰδιορρυθμίαν κατὰ τὴν ἀπόδοσιν. Ἔνα, δηλ., ἔρευς νὰ εἶναι «βαμμένο» τὸ κυρτό - τὸ τόξο, ποὺ σχηματίζεται πρὸς τὴν πρώδαν καὶ νὰ σχηματίζεται κενὸ τὸ ἐσωτερικὸ τοῦ κολό μὲ χρώμα ἱδίο πρὸς τὸ φόντο τοῦ ἀγγείου, ἔχει συμβῆ τὸ ἀντίθετο, ῥεῖλεται δὲ, προφανῶς, στὴν προσπάθεια τοῦ σχεδιαστοῦ.
νά ἀποδώσῃ σκοτεινό τὸ ἑσωτερικὸ τοῦ ἱστίου.

Δυστυχῶς, τὸ μικρὸ ὅστρακο μὲ τὸ καρχίσιον ἔχει ἀπολεσθῇ, προφανῶς, κατὰ τὴν κατοχικὴν ἢ μετακαταχωρικὴν περιόδον εἰς τὰς ἀποθήκες τοῦ Ἐθνικοῦ Ἀρχαιολογικοῦ Μουσείου καὶ δὲν εἶναι ἀπολύτως σαφῆς ἢ σύνδεσθε συστολέως /ὑποστολέως καὶ καρχίσιον.

β) Πρόφρα - στείρα - ἐμβλήμα - ἀφραστόλιον

Ἐκ τοῦ προσθίου μήματος τῆς στείρας προεξέχει κόρα (γάντζος) (;) καὶ, κατὰ τὸ παλαιόν του Κουρουνιώτου σχέδιον, σἱλίγον ψηλότερον, ἐν δριόντων στέλεχος. Ἡ χρήσις τοῦ δευτέρου εἶναι ἀνεύ ἀντικειμένου, καὶ ἀποτελεῖ λάθος τοῦ σχεδιαστοῦ. [Προσθήκη: τὸ θέμα χρῆτε ἐπανεξετάσεως κατάπιν τῆς ἀνυψώσεως τῆς ΜΓ I ἀττικῆς πυξίδος εἰς Τούμπαν Λευκάντι.] Πάντως, ὅπως φαίνεται, δὲν ἐσχηματίζετο κλίμαξ διά τὴν ἄνωδον καὶ διὰ τὴν κάθοδον τοῦ πλημώματος ἢ τῶν ἐπιβατῶν.

Δυστυχῶς, ἢλλείπει τὸ ὅστρακον μὲ τὸ πρόσθιον μήμα τοῦ πτηνοῦ καὶ μὲ τὴν κορυφὴ τῆς στείρας (στόλος ἢ περικεφαλία). Ἑλλα μέγα ἀπόκτημα ὑπήρξε τὸ νέον ὅστρακον, τὸ ὅποιον ἀποδίδει ἄλλο προεκβαλλόμενον ἀντικειμένον, οὐσιαστικῶς ἐν κολάκωμποι ἀνυψώμενον στέλεχος μὲ δόντωσις καὶ ἐν κυρτόν ἐνδιαμεσον τοῦτον εἰς τὸ ἑσωτερικὸν τοῦ. Τὸ ἀντικειμένον τοῦτο, μάλλον, ὦτο προστηρομένον εἰς τὴν ἀνωτέρα ἐπιφάνεια τῆς στείρας (περικεφαλία).

Ἀνεξαρτήτως τῆς ἔλλειψεως ἐνὸς μικροῦ ὅστρακον ἐνδιαμέσως, ἠμαρτούμε νὰ ἀντιληφθῶμε τὸ σχῆμα χάρις εἰς σύγχρονα καὶ εἰς κατὰ τι μεταγενέστερα παραδείγματα.

Ἀντίστοιχα, περίπου σύγχρονα, παραδείγματα εἶναι τὰ ἀκόλουθα:
α) τὸ πλοῖον τὸ ἐξαγγειρημένον ἐπὶ τῆς ΥΕ ΙΙΙ Β λάρνακος εἰς Γάζι Ἡρακλείου,12 τὸ ὅποιον ἐμφανίζει ὁμοιότητας (χωρίς κοπά, μὲ μακρὺ σκαρι, ἀπόνερα ἀπὸ τὸ πηδάλιον)33 καὶ διαφορές (ἰστιόν, σχοινιά). Εἰς τὸ πλοῖον τῆς λάρνακος τοῦ Γάζι ἐμφανίζεται δριόσιμος προεκβαλλόμενον ἀπὸ τὴν πράραιν ἐπίμηκες στέλεχος μὲ ψυχαίνες μικρές κάθαρες γραμμῆς /νοούμενες κατακόρυφες (στήν ἀνωτέρα ἐπιφάνεια τοῦ). Τὸ γνώρισμα τοῦτο περιελήφθη μεταξὺ τῶν διαφορῶν τῶν δύο παριστώμενῶν πλοίων, ἐπειδὴ δὲν εἶναι ἀπολύτως δύσμοι (κυρτόν τὸ ἐν μὲ μικρότατες προεξοχὲς καὶ εὐθύγραμμον τὸ ἄλλο μὲ σφαίρας μεγαλότερες κατακόρυφες γραμμῆς).

β) τὸ ἐπὶ τοῦ ΥΕ ΙΙΙ Γ πευκοῦτομον ἀμφορέως τῆς Σκύρου πλοίον14 καὶ
g) τὸ ἐπὶ ὁμοιόμορος πευκοῦτομον ἀμφορέως τῆς Ἀσίνης πλοίον, ὁμοίως

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τῆς ΥΕ ΙΙΙ Γ φάσεως.35

Εἰς τὸν ψευδόστομον ἀμφορέα τῆς Σκύρου τὸ προεκβαλλόμενον σύνολον στερείται ὁδοντώσεων ἐναντίον τοῦ παραδείγματος τῆς Τραγάνας, ἀλλ’, ἐν πάσῃ περιπτώσει, ἐμφανίζεται ἀντίστοιχον κατὰ τὸ σχῆμα, τούδαχιστον, πρὸς τὸ ἀντίστοιχον τῆς Τραγάνας. Δὲν πρόκειται, ἀπλῶς, περὶ «πτηνοπροτομῆς» ἢ περὶ κεφαλῆς αὐγοειδοῦς εἰς τὸ ἀκρόπρωυν (περικεφαλαία, στόλος ὑπέρθεν τῆς στείρας) τοῦ «σκύρανοπο» πλοίου, περὶ τοῦ ὀποίου ὑπάρχει κατὰ τὰ λοιπὰ σύμφωνος ἡ γνώμη τῶν ἔρευνητών ὑπ’ στερείται χαρακτηριστικῶν πολεμικοῦ πλοίου.

Ἡ δ. Παρλαμά σημειοῦ ὅτι «ἡ κατακόρυφη (σάν;) κέρατο αὐτῆς προεξοχή στό πλάσιο μέρος τοῦ κεφαλίου, ποὺ καθιστά δυσερμένοντο τὸ ἀκρόπρωυ τῆς Σκύρου, δὲν ἀποτελεῖ ἀπόληξις τῆς στείρας. Μιὰ πινελια σχεδιάζει τὴν καμπύλη τοῦ κεφαλίου καὶ συνεχίζεται παράλληλα πρὸς τὴν στείρα, γιὰ νὰ σβήσει μέσα στὴν ὑπόστοιχη γραμμή, ποὺ ἀποδίδει τὴν ἀπὸ νὰ πλευρά τοῦ σκάφους. 'Ἡ προσεκτικὴ παρατήρηση τοῦ τρόπου σχεδιάσας δεῖχνε ὅτι η κατακόρυφη αὐτῆς προεξοχή ἀνήκει στὸ κεφαλί, δὲν ἀποτελεῖ, ὀπλ., ἀπόληξις τῆς στείρας».36 Ἐν τούτῳ, τὸ ἀντίθετο εἶναι σαφές.

Ἀρα, μὲ τὴν βοηθεία τοῦ νέου τούτου ὀστράκου τῆς πυξίδος τῆς Τραγάνας ἡμιποροῦμε νὰ ἐρμηνεύσομεν ὅσα παρὰ ἅλλα τὰ παραδείγματα ἀπὸ τὸ Γάζι, τὴν Ἀσίνην καὶ ἀπὸ τὴν Σκύρου. Εἶναι κοινὴ ἡ μορφή τοῦ καμπυλοκύρτου στελέχους καὶ τῆς κεφαλῆς τοῦ θεαρμομένου πτηνοῦ τῆς Σκύρου. 'Ἀλλ’ ἡ κεφαλή τοῦ «πτηνοῦ» τῆς Σκύρου ἀποδίδεται, ὅπως καὶ τὸ σύνολον τοῦ πλοίου, εἰς ἀπόλυτο σχηματοποίηση καὶ ἀφαιρέσει καὶ, μάλλον, ὑπήρχε η πρόθεση τοῦ ἀγγειογράφου νὰ ἀποδώσῃ συμβατικὸς τὸ προεκβαλλόμενον κυρτὸν ἀντικείμενον ὡς κεφαλήν πτηνοῦ, περιοριζόμενον, διὰ λόγους, προφανῶς, ἀγνοοῖς, εἰς ἐν τὸ πτηνὸν τῆς πρόφασος τῆς Τραγάνας καὶ τὸ κοινὸν καὶ εἰς τὰ ἄλλα παραδείγματα προεκβαλλόμενον στελέχους. Πρὸς συμπληρώσεις, ὁ ἀγγειογράφος τοῦ ψευδοστόμου ἀμφορέας τῆς Σκύρου έθεσε καὶ τὴν στιγμὴν ὡς ὀφθαλμὸν εἰς τὸ πτηνοκέφαλον τοῦτο ὁμώμα. 'Ὡς περικεφαλαία τῆς στείρας νοεῖται, ὡς πιστεύω, ἐν πρὸς τὸ ἄνω ἀπόληξις τῆς στείρας, ἀνεξαρτήτως τῆς «κεφαλῆς τοῦ πτηνοῦ».

Τὸ πτηνὸν, τὸ ὀποίον ἀποδίδεται ὑπέρθεν τὸν ἵκριον τῆς πρόφασος τοῦ πλοίου τῆς Τραγάνας, ἀποτελεῖ ἐμβλημα διὰ τὸ πλοῖον τοῦτο, ἐνώ, ἀντίθετα, ἢ πτηνοπροτομὴ τοῦ πλοίου τῆς Σκύρου ἀποτελεῖ ἔμπνευσιν καὶ συνδυασμόν τοῦ ἀγγειογράφου. 'Ἡ καθημ. Em. Vermeule ἐχαρακτηρίσε οἱ ἀμφοτέροις τὰς περιπτώσεις ὡς bird-headed long ship. 'Ἄς σημειωθῇ καὶ ἡ μετόπη εἰς τὸ ΥΕ ΙΙΙ Γ διστρακὸν τῆς 'Ακροπόλεως τῶν Ἀθηνῶν μὲ ἴχθυν εἷς παρόμοιο ὀδοντώτων στελέχους.38

Ἐἰς τὸ πλοῖον τοῦ ΥΕ ΙΙΙ Γ ψευδοστόμου ἀμφορέας τῆς 'Ἀσίνης ἀποδίδονται κυρτὴ τρόπη, κοινᾶ καὶ ἱστοί φουσκωμένοι πρὸς τὴν πρόφασαν, τὸ ἀνώτερον σημεῖον τῆς ὀποίας φέρει ἐσωτερικῆς ὀδοντωστή. 'Ὡς συνέχεια τῆς τρόπιδος ἐμφανίζεται ὁπλίσω τὸ πηδᾶλιον, ὅπως καὶ εἰς τὸ Γάζι. 'Αρα, καὶ οἱ τέσσαρες περιπτώσεις εἶναι ἀνάλογες.

Εἰδικῶς, ἐὰν λάβωμεν τὰ ὀδοντωτά ταῦτα στελέχη τοῦ Γάζι καὶ τῆς
Ασίνης και τά στρέψωμε 90° και 180° ἀντιστοίχως καὶ τά ἐπανατοποθετήσωμεν εἰς τήν προσθίαν ὅψῃ τής στείρας, ἀντιλαμβανόμεθα ὅτι προσαρμόζονται ἀπολύτως καὶ ἡμιπρόντινα νὰ θεωρηθοῦν ὅτι ἀποτελοῦν ὅμοιες κατασκευές. Αὐτὸ δὲν φαίνεται ὅτι συμβαίνει εἰς τήν περίπτωσιν τῆς Σκύρου. Τὸ παράδειγμα τῆς Τραγάνας παραμένει εἰς τήν ἀνοικτόν καὶ ἡ ἐπιλυθή δὲν τῆς πυροβολίσαν ἐπανεύρεσιν τοῦ ὑπολειμματικοῦ οὐσικοῦ. Ἐρωτηματικῶν παραμένει καὶ τὸ ὁστράκον ἐκ Μυκηνῶν (ἐκ βαθιὸν χειλόν εὐφυοτόμου ἁγείου) εἰς τὸ Ἐθνικὸν Ἀρχαιολογικὸν Μουσείον. Ἀθηνών ύπὸ τά στοιχεία (Mycenae, 10.IV.08), ἐνδὸ καὶ εἰς τὸν ὄμον τοῦ ὑστότου Μυκηναϊκὸν ψευδοστόμου ἀμφορεῶς τῶν Μαζαρακίτων ἐμφανίζεται σχέδειο μεμοιομένον, ὑπενθυμίζον τὴν στείραν τοῦ πλοίου τῆς Τραγάνας.

Ἡ φύση τοῦ προεκβαλλομένου τούτου στελέχους τοῦ πλοίου τῆς Τραγάνας καθορίζεται καὶ χάρις εἰς τά μεταγενέστερα παραδείγματα καὶ αὐτό διότι παρακολουθοῦνται τὰ αὐτά, περίποι, στελέχη, ἄλλ' εἰς σαφῶς διάφορον τοποθέτησιν (ἔνδον τοῦ πλοίου καὶ, εἰδικῶτερον, ὑπερθεν τῆς πρώτας) καὶ όχι προεκβαλλόμενα, ὅπως εἰς τὸ παράδειγμα τῆς Τραγάνας. Τὰ παραδείγματα ταῦτα εἶναι τὰ ἀκόλουθα:

1) τῆς Φορτέτσας, ὅπου τὰ στελέχη εἶναι ἀπλῶς κοῖλα καὶ ἀποτελοῦν σαφῆ πρός τὰ ἐπάνω προεκτάσις τῆς στείρας/πρώτας καὶ τῆς πρώτης. Οἱ βαθμίδες κλίμακος διακρίνονται καὶ εἰς τῆς στείρας καὶ εἰς τῆς πρώτης (ΠΠ).  

2) εἰς τὸ ἀπεικονιζόμενον ἐπὶ ἐνός ΠΠ κρατήρος εἰς Ἀλικαρνασσοῦ.  

3) εἰς τὸ μικρὸν ὁστράκον τοῦ 9ου αἰ. π.Χ. ἐκ τοῦ νεκροταφείου Σκούμης εἰς τὸ Λευκαντί. Δεξιά ὁ Williams διακρίνει ἔμβολον καὶ "above the compartment is a back-curved stem-post".  

"Ἰδιοί ἔμφανιζονται καὶ οἱ σχηματισμοὶ τῶν γεωμετρικῶν πλοίων ἐπὶ ἁγείων. Τὸ στοιχεῖο τοῦτο εἶναι ἐν ἐκ τῶν πολλῶν διὰ τῶν ὅποιων πιστοποιεῖται ἡ συνέχεια εἰς διαφόρους τομεῖς τῆς κατασκευής καὶ τῆς μορφῆς τῶν πλοίων ἀπὸ τὴν ὑστάτην μυκηναϊκήν καὶ τὴν υπομυκηναϊκήν ἔποχαν εἰς τὴν Πρωτογεωμετρικὴν καὶ Γεωμετρικὴν περίοδον. Ὁ Στιλ. Ἀλεξίου ἀπεφάνθη, ὅρθως, ὡς καὶ ἄλλοι μελετηταὶ, ὅτι «ὁ τύπος τῶν πλοίων, πιθανόν δὲ καὶ τὸ ἀντίστοιχον θέμα τῆς ἁγειογραφίας, ἐπεβίωσεν ἐκ τῆς μυκηναϊκῆς εἰς τὴν πρώτην ἐλληνικήν ἑποχήν», ἑρείδευμος εἰς τὸ θέμα τῶν χάρων διὰ τὰς κόπας (inter-scalmia)."  

Τὸ κυρίωτερον, κατὰ ταύτα, πρόβλημα περὶ τῶν σφαξιομένων τηματῶν τοῦ πλοίου τῆς Τραγάνας ἀποτελεῖ ἡ ἀπόλυτη ἀνατροπὴ τῆς στείρας καὶ ὁ χαρακτήρας καὶ ἡ σημασία τοῦ προεκβαλλομένου στελέχους. Εάν ἐπειδιδόξασιν νὰ παρακολουθήσωμεν τὴν ἔξελιξιν τοῦ στοιχείου τοῦτοῦ, εἶναι σαφῆς ὅτι ἐμφανίζεται ὡς περίπου ἐνθ' στέλεχος με αὐτές τὶς λέπτες γραμμές (Γάζι καὶ Ἀσίνη) παραδείγματα τὰ ὅποια θεωροῦνται ὡς ἀρχαιότερα τῆς στείρας καὶ ἐν συνεχείᾳ ὡς κοιλόκυρτον στελέχους μὲ ὀδοντώσις εἰς τὸ ἐσωτερικόν. Εἰς αὐτὴν τὴν δευτέραν φάσιν ἀνήκουν τὰ δύο παραδείγματα, ἐν πολλοῖς ὅμοια, ἐκ Τραγάνας καὶ Σκύρου, διὰ τὰ ὅποια διείσοσα ἴδια τὰς ἀπόψεις μου. Τὸ ἐρώτημα που προκύπτει εἶναι, λοιπὸν, κατὰ κόσον τὰ κοιλόκυρτα, ὡς συμβατικὸς ἀποδεδομέ-
νη «πτηνοκεφαλή» τής Σκύρου και τό ένδον δόντωτόν κουλόκυρτον ξύλινον κατασκεύασαμε πρό τής πρόφας τού πλοίου τής Τραγάνας, ἀποτελοῦν ἄμεσον ἐξέλιξιν, διάδοχον σχήμα καί ὁμοίαν κατασκευήν ἐν σχέσι πρός τὰ προεκβάλλομενα ἢ ἀνορθομένα στελέχη τῶν πλοίων τοῦ Γάζη καί τῆς Ἀσίνης, ποὺ προηγοῦνται καί ἐπικοίνωνες δηλ., ἀποτελοῦν τό πλαίσιον τῆς ΥΕ III Γ periodοῦ εἰς αὐτὸν τόν τομέα τῆς ναυπηγικῆς τοῦ κρητομυκηναϊκοῦ κόσμου. Αὐτό φαίνεται πιθανὸν καί τήν λόγιν τά προσφέρει τό ἐπίμαχον ἔλειπον ἐνδιάμεσον διὰ τῆς πιείδος τῆς Τραγάνας.

Αἱ πιθανότητες ποὺ δυνατοῦ νά ἀντιμετωπισθοῦν διὰ τήν έρμηνειάν του, εἶναι αἰ ἀκόλουθοι: ἢ εἶναι ἐν ἐξάρτησι τῆς πρόφας τοῦ πλοίου, ποὺ ἐξελίσσεθα στήν εὐτάνως καμπυλωμένη ἀνωτέρα ἀπόληξιν τῆς πρόφας τῶν γεωμετρικῶν χρόνων ἢ εἶναι λέμβος ἢ εἶναι σύστημα ἀνόδου καί καθόδου διὰ τό πλοίον. Ἡ στείρα συνεχίζετο πρός τά ἐπάνω τόσον, ὡσον ἦτο ἀναγκαῖον διὰ νά ἔδρασθη τό προεξήλθον δεξία ἐξάρτημα. Σὲ θα συνεχίζετο υψηλότερον, διὸτι θα ἀπεδίδετο πρό τοῦ πτηνοῦ, ποὺ ἔχει συμβολικῆς σημασίαν διὰ τίς δυνατότητες πλεύσεως τοῦ πλοίου. (Ἀναφέρομαι πάντοτε εἰς τό παράδειγμα τῆς Τραγάνας.)

Κατά τόν Σπ. Ἀλεξιοῦ,45 εἰς τό πλοίον τοῦ Γάζη «Ἡ ὄρθοντια ταινία μὲ τάς λεπτάς καθέτους γραμμάς ποὺ ἐξέχει ἀπό τήν κορυφήν τῆς πρόφας παριστά Ἰος "ὅρατον" (τό τῶν καλομένου "κοινός μπαστότιν"). Τούτου πάσαλε, βοηθητικοὶ κινήσεως ἀνθρώπου, ἐμφανίζονται καί εἰς τήν κυρτήν ὁμοίως πρόβας πλοίου ἀπεκοινώζομένου ἐπὶ μεθοδομοὺν ἀμφιρέως από τήν Ἀσίνη καὶ δ.»

Κατά τόν Σπ. Μαρινάτον,46 ὑπάρχουν ὀρισμένοι ὅροι, μεταξύ τῶν ὁποίων ἐνδείκνυται νά γίνῃ ή ἐπιλογή: ὀλκαῖον, ἐφόλκιον, ἔφόλκικον. Εἰδικέτερον, μηνυμονεύει τὰ ἀκόλουθα: "Εσοβ γειν Σῆφυζουσή, δας μαν ὀλκαῖον ναμνετε. Δε Λεξικογραφεν ηλεκτετε, ης εις επως, δας μαν ηναχσλεππτ, ἐποιεσ θοικαίον. Κατα Μινότ, δας ης ηειτε οὐσια οτής Σῆφων δας ἐφόλκιον. Εἰρέτερον, μηνυμονεύει τὰ ἀκόλουθα: "Εσοβ γειν Σῆφυζουσή, δας μαν ὀλκαῖον ναμνετε. Δε Λεξικογραφεν ηλεκτετε, ης εις επως, δας μαν ηναχσλεππτ, ἐποιεσ θοικαίον. Εἰρέτερον, μηνυμονεύει τὰ ἀκόλουθα: "Εσοβ γειν Σῆφυζουσή, δας μαν ὀλκαῖον

45 Αλεξιοῦ, Σ., "Η ὄρθοντια ταινία μὲ τάς λεπτάς καθέτους γραμμάς ποὺ ἐξέχει ἀπό τήν κορυφήν τῆς πρόφας παριστά τήν Ἰος "ὅρατον", Τεχνολογία τῆς Σκύρου, Πατρών, 1985.
46 Μαρινάτος, Σ., "Η ὄρθοντια ταινία μὲ τάς λεπτάς καθέτους γραμμάς ποὺ ἐξέχει ἀπό τήν κορυφήν τῆς πρόφας παριστά τήν Ἰος "ὅρατον", Τεχνολογία τῆς Σκύρου, Πατρών, 1985.
στόλος - περικεφαλαία υπέρθεν τῆς στείρας) δψηλή καὶ εἰς τὰ δύο πλοία ἐκ τῆς Τραγάνας καὶ ἐκ τῆς Σκύρου, συνυπολογιζομένων δὲ καὶ τῶν πλοίων τοῦ Γαζί καὶ τῆς Ἀσίνης. Τὸ υψός, ὡσα, ὀφείλεται εἰς τὴν ἐπιθυμίαν τοῦ πληρώματος νὰ υπάρχῃ δυνατότης ἐλέγχου μέχρι μακρυνῆς ἀποστάσεως ἐκ τοῦ υψηλοῦ τούτου σημείου.

Εἶναι σαφές, ἀν καὶ ἐλλείπει εἰσέται τὸ ἐπίμαχον τοῦτο, τὸ ἐνδιαμέσου, σημείου τῆς πρόφας τοῦ πλοίου τῆς Τραγάνας, ὅτι ὁ σχηματισμὸς τοῦ ἀνωτέρου τμῆματος τῆς πρόφας (ὑπὲρθεν τῆς στείρας) καθ' υψός, πρέπει νὰ ἴτο ἀνάλογος πρὸς τὴν φαινομένην συμβατικὴν «πτυχοκεφαλὴν» τῆς Σκύρου καὶ αὐτὸ διότι τὰ δύο προεκβάλλομένα στελέχη ἐμφανίζονται ὑμῖν καὶ ταυτόσημα. Ἐκ τοῦ προεκβαλλομένου στελέχους τῆς Τραγάνας υἱὸνται τὰ δύο τμήματα, τὰ ὡποῖα εἶναι ὑμῖν πρὸς τὰ ἀντίστοιχα τῆς Σκύρου. Αὐτὸ ποὺ λείπει ἀπὸ τὸ στελέχος τῆς Τραγάνας εἶναι τὰ σημεία συνδέσεως, πρὸς τὸ ἀνωτέρον τμήμα τῆς πρόφας (ὑπὲρθεν τῆς στείρας), ἐπειδὴ δὲ τὸ κοιλόκυκτον τοῦτο στελέχος πρέπει νὰ προσαρμόζεται ἐπὶ τοῦ ἀνωτέρου σημείου τῆς πρόφας, εὐνόητον τυχάνει ὅτι ἄντιπροσώπευε τὸ ἀκροστόλον τοῦ Πολυδέκτους (A 86).

Ἐγκοιλα

Ἀλλο πρόβλημα ἔγειρες αἱ 24 τῶν ἁριθμὸ κάθετοι γραμμαὶ μεταξὺ πρόφας καὶ πρύμνης, ποὺ ἀποδίδονται μὲ στρέβλωσιν εἰς ὀρθομένας περιπτώσεις. Τὴν λύσιν, πιθανὸν, δίδει ἡ ἄλλης YE III B (,) σαρκοφάγου παράστασις πλοιαρίου στερούμενον ἑστῶ, ἀλλὰ διαιθέτος ἕξιν ὑμίας γραμμᾶς.47

Ἡ γενικὴ ἂποψις εἶναι ὅτι πρόκειται περὶ διαχωριστικῶν σημείων διὰ τὰς κώπας τῶν ἔρετων, πρὸς σχηματισμὸν ἀνοιγμάτων (interscaln) πλῆν, ὡς, οὐδέμια ἀποδέδεται κάπη. Οἱ μελετηθῆ ἔρειδοι εἰς τὸν ἁριθμὸν τῶν 25 ἁνιγμάτων τῆς Τραγάνας,48 διὰ νὰ ἀποφανθῶν ὅτι πρόκειται διὰ «νῆα πολυκλή-

Εἶναι ἐντεῦθεν ἐν τούτῳ προεκβαλλομένης στείρας τῆς Τραγάνας, ὅτι τὸ πλοίον τὸ ἐκκαθαριζόμενον ἑπὶ τοῦ YE III Γ ἀγγείου ἐκ Τραγάνας - Πόλου μὲ τῆς διαστάσεως ἑκάστην πλευράν. Ἐσος, πρόκειται περὶ τῶν τρήματων τοῦ Πολυδέκτους (A 88).

Συναφεῖς εἶναι καὶ αἱ ἄποψεις τῶν Σπ. Μαρινάτου,49 R.T. Williams,50 Cl. Laviosa,51 G. Jöhrens,52 L. Ach. Stella 53 καὶ J. Morrison.54 Ἡ λύσις αὐτή κρίνεται λογική, ἐὰν, ὡς, συγκριθῇ πρὸς τὰς λεπτομερείας τοῦ πλοίου ἐκ Γαζί, δυνατὸν νὰ ἔχουν αἱ κάθετοι λεπταὶ γραμμαὶ ὡς «ἐγκοιλα», ἤτοι, ὡς ἔπεξηγεὶ ὁ Στυλ. Ἀλεξίου,55 ὡς τὰ κυρτὰ ἔξοπα (στραβόπεδα, κοινῶς), τὰ σχηματίζονται ἐκατεραθεῖν τῆς τρόποις τῶν σκελετῶν τοῦ κύκλου τοῦ πλοίου. Τέλος, οἱ Morrison - Williams ὑποστήριξαν ὅτι “The verticals can be explained as decoration”,56 ἐνώ ὁ Κ. Κορουνιώτης εἴχεν ὑποστήριξε ὅτι εἶναι “γεφυροειδὲς ζεύγια τῆς πρόφας τοῦ τρήματος καὶ ιδίως γεφύρας ψεφομένης ὑπὸ παλλων ὅρθιον πασσάλων”,57 ἀλλ' αὐτὸ προσομοιάζει εἰς τὸ πλοίον τοῦ κρατήρος τοῦ Ἀγαπητοχωρίου Ηλείας.

Ἡ τελικὴ δημοσίευσις τῆς πυξάς ὑπὸ ἀνάλυσιν ὑπὸ πλαίσιον ᾧ ἀρκετοὶ νὰ προφορίζουν τὰ τούτο τῆς Τραγάνας. Ἠκεῖ ἡ ἀντιπροσώπηθη ὁλὸ τὸ φάσμα τοῦ διακόσμου, τῆς κατασκευῆς, τῆς χρονολογίης καὶ τῆς
προελεύσεως τοῦ ἄγγειον ἐπὶ τῇ βάσει συγκριτικοῦ ύλικοῦ ἐκ Τίρυνθος, Μενελάου, Αλεξίας. Ἀκροτόλεως, Δευκαντί κ.ο.κ.

Ἐπίμετρον: Τὸ γλωσσάριον σχετικῶς πρὸς τὴν ὁρολογίαν περὶ τοῦ πλοίου.

Ὡς βάσις διὰ τὴν ὁρολογίαν ἔχρησμευσεν ἡ περιγραφή τοῦ Ἰουλίου Πολυδέικου Ὀνομαστικοῦ, Α 85-93: μέρη ἐν νεώς ὄρισαν, τρόπις, τροπίδια, στείρα, τροπολ. τὸ δὲ τῇ στείρᾳ προσηλούμενον φάλλης, ἐφ᾽ οὗ ἡ δευτέρα τρόπις, καλεῖται δὲ οὔτος καὶ κλειστότοιον. τὸ δὲ καταλήγον αὐτοῦ ἐπὶ τὴν πρώτην προεμβολή, τὸ δ᾽ ὡς καὶ ἐμβολον. μέσον δὲ τῆς προεμβολίδος καὶ τοῦ ἐμβόλου ἡ στείρα καλουμένη... τὸ δὲ μεταξὶ τοῦ στόλου καὶ τῆς προεμβολίδος... ὃ στόλος δ᾽ ἐστὶν ὑπὲρ τὴν στείραν, ὡς καὶ περικεφαλαία καλεῖται. τὸ δ᾽ ὑπὲρ τὸ προχόν ἀκροστόλιον ἢ πτυχῆς ὄνομαζεται, καὶ ὀφθαλμός, ὅπως καὶ τοῦρμα τῆς νεώς ἐπηγράφουσιν. τῇ δὲ στείρᾳ προσηλοῦται ὁ καλουμένος φάλλης... τὸ δ᾽ ὑπὸ τὴν τρόπιν τελευταῖον προσηλούμενον, τοῦ μὴ τρίβεθαι τὴν τρόπιν, χέλιοσμα καλεῖται. καὶ τὸν μὲν ἐδώσαυ τῆς νεώς κύτος καὶ γάστρα καὶ ἁμφιμυθηρίων ὄνομαζεται. καλεῖται δ᾽ ἃν καὶ ἄλλως, ὅτι οἱ ἀλαμμοὶ ἐξέρχοντο... δι᾽ αὐτὸ ἂν δέδηται ἡ κώμη, τρήματα, τὰ πρὸς αὐτὸν τὸν σκαλιόν δέρμα ἄσκομα. οἱ δὲ περὶ τὴν στείραν ἐκατέρθεθεν παρατεῖνομενοὶ τροποὶ πρῶτος καὶ δεύτερος, ἡ καὶ ἄλλως, τῆς δὲ πρώταις τὰ ἐκατέρθος παρεῖν καλεῖται καὶ πτερά. τὰ δὲ περὶ τὴν πρύμναν προσυνάντει ἔξω περιτοίναι καλεῖται. τὸ δὲ ἀκρόν τοῦ πηδαλίου οὐας, καὶ τὸ πάν τε οὐας τε καὶ πηδάλιον καλεῖται. τὸ δὲ μέσον αὐτοῦ φθείρι ἢ ρίζα ἢ ἀπάξωμα, τὸ δὲ τελευταῖον πτερύγων, τὸ δὲ λοιπὸν ἁγχής, καὶ τὸ μὲν ὑποδεχόμενον τὸν ιστόν ληνός, τὸ δὲ ἐναρμοζόμενον αὐτῶς πτέρνα, τὸ δὲ τελευταῖον τὸ ἀγαθὲ καραθηκὴ καὶ θεοράκιον καὶ καρχήσιον, τὸ δὲ ὑπὲρ τὴν κεραίαν ἄρτακτος, οὐ καὶ αὐτὸν τὸν ἐπιπεδόντα ἀπαρτεῖσθαι καὶ οὐ μὲν μέγας καὶ γνήσιος ἦστι ικατείς, ἐστι δὲ ἐν τῇ νηρί ιστός, ἱστοδέκη, κεραία, σχοινία, κάλοι, πρότονοι, καλώδια, πείσματα, ἀπόγυα, προμηθεία (93), καὶ ἄγκυρα ἡφᾶ, ἡ ἄχωρη ἀνάγκης οὐ χρώνως. ἀποβάθρα καὶ διαβάθρα, ἢν σκάλαν καλοῦν.

Πολύτιμον ύλικόν παρέχεται καὶ διὰ τοῦ ἐκδοθέντος ἔννεπτάς ἐκ τοῦ Ἐθνικοῦ Τυπογραφείου (1884) ὑπὸ τὸν τίτλον «Ὀνοματολόγων Ναυτικῶν», ὅπου παρατείνονται οἱ σχετικοὶ δροι μὲ ταυτόχρονον παράθεσις τῆς λέξεως εἰς τὴν καθαιρεύσαν, εἰς τὴν δημοτικὴν, εἰς τὴν γαλλικὴν καὶ εἰς τὴν ἀγγλικὴν. Παρέχονται ἐν τοῖς ἐπιμένοις ὄρισμαί τινες λέξεις:

1. ἡ σκάφος, ἢ σκάφη, τὸ κούφαρι, la coque, hull.
2. ἡ πρόβα, ἡ πλόρη, l'avant, la proie, head of a ship.
3. ἡ πρόμην, ἡ πρώμη, l'arrière, stern.
16. ἡ τρόπις, ἡ καρένα, la quille, keel.
17. ἡ στείρα, τὸ κόρακι (πλώρης), l'étrave, stem.
65. τὸ περιτόναυον, ἡ κουπαστή, le plat-bord, gunnel, gunwale.
225. τὸ ἀκροστόλιον, τὸ αποστευκτικό τοῦ πουλαίνοντος (στολίσματα πρόφρα), head-moulding.
312. τὸ σχηματίζον, τὸ σχοινί, τὸ κορδάζον, τὸ φίιλιν, κορδάζον, rope.
504. τὸ δοράτιον, τὸ μπαστουνί, τὸ ντου-ντουρ, le baton de foc, boom.
512. ἡ κεραία, ἡ ἀντένα, la vergue, yard.
521. Τὸ ἐπίκριον, ὁ φόγος, la vergue barrée-vergue sèche, crossjack-yard.
525. Τὸ ιστιόν, τὸ πανί τοῦ καραβίου, la voile, sail.
528. 'Η δῆδην, ὁ μουσαμάζ, la toile à voile.
608. 'Η ἄγκυρα, ἢ ἄγκυρα, τὸ σίδερο τοῦ καραβίου, l'acre, anchor.
702. 'Ο πρότονος, ὁ στάντζος καὶ τὸ στράλιο τσιμπουκιοῦ, l'étai, stay.
703. 'Ο ἐπίτονος, τὸ ἕξαρτι καὶ τὸ βέντο (μπομπρέσο μπαστουνιοῦ), le hauben, shroud.
734. 'Η διαβάθρα, ὁ πασαδούρος, le marche pied, footrope.
736. Οἱ κεροίκες (ἰμαντίκου), les balancines, τὰ μαντίκα, lifts.
737. Οἱ ὀλκοὶ τῆς κεραίας ἢ κερουλκοὶ τοῦ ιστίου, les bras, τὰ μπράτσα καὶ αἱ μπουταφόρες, braces.
738. 'Η υπέρα, τὸ ἰμαντάρι, ὁ σολόγγος καὶ ἡ κανδίλιτσα (φλόκου), la drisse, halyards and tie.
747. Τὰ καλώδια, τὰ σερβίτσια, les manoeuvres des voiles, sail-ropes.
748. Οἱ πάδες, αἱ σκόται, les écoutes, sheets.
752. Οἱ συστολείς, le cargues, οἱ στίγκοι, brails.
753. 'Ο μέσος (συστολέως), la cargue fond, τὸ μέντζο, hunt-line.
754. 'Ο πλάγιος (συστολέως), la cargue - bouline, τὸ σερπινέλι, leech-line.
944. Τὰ ἑφόλκια, αἱ βάρκας, les embarcations, boats.
971. Αἳ καὶ τὰ τουπιά, les avirons, rames, oars.

Προσθήκαι
Προσφέραμεν ἐκκυκλοφορήθη τὸ ὑπὸ τοῦ Ἡ. Φ. Κανελλοπούλου ἐκδόθην τὸ 1890 «'Ονοματολόγιον 'Ιστιοφόρων», ἐκδόσεις Ναυτικοῦ Μουσείου Αθηνών 1987, ἐπιμελεία - πρόλογος - εὐφημία «Α.Ι. Τζαμτζής, ὅποι παρέχεται συστηματικῶς τὰ τρόπω τὸ ἀντίστοιχον ὦλικὸν καὶ δὲν μνημονεύεται ὁ ὄρος «ἀκροστόλον».
'Η νεωτέρα βιβλιογραφία περιλαμβάνει ὀρισμένα εἰσέτη συμβολάς, ὡς
1) τοῦ δρ. Olaf Höckmann, που παρετήρησεν ὅτι: "ein spontanartiges Kinn kennzeichnet die mykenischen Vasenbildschiffe [(Abb. 17 (aus Jolkos), Abb. 19 (aus Tragana), Abb. 20 (aus Asine)], ebenso wie das Modell aus Attika (Abb. 18 aus Oropos)".,
2) τῆς δρ. K. Δημακοπούλου μὲ δημοσίευσι, ἄνευ ἀδείας μου, ἂν καὶ εἴχα παραδόσει σχετικὴν περιγραφήν, εἰς τὸν κατάλογο τῆς εἰς "Ἀμστερνταμ ἐπιδειχθεὶσας ἐκθέσεως "Ελλάς καὶ θάλασσα" (1987), μὲ ἀποτέλεσμα νὰ ἀποδοθῇ τὸ παλαιὸν σχέδιον τοῦ Κ. Κουρουνιώτου (1914) εἰς ...ἐμε (New reconstructed drawing!!!), νὰ παραλείπεται ἡ μνεία τῶν ΠΑΕ 1983 (1986), 206-208 εἰκ. 3-4, νὰ χρησιμοποιεῖται φωτογραφία συνοδευτικῆ τοῦ μὲ δημο-
σιευθέντος κειμένου μου ἄνευ ἀδείας μου, ἢπ" ὅσον δὲν εἶχε δημοσιευθεῖ μέχρι

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τότε όπ’ ἐμοὶ, νά ἀναγράφετα δι’ ἡ διακόσμησις χωρίζεται σὲ μετόπες, ὅτι τό... κατάστρωμα καλύπτεται μὲ μικρὲς κάθετες γραμμές, ὁ πρότονος καὶ ὁ ἐπίτονος ἀποκαλοῦνται συλλήβδην σχοινιά κ.ο.κ. ᾧ 60.

3) τοῦ ὁδ. Γιάννη Βήχου διὰ τὸ μικροκατάκτον των ἄγγελον ἀπὸ τὸν τόμβο τῆς Τραγάνας, ποῦ δεῖχνε ἕνα πλοίο μὲ χαρακτηριστικά, πολλὰ ἀπὸ τά ὅπωσα συναντάμε ἀφιέρωσε στὴν Γεωμετρικὴ ἑποχή (δῆ καὶ συναντῶνται στὴν ΥΕ ΙΙΙ Β-Γ καὶ τήν ΠΓ) ᾧ 61 καὶ

4) τοῦ Lucien Basch, κατόπιν ἀδείας μου, εἰς τὸ πεπραγμένον πρόσφατον ἔργον του Le musée de la marine antique, Athènes 1987, ὃποι τονιζεται ἡ ἀνασύστασις τῆς παραστάσεως τοῦ πλοίου πλήν τῆς κορυφῆς τῆς πρώσα/στείρα, ὡς ὅπωσ, ἐν τούτοις, νοεῖται ἀνάλογος πρὸς τὸ πρόσφατον ἐκ Λευκαντὶ παράδειγμα. Ὁ Basch ἐπιτελεῖ πολλὰς συγκρίσεις πρὸς τὸ λοιπὸ ὑλικό καὶ, τέλος, φρονεῖ ὅτι τὸ ἀνατέρω παράδειγμα πλοίου ἐπὶ τῶν στηλῶν εἰς Σχηματάρι προσωρίζετο διὰ πολεμικὰς ἐπιχειρήσεις καὶ κατά τὴν ἐμφάνισιν οὐδέλλου διέφερεν τῆς Τραγάνας. ᾧ 62

Μνείαν τοῦ πλοίου τῆς Τραγάνας ἔκαμαν καὶ ἄλλοι μελετηταὶ, ᾧ 63 ὃ ἐπὶ ἑνδείκνυται ἀναγνώση, ἀπαξ ἔπι, πρὸς τὴν πνεῦμα Π 2811 τοῦ Μουσείου Ὁλυμπίας ἐκ τοῦ τάφου Ι Καυκανίας τοῦ τύπου Γ τῆς ΥΕ ΙΙΙ Γ περιόδου. ᾧ 64

Τὸ ὅτι προέρχονται ἐκ τάφων τὰ ἄγγεια μὲ παράστασιν πλοίου δὲν φαίνεται νὰ εἶναι νυχτὸ γεγονός. Πάντως, εἶναι πασίδηλος ὡς σπάνις παραστάσεων ἔξελελιμένου πλοίου ἐπὶ μινοικῶν λαρνάκων (Γάζη, ᾧ 65 ἐς ἀγορὰν Ἔλβετας). Ἐκ τῶν λοιπῶν ἄγγειων τὸ τῆς Ἀσίνης δὲν προέρχεται ἐκ τάφου ἄλλο ἐς οἰκίας. Τὰ τῆς Τραγάνας, Σκύρου, ᾧ 66 Φόρτετσας - Ἀλικαρνασσοῦ ᾧ 67, ἀμφότερα τὰ παραδείγματα ἐκ Λευκαντὶ κ.α. προέρχονται ἐκ τάφων. ᾧ 68

"Οσον ἀφορᾷ εἰς τὰ ὁμοιώματα (πλοία-βάρκες) καὶ τὰς ἐπὶ ἄγγειων παραστάσεις τῶν ὁ Στυλ. Ἀλεξίου ἠδοὺ ἐστημείωσον διὸ «ἔναν τὸσα τὰ προσεχόμενα ἐκ τάφων δείγμα, ὡστε ἀλλόγοις δυνάμεθα νὰ υποθέσομεν ὅτι καὶ ἄλογα, ἀποκρίσονται ἐς-οἰκίας, ... προσωρίζοντο ἔπινης διὰ ταφικῆς χρήσεως", ᾧ 69 πράγμα που θεωρεῖ πιθανῶν καὶ ὁ Jacques Vanschoonwinkel. ᾧ 70

Τὸ οὐδιώδης, βεβαιῶς, ἐκ τῆς συμπληρώσεως τῆς πνεύματος ὑπήρξεν ὁ καθορισμός τοῦ ρόλου τῶν ἱστίων, τὰ ὅπωσ ἀποδίδονται ἐπὶ τῶν τεσσάρων νέων ὀστράκων. Κατὰ δεύτερον λόγον, ἡ ἀνέφρεση τοῦ ὀστράκου μὲ τὸ προσβαλλόμενον κοιλόκρυτον στέλεχος, ποὶ δυνατὸν νὰ ταυτισθῆ πρὸς τὸ ἀκροτόλιον τοῦ Πολυδεύκους. ᾧ 71

Ἀνάλογα παραδείγματα μὲ προβαλλόμενον κοιλόκρυτον στέλεχος ἀπαντᾶται πολλὰ μέχρι καὶ τῶν γεωμετρικῶν χρόνων καὶ εἶναι βέβαιο διὰ αὐτὰ τὰ στελέχη ἤτο δυνατὸν νὰ περιστρέφονται περὶ τὸν ἀξονά τῶν, ὡστε νὰ ὑπερκεῖται —ἀπεικονιζόμεναι — τῆς πρώσας ᾧ 72

Τὸ ἐπὶσκεύες στάδιον μὲ τὴν ἐπανάληψιν καὶ τὴν ἀνάπτυξιν ἄριστων μερῶν τοῦ πλοίου τῆς ΥΕ ΙΙΙ Γ ὀστεως ἀπετελεῖ ἡ παράστασις τοῦ πλοίου ἐπὶ τῆς προσφάτως εἰς τὸ νεκροταφεῖον τῆς Τούμπας εἰς Λευκαντὶ ἀνευρεθείης καὶ ὑπὸ τοῦ Mervyn Popham δημοσιευθέντως ΜΓ Ι ἀποκαλεῖ τοῦ πνεύμα (850-825 π.Χ.). ᾧ 73
Τὸ παράδειγμα χαρακτηρίζεται ύπο τοῦ Popham ὡς μία τῶν πρωίμωτέρων, ἀν μὴ ἡ πρωίμωτερα μετὰ τὴν Ἐποχὴν τοῦ Χαλκοῦ παράστασις πλοίου εἰς τὴν ἡπειρωτικήν Ἑλλάδα.

Ἀλλὰ περιγραφαὶ τοῦ Popham εἶλαι ἑνδεικτικὴ ὑπὸ ὑπογενειας καὶ τῆς ἐξελίξεως τῶν μορφῶν τοῦ πλοίου ἀπὸ τῆς ΥΕ III Γ. φάσεως καὶ ὑποδηλοῦται ἡ ἐξάρτησις τῆς καθόλου μορφῆς τῆς πρώτης ἐκ τῶν πολλαπλών τούτων παραδειγμάτων: "vertical timbers project above the hull, and other timbers project outward beyond the straight stem post; below them is apparently a ram. The mast, more or less centrally placed, has two short side extensions at the top where it is supported by a forestay or pole".75

"Another painting of a ship from Lefkandi survives on a sherd found in a levelling fill in the Skoubris cemetery, where the same date of around 825 B.C. holds true for the latest burials. In this case only the forepart of the ship is preserved, which has the same in-curving end to its similarly straight stem post".76

Εἰς τὸ πρόσφατον ἐκ Λευκαντί εὑρημα διαμορφώνεται υψηλή ἡ πρώτα με στείραν, ποῦ ἔχει «διακόσμησιν» μὲ λοξᾶς γραμμᾶς, ἐνθέλει τὸ παράδειγμα τῆς Τραγάνας ὑπήρχε τεθλεσμένη γραμμή. Εἰς τὸ ἀνώτερον τμῆμα τῆς στείρας — η περικεφαλαία ο τσέλος — καὶ, εἰδικώτερον, εἰς τὸ πρόσθιον σημείον, ἔχει προσαρμοσθῆ καμπτόμενον στέλεχος ποῦ ἔχει περιστρωθῇ περί ἄξονα πρὸς τὸ ἐσωτερικὸν καὶ ἀποδίδεται ὑπερθεῖ τῆς στείρας καὶ τοῦ προσθίου τμήματος τοῦ πλοίου. Πρὸ τοῦ προτὸν καὶ ὅσιον τοῦ ίστου ἀποδίδεται ἀνά εἰς πτεινόν μετέφωρον, ἐν πτεισεί.

Τέλος, πρὸ τῆς στείρας, ἀποδίδεται ἡ κλίμαξ ἀνόδου-καθόδου, ἐνθέλει ὑποκάτω προβαλλεῖ εἰς σημαντικὸν βαθμὸν τὸ ἔμβολον.

Τὸ νέον τούτου παράδειγμα βοηθεῖ οὐσιαστικῶς εἰς τὴν ἀνάπλασιν (τῆς εἰκόνος) τῆς πρώτας τοῦ πλοίου τῆς πυξίδος τῆς Τραγάνας, ὑποδηλοῦτο δὲ τὶς διαφορὰς μεταξὺ τῶν δύο, ἐν αὐτῷ ἀκινητοποιημένον μὲ τὰς κάτως εἰς κατακόρυφον στέσιν. "Ἀγχυραὶ καὶ ἱκρια δὲν ὑποδηλοῦνται, ἐνθέλει ὑπάρχουν ὅπλα εἰς τῆς πρύμνην, ποὺ ἀπουσιάζουν ἐκ τοῦ τῆς Τραγάνας.


ΓΕΩΡΓΙΟΣ ΣΤΥΛ. ΚΟΡΡΕΣ

Σημειώσεις

2. Γ.Σ. Κορρές, ΠΑΕ 1977, 238-241, πίν. 143β-145.
3. Α. Furumark, Mycenaean Pottery, I. Analysis and Classification, 1941/1972, 333 εἰκ. 56, σ. 335

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9. *Αντιθέτως, δ Κορουνιώτης (AE 1914, 107) εσπευσμένως δέχεται ότι "είναι ναός πολεμική μετ ' εμβόλου, άλλα άνευ κοινωνίαν".*

Πρβ. Αριστοκρατία, BCH 1933, σ. 219, *"La piraterie, bien connue dans les poèmes homériques, supposait un type approprié de navire, tel exactement celui des Nos 16 et 17 (de Tragana). Sans doute, chez Homère, ne rencontrons-nous nulle part la mention expresse de vaisseaux de guerre ou "navires longs". Mais le poète connaît les bateaux de transport (φροντίδας νήσος) (Od. τ 250, τ 323), ce qui prouve qu'au temps de l'Odyssée au moins, il existait une autre catégorie de navire, sans doute du type allongé",* Seewesen, G 117 κεξ. Em. Vermeule - V. Karageorghis, *Mycenaean Pictorial Vase Painting*, Cambridge Mass. 1982, 145 (equipped with a ram, as on MH lolkos fragments (VII. D), but more swiftlooking and narrow. It is probably meant to represent a warship or one suited to pirate raids, not a merchantman) and L. Παπαλιάμπα, Σύρος (1984), σ. 148a. Πρέπει, έπομένως, να όμολογηθεί, ότι δεν είναι σαφή τα στοιχεία περί πολεμικού πλοίου που άποδοσαν άλλοι μελετητές.

10. *Επί τόν διαφορών περί εμβόλου απόγευσαν ίδε κατωτέρω (σημ. 13).*

11. *Αποκλείεται οιαδήποτε άλλη πιθανότητα.*


13. Πρβ. L. Casson, *Bronze Age Ships. The evidence of the Thera wall paintings*, The International Journal of Nautical Archaeology and Underwater Exploration 4, 1975, 3-10, ειδικ. σ 7: "Finally, these ships (Thera), clearly serving as warcraft, have no ram, confirming that, as has been argued (Casson, 1971."

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49-50, 58), the introduction of this revolutionary naval weapon took place after the close of the Bronze Age'. The mono paraeideigma plouioi meta- ebboioi apodidetai sti mia mikra pleioura tis YM III B labanakos apo to Gazi 194,7. 'Aileziou grafoi: 'H orizontia proeazogoni ou organismwn katauboq tis steirias'. 'Aristeira dehlo asfaalos to ebboio kai de proesi na elkirethi aq to "stathron pibalon" ton palamoteteron plouioi (kata tina ereunhsa) ou proemnias proeazogoni tis trapezwn, ou apokale mei ena stateropoihsen tis poroi.' (AE 1972, 91).

Mev auto to paraeideigma apodeixetai oti uphre eboio sto Aigai kata tis 'Empoi tis Xalooi heta sto 'Osteoregalek III B fasa. 'Ara, dunaton to paraeideigma tis Traganas na mi eina paraeideigma as to to Gazi kai na mi eina polemikio plouio. Bebaio, deon apo ekeiasthia kata kason auton to eboio elkrismei eis to plouio to Gazi proes epibbasi ou proes apobbasi. 'Oti uphre eboio sto plouio tis Traganas kai tis 'Asytis deygetai h D. Gray, ss. G 53, 81, allla terpiptaseis kai stis duo terpiptaseis.


16. A. Furumark, MEP, eik. 75 teuma tis YE III G: 1-2 up' dprh. 22 kai 38 (s. 415). Prb. kai L. Cohen, AJA 42, 1938, 492 ss. 3 (But, as we will see below, zigzag lines on the prow are common), eti de R. T. Williams, Greece and Rome 1949, 127.


18. L. Cohen, ed. a., ss. 492-493: "Now even in the revised drawing this interpretation is not certain, for the prow of a rammed vessel must be massive and strong to sustain the shock of collision, while here the prow appears as a single slat, not thicker than any of the supports of the superstructure and far thinner than the prows of the ramless ships which we have already examined. But in its original form the painting is quite clear, the 'ornamentation is really integral part of the ship..."


20. 'Iou. A. Sakellaraikhs, AE 1971, 210 eik. 9. Eix to steidio toto deon elhexhsan up' deii oi katadousin tis diplou epitou kai twn 'dou' up' autoi uperann (upera), ta sounia ta proiseemena eis tis akra ton epikrion, di' avn ta istia metekiniouste kata twn foran ton anemou oito en Liddell - Scott - Kenstavantiniou, D', 433 (kaladha), me apotelesma na katalhgoi kai tis tria sounia eis tis karhathisi. Bebaio, pera ton diplou epitou kai ton sounioi dia tis ekparma kai sostoilh/antostolh ton istiou (kerivakes) oode eixer sounioi eixe noma na apodidete synvedomwn metat tis karhathisi. Autou epibebaiwetai ek to geganoton oti tis akra ton epikrion (keria) deon synvedon meta tis karhathisi, deh., uphren, dnav, allo souni gia tis ekparma ton istiou, to oiko souni synvedeto (deos faivetai), meta tis karhathisi. Autou einai to souni, po apodeidetai lojdos kai apoilegei eis ton ekteinon kouparisths prounhs (periptonwn). Tis 'dou' katasteria kaladha (upera) eixupiretai alloon skopostetin. Prb. tis exous diaskeiologias, ed. a., ss. 210 ss. 3.


22. AE 1914, ss. 109 eik. 15.

23. 'Ied anatetra, ss. 8 (1964). Sygkekrwmwes, deon visplhri tis istio, deon visplhri to istio, deon visplhri tis duo kaladwia kai diasthri tis proekbolh tis trpodios elhista, diasthriqen tis steirias. 'Etis, deon diamorphoskei katallhlou - kechirmenwnos touv podas, tis podas to phtnou kai paraleipke dros to uperkimenon ek tis steirias proekbolwmenos stoigcwn (to droumis). 'H teleustai 'dunamia paraeleipetai se allo sounia (Stella, Vermeule - Karageorghis) kai suvanatai seis lkhpeutwria eis allo (Casson, Laviosa, Morrison - Williams).

Vorgesch. XI, 1927/28, 242. Behn montre aussi que les deux câbles inférieures, qui partent de la poupe, doivent être dirigés vers la voile, comme nous l'avons fait sur notre No 17 (de Tragana), tandis que la publication originale réunit tous les câbles vers le sommet du mât'.

25. Sp. Marinatos, BCH 1933, 210: «Les bras (inépiais), c'est à dire les câbles servant à manœuvrer la vergue de la voile en haut, sont des détails qu'on ne peut pas attendre de nos artisans. Incidemment, on en peut apercevoir un ici ou là: le No 16, comme aussi le vaisseau apparente de Pylos (Tragana) No 17, porte un étai et un galbauban et en outre, deux bras se dirigeant vers la vergue».


'Ο Λ. Casson χρησιμοποιεῖ το αὐτὸ σχέδιο του Κουρουνιάτη, δηλ., άνωτέρω απολήγει το ἕνω καλλίδιο στὸ καρχιστίον καὶ τὸ κάτω στὴν μικρία του ἑστίου, μὲ πλέον ἑστόν τὴν προεκβολὴ τῆς τρόπας.

27. AE 1971, 210 eik. 9.


29. 'Ἡ συγκάλληση ἐγίνει εἰς τὸ ἐργαστήριον συντηρητέως τοῦ Ἐθνικοῦ Ἀρχαιολογικοῦ Μουσείου Ἀθηνῶν (1983) διὰ τοῦ ἐμποροτάτου συγκολλητοῦ-συντηρητέου τοῦ Κ. Πανταζῆ. Εἰς τὸ ἄγγελον προσέπεσαν ὁκτὼ νέα ὀστρακά (ὅπως μεταξὺ δύο λαφίων, ἀκριβέστερον, ἢ μία ἡμισεία) καὶ ἀφήθη ὄλοι μικρότατον, τὸ ὁποῖον δὲν εἶναι δυνατόν, κατά τὸ γε νῦν ἔχου, να διαπιστώθηκε πάντων προέρχεται. Τὰ τελευταῖα ταῦτα ὀστρακά συνεβάλλαν ὁστηστικῶς εἰς τὴν συμπλήρωσιν τοῦ σχῆμας τοῦ ἄγγελον καὶ τῆς μορφῆς τοῦ ἀπεκοινωνούμενος πλοίου.


33. Μέ τὲς δῷ κυματειδεῖς γραμμές, ἵσως ἐπιδιόρωται νὰ ὑποδηλοθῇ ὡτι ὑπήρχον δὺ πρᾶξιν. Δύο κυματειδεῖς γραμμές ὑπάρχουν, λουκάν καὶ εἰς τῆς Τραγανῆς καὶ εἰς αὐτὸ ἐπὶ τὸ Γάζι, ὅπου ἐπερχόταν τοῦ πλοίου ἀποδίδοται καὶ ἀνὰ τρεῖς κυματειδεῖς γραμμές.


36. Αδανα Παρλαμά, ε. δ., 149.
39. Παν. Καβαδίδου, Προϊσταμένη Αρχαιολογία, Εν Αθήνας 1912, 369 εκ. 466 (ξέ άνασκαφής Μαζαρακάτων, 20 Σεπτημβρίου 1908, σπάλιον Α', τάφος 1 (κατά στοιχεία μεριμνά κ. Βασ. Αραβάντη): "Στεγανόχομοι φυγείοι (Bögelkanne) μυρακιανό. Κοσμήματα χρώματος έρωδροφοίρων. "Εκτομάτισαν την έκρηκτη καθέτος επί της ανάλυσης τριζε παράλληλοι γραμμαί και μεταξύ αυτών τελαμόνιν. Υπό τα ανά πρώ περί αυτών δύο παράλληλοι γραμμαί και μεταξύ αυτών κάθετοι. Χρώμα εκά τών τών ψευδών στομάτων και του πόδος. Πρόδος άγριάλνικος").
42. Vincent R. d'A. Desborough, Lefkandi, The Iron Age, The Settlement, Text, London 1980, σ. 267 αρθ. 918, Plates 284.11 (D 44): "9th cent. B.C. Ship's bow to right. The thickest piece of vertical painting on the right represents the bow compartment, from which project, above the extension of the horizontal rail and, at the level of the hull, the ram; above the compartment is a back curving stempost. We thus have one of the earliest representations of a post-Bronze Age ship."
43. Προβ. J.S. Morrison and R.T. Williams, Greek Oared Ships, 900-322 B.C., Cambridge 1968, Catalogue (The Homeric Period), 18-33, πι. 1d-e, 2a, c, d, 3b, 4b, c (I-I), d, e, 5, 6a, b, c, d. Αιτά το παράδειγμα του Λούβρου Α. 527 ἢ περιγραφή εἶναι ἢ ἀκόλουθος: "hatched stem post on the high bow curves forward before curving aft, and whether there is a final curve upwards is doubtful, for there is a break at this point: the stem post seems to begin at the inboard side of the bow screen...". Προβ. κατ John Morrison, National Maritime Museum. The Ship. Long Ships and Round Ships, London 1980, Pl. 7a, b.
44. Κνω. Αλεξιού, Περιγραφή Γ' Αιθροί Κτητολογικού Συνεδρίου, Ρέθυμνον, Α' (Ἀθήνα 1983), 5 δ αυτός, AE 1972, 93.

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45. Πεπραγμ. Γ' Κρητ. Συνεδρίου, 3-4: ΑΕ 1972, 9! (Εἶς τὸ πλοῖον μας αὐτῆ ἰδόλι σανίδα χρησιμοδοσον διὰ τὴν ἐπιβίβασιν καὶ ἀποβίβασιν, μὲ κάθετα στηρίγματα ἰδόλι διὰ τὴν τοποθέτησιν προστατευτικοῦ σχοινίου. «Ἀφράταιν δὲ φαίνεται πάντως νέ εἶνα ἡ προεχομή αὐτῆ λόγο τοῦ πάχους της»).

51. Cl. Laviosa, La Marina Micenea, 24 (18).
53. L. Ach, Stella, Tradizione micenea e poesia dell' Iliade, Roma 1979, 147 καὶ σημ. 19.
55. Πεπραγμ. Γ' Κρητ. Συνεδρίου, A' 4.
56. 8.
57. ΑΕ 1914, 108.
68. Greece and the Sea, 156 ἀρθ. 57: L. Basch, 146 ἐκλ. 309, 318.3.
70. Στυλ. 'Ἀλέξιον, Λάρνακες καὶ δραματικά ἐκ τάφου παρὰ τὸ Γαζί, ΑΕ 1972, 97.
71. J. Vanschoowinkel, ἐ. ἅ., 28.
SUMMARY

"Representation of a Late Mycenaean ship on the Pyxis from Tragan, Pylos"

The recent founding of some more sherds and the re-mending of the Late Helladic III C 1/2 "pyxis" of the "tholos" tomb No. 1 of Tragan in Pylos gave us the chance to make some new observations on the ship represented on it.

It is a sailing-vessel of the Aegean region, without any particular characteristics of a war-ship, though it is not improbable to have been such. It has a big main-mast with a stay and a shroud. This is provided with a quadrangular sail (unhappily drawn in an effort to be given under perspective). Sail-ropes (for the manoeuvres) and brails (to hoist and slew-up the sail) finish on it. There is no ram on the prow, while a curvilinear and denticulated "akrostolon" (head-moulding) (?) springs out from the stem. A similar one is represented on the ship of the LM III B "larnax" from Gazi-Herakleion and on the ships of two LH III C stirrup-jars, one from Asine and one from Skyros. In the cases of Gazi and Asine, this denticulated "akrostolon" (extra-stem) could have been lowered and fixed on the stem, in order to be used for climbing aboard. Later on, it appears on prow and stern of the ships of Fortezza (Early Geometric) and in many other ships of the Geometric period, but turned, in these cases, to the interior of the ship.

The bird of the Tragan ship is represented over the (stage) fore-castle of the ships prow, whose upper part is missing.

The timbers and outside-planks are also represented, while the keel is slightly projecting in front. Among all ship-representations of the Bronze Age in the Aegean only the ship of Gazi seems to have a considerable ram (if this projection was not used for different reasons).

The archaeologist, Mr. Elias Spondylis, of the Ephorate of Underwater Antiquities, to whom I address my warm thanks, has helped me a lot with the identification of the parts of the Tragan ship.

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Η πυξίς της Τραγάνας
REMARKS ON AN INSCRIBED ANCHOR STOCK FROM AEGINA (IG IV, 176)*

For Honor Frost

Among the stone objects exhibited in the Museum of Aegina, there is an anchor stock of trachyte, found at the end of the last century in the so-called Meristos area, some 10 minutes walk from the coast, not far away from the modern port.

The stone (fig. 1) is broken at one end. Its preserved length is 1.11 m. It carries a 5th century B.C. inscription,\(^1\) published in 1902 by Fränkel (IG IV, 176):

\[\text{MEKINETODAE}\]

\[\text{Μὴ κίνε τὸδε (Μὴ κίνει τόδε, do not move this)}\]

Since such anchor stocks were not well known at the time of the discovery of the stone, scholars interpreted it in several ways: Fränkel (l.c.) comments that it could be a grave stone, but he thinks that this is not certain. In 1914 the Greek scholar Iriotes\(^2\) was the first to mention that some others thought it was either a boundary stone, or a gravestone, or an anchor (p. 93), but he himself interpreted it as a weight intended to hang from the lever arm of a winch for a draw-well (κηλώνειον, γεράνιον, τόλεμον). Iriotes based his interpretation on the fact that the stone was found by a well. According to him the inscription is addressed to children, who would try to play with the suspended stone.

Gabriel Welter, in 1938, recognized it definitely as an anchor stock and explained the inscription as an invocation, a plea, to the spirits of the sea, not to move the anchor stock stuck on the sea bed.\(^3\)

This ingenious interpretation was generally accepted. Only M. Guarducci\(^4\) in 1974 came back to Iriotes’ theory of the draw-well lever weight. But more recently, in 1980, Costis Davaras\(^5\) defended Welter’s interpretation again and remarked that the inscription finds its parallels in the apotropaic gorgon masks, caduceuses or astragals found on later lead anchor stocks. Welter’s interpretation is also accepted by Mc Caslin.\(^6\)

There is no doubt that the stone was originally an anchor stock.\(^7\) It looks as if it had not been in use for a very long time, since its surface is not much damaged by sea worms. There are however good reasons to believe that the inscription was not cut for its initial use:

1. The inscription covers 3/4 of the length of the stock, including the central groove. In such a case the rope needed to hold the stock attached to the vertical shanks and the shanks themselves\(^8\) would cover a part of the inscription, making it invisible.

2. The Greek words meaning “anchor” are εὐνη, ἀγκυρα (both feminine), and sometimes the more generic term λίθος (masculine).\(^9\) But the neuter pronoun τὸδε
must refer to a neuter word.

3. The third argument is *ex silentio* and thus merely cumulative: no other example of such a plea was ever found on other anchor stocks, although one could expect that such a belief might have been quite widespread among mariners.

In order to understand the real meaning of the inscription let us look at some analogous examples, both epigraphical and literary:10

a. On a column drum from Paros (*IG XII 5, 247*) we read:

*Νυμφίων* Of the Nymphs

Μὴ κιψηθεί. Do not move (or take away)

b. A little stele from the same island, most probably funerary (*Arch. Deltion 1960, Chron., p. 245*), carries the inscription:

'Αντιφίλο, μὴ κίνε. Of Antiphilos, do not move.

c. A similar interdiction on a slab from Thera (*IG XII 3, 451*), which could have belonged to a precinct or to a tomb, reads

Μὴ θίγγανε. Do not touch.

d. A later funerary epigram (*Kaibel, 166*) starts with:

Μὴ κεῖνει λίθον [ἐξ] γαίης ἄνθρωπον πανόρμυ... Do not move any (funerary) stone from the earth, o rascal...

Of course there are many epigrams of the same character.11

d. Plato (*Laws 842ε*), when establishing the theoretical basis for his ideal state, has as the very first of his agricultural laws:

Μὴ κινεῖτο γῆς ὁρία μηδεκ. No man shall move boundary-markers of land12.

f. A similar interdiction is frequently stated in the Bible. In *Deuteronomy 19.14* for example we read:

Όὐ μετακινήσεις ὁρια τοῦ πλησίον, ἃ ἔστησαν οἱ πατέρες σου. You shall not remove your neighbour's landmark which the men of old have set.13

These examples, which could be multiplied, give, I think, the key to our problem. The neuter word to which the pronoun τὸδε refers is most probably ὁρίαν (boundary) or perhaps σήμα (sign).

The first alternative, most probable in my opinion, means that the anchor stock was reused as a boundary stone, fixed upright on the boundary of a field at Meristos, with the uninscribed part in the earth.

It is well known that the necessity of preventing violation of private property was so widespread, that any boundary stone (ὅρος, ὁρίον) in antiquity was invested with sanctity, as being under the protection of Zeus "Ornos (Zeus, the Boundary-god)" or of other similar deities.14 Parallel to the divine, human law also provided special measures against violators of boundaries.15 In such a case the inscription μὴ κινεῖ τὸδε (sc: ὁρίον) would be an almost proverbial phrase, meaning: "Do not move this (boundary stone)"

The second alternative, although less probable, cannot be excluded. An anchor stock would fit perfectly as a σήμα (which is also a kind of boundary stone)16 on a tomb of a boatman, but also on the tomb of anyone buried in a coastal area, such as Meristos.17 Recently Piero Gianfrotta18 identified an anchor
stock, which was fixed upright as a σῆμα of the etruscan tomb 245 of Valle Trebbia (mid 5th cent. B.C.) excavated in 1922. He thinks that this particular σῆμα could reflect the occupation of Kutikluna, as the buried person (with some maritime occupation) was called.19

This unique find can be better understood in the light of litterary sources: we know from Homer (Od. XII, 13-15) that an oar (ἑπετμόν) was put as a σῆμα on the tumulus-tomb of Elpenor, on which a pillar (στήλη) was also erected.20 The ghost of Elpenor asks Odysseus (ibid., XI, 75 sq.) “to fix upon the mound (of his tomb) his oar wherewith he rowed in life when he was among his comrades”. It is obvious that he wants to have something on his tomb, which recalls his occupation in life. Vergil (Aen., VI, 232) imitates these verses, saying that an oar was fixed on the tomb of Misenus (Vergil omits mention of a stele). An epigran attributed to Sappho,21 but probably later, says that “his father, Meniscus, placed on fisherman Pelagon’s tomb a weel and oar, a memorial of the indigent life he led”. Here also the symbols of the occupation of the dead man are put on his tomb.

Was the anchor stock of Aegina also a σῆμα of a tomb? After the discovery of P. Gianfrotta this is possible. In such a case the inscription would mean “Do not move this tomb marker (σῆμα)”. Two objections however could be advanced: a) The name of the dead man does not appear, unless we suppose that a funerary stele was also erected. b) In such early times interdictions of violating a tomb are extremely rare as for example the case of Antiphilos mentioned above.

Whether grave stone or boundary stone, in any case the inscription goes with a second period of use of the anchor stock and thus cannot be an invocation to the spirits of the sea. Nor could the stone be the counterweight for a winch of a well, because such weights have a completely different shape.

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Notes

* I wish to thank Mrs J. Binder for the revision of my english text.


2. Π. Πράσας, Εἰς Αἰλίναν ἐπιγραφή (IG IV, 176), AE 1914, pp. 92-94, figs 1-2.


4. L.c., p. 364.


7. For stone anchor stocks, in addition to the book of Mc Caslin noted in note 6 (bibliography in Chapter II, note 131), see especially: F. Braemer - J. Marcadé, Céramique antique et pièces d’ancres


11. See for example w. Peck, GV, no 1373 sq.


15. See for example the laws of Chios (5th cent. B.C.), SGDI, 5653, 5654.

16. It is characteristic that the funerary stelae are sometimes called ὁρός: see for example IG F, 907: ὁρός Χεισθίυο and HESPERIA 35 (1966), p. 276-277: ὁρός Ηελίκης.

17. It is known that there is an ancient cemetery at Meristos (I owe the information to my colleague Liana Parlama, whom I thank).

18. Piero A. Gianfrotta, L’ancora di Kutikluna, Musei Ferraresi, Bollettino Annuale 12 (1982), pp. 59-62, figs 1,5. I would like to thank Miss Honor Frost, who brought the article to my attention and kindly sent me a photocopy, since there is no copy of this periodical in Greece.

19. There are many examples of stone anchors found in connection with tombs, all of earlier times, but none was used as a stele. See for example H. Frost, Note on three fragmentary anchors from the the palaepaphos - Skales tombs, in Kouklia V (ed. V. Karageorghis), 1984, pp. 433-434 with earlier bibliography.

20. Τῶμβοι κεχάντες καὶ ἐπὶ στήλην ἐρόταντες πέζαμεν ἀκροτάτω τόμβῳ εὐήρες ἐρετιμῶν. These verses are sometimes considered as a later addition to the homeric text, but this has no bearing in our case. Cf. the commentary of V. Béard in the edition “Les Belles Lettres” (1946).


ΠΕΡΙΛΗΨΗ
ΠΑΡΑΤΗΡΗΣΕΙΣ ΣΕ ΕΝΕΠΙΓΡΑΦΟ ΑΝΤΙΒΑΡΟ ΑΓΚΥΡΑΣ ΑΠΟ ΤΗΝ ΑΙΓΙΝΑ (IG IV, 176)

Στο Μουσείο της Αἴγινας υπάρχει ένα αντίβαρο άγκυρας από τραχείτη λίθο, που βρέθηκε τον περασμένο αιώνα στην παραθαλάσσια θέση Μεριστός. Τα τρία τέταρτα της επιφάνειας του καλύπτονται με την επιγραφή του 5ου π.Χ. αιώνα:

Μὲ κίνε τόδε (Μη κίνε τόδε)

Για τον χαρακτήρα του λίθου και την σημασία της επιγραφής έχουν διατυπωθεί διάφορες υποθέσεις: επιτύμβια στήλη, αντίβαρο γερανιού (κηλωνείου) ενός πηγαδιού, επίκληση στους θαλάσσιους δαιμόνες να μη μετακινούν την άγκυρα από τον βυθό.

Με βάση επιγραφικά και φιλολογικά παραδείγματα υποστηρίζεται ότι η επιγραφή είναι μια σχεδόν παροιμιώδης έκφραση, που χαράχθηκε σε δεύτερη χρήση του λίθου, όταν χρησιμοποιήθηκε πιθανότατα ως ὁρός ή ἱςως ως επιτύμβιο σήμα. Γι’ αυτό άλλωστε η επιγραφή καταλαμβάνει και το χώρο της κεντρικής εγκοπής, που ήταν αθέατος όταν το αντίβαρο ήταν στερεωμένο στο κάθετο στέλεχος της άγκυρας.

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"Ships of the Roman period in Central and Northern Europe"

For reasons beyond our control, it was not possible to obtain Mr. Marsden’s paper, in time for this publication we have published the relative abstract in its stead.

Many ships of the Roman period have been found in central and northern Europe during the last twenty-five years, and they show that there were three main shipbuilding traditions in the region:
1. A native tradition of central and north-western Europe, which is, for convenience, called the “Celtic tradition”. Recent discoveries suggest that this was the most common form of shipbuilding in the region, even though the existence of this tradition was only vaguely recognised until 1962. The ships were carvel built, and the planking was mainly attached to preerected ribs in a “skeleton technique” of construction. Examples of sea-going ships have been found at London, Bruges and in Guernsey (Channel Islands); and inland waters craft have been found in England, Netherlands, Germany, Switzerland and Northern France.
2. The Classical Mediterranean tradition, with the well known mortise and tenon joints in the planks. This is the “shell technique” of shipbuilding, the ribs being inserted mainly after the planks have been joined together. Examples have been found in London, and at Zwammerdam and Vechten in the Netherlands.
3. The Scandinavian tradition of clinker (overlapping) planking, which was in use around the Baltic Sea area, just beyond the edge of the Roman Empire. This too was a “shell technique” of shipbuilding, the planking being joined together before the ribs were added. The best example is the Nydam boat of the 4th Century A.D., found in Jutland.

The Romans therefore, from the 1st century B.C., were in direct contact with other shipbuilding traditions, particularly that of the Celtic people of central and northwestern Europe. It is possible, then, that this may have influenced the later development of Mediterranean shipbuilding, and its change from the “shell” to the “skeleton” techniques of construction.

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Marine archaeology conserves, recreates from a preserved base, or wholly recreates, relevant artefacts of a given historical period. Examples of the first kind are Averoff at Piraeus, Constitution at Boston, Victory at Portsmouth, Cutty Sark at Greenwich. Examples of the second are the Roskilde Viking ships, the Marsala galleys, Mary Rose and the Kyrenia ship, while Mayflower, Kontiki and the trieres reconstruction are examples of the third, wholly recreated, kind. It may be worth while dwelling for a few minutes on the reasons for such enterprises in practical marine archaeology all of them costly. What moves individuals and governments to spend large sums of money on them? What in short does a conserved or recreated artefact of a past age do for us?

Objects of daily use retrieved from ships, e.g. in the Zuyder Zee, or from the Mary Rose, appeal to us, and have precious value as vivid, tangible, links with the people of the past, as do the ships from which they come. Ships which have a historical significance or have participated in famous events, e.g. Mayflower and Cutty Sark, or those which have had a part in famous actions, the trieres at Salamis, Victory at Trafalgar, Olympia at Manila, have, for Greeks, British or Americans, an added value on that account. Where ships have become recognised as playing a part in world history and in the development of a civilisation in which many nations have come to share, they have a significance and emotive value crossing national boundaries. For example the trieres has a significance and
emotive value properly for Greeks in the first place, and then also among the wider circle of peoples in Europe and the Americas for whom Greek history and civilisation has been seminal, laying the foundations of the ways in which we think and write and govern ourselves. The marine artefacts mentioned will have value in one or more of these senses, the trieres in all of them.

We may press a little further the question of what the reconstruction of a 16th century Mediterranean galley, a Roman quinquereme, or an Athenian trieres will do for us. Some read history out of intellectual curiosity. For them tangible visual images illustrate their reading and make it more vivid. But the student of history is made of sterner stuff. His mental picture of the people and events of the past is furnished and enriched by those images not as an end in itself but as a means to useful evaluation and probable conclusions. This process is a superficial one, but not, I think, to be dismissed as merely superficial. The value of history as an educational and scientific pursuit is diminished if the imagination cannot be stimulated by true images of the past. The interest and excitement of archaeology lies as much in the restoration and recreation of the past life and behaviour of people as in the discovery of actual remains and artefacts, in themselves often unexciting. However much the sceptic may distrust it, the exercise of the creative imagination, putting flesh on the dead bones, is the reward and culmination of necessarily plodding historical and archaeological work, and the creative imagination needs true images if its exercise is to have value. In the marine sphere these images are provided by the Maritime Museums of the world, for Greece pre-eminently by the magnificent exhibition, Greece and the Sea.

The second sense in which the reconstruction of a historical ship, if a working reconstruction, may be of use to the historian is by its performance that is to say, by providing data for the assessment of historical voyages, naval movements and actions, and, more widely, of the potentialities of trade and the effectiveness of sea-power.

There are, further, some particular questions to which a working, reconstructed, trieres may give an answer. The 200 hundred triereis under Themistocles’ command at Salamis helped to win, against great odds, a battle which Creasey numbered among the decisive battles of the world. The story is in no need of telling. A very large fleet of Persian triereis manned by Phoenicians, Egyptians, Greeks and non-Greeks from Asia Minor was decisively defeated by a much smaller fleet of those Greeks who resisted, in which the 200 Athenian triereis, “specially built”, Plutarch says later, “for speed and quick turning” were outstanding. Athenian triereis continued to display those qualities throughout the period of Athenian naval supremacy. A reconstructed Athenian trieres may be expected to make clear how and to what degree speed and manoeuvrability were achieved, and help us to understand how she proved so effective in that remarkable battle. It is not just the trieres, but the special qualities of the Athenian triereis, which we need to realise.

Again, in the latter part of the fifth century Athens became the richest and
most powerful city in the Mediterranean, largely, it appears (and Pericles claimed) through her ability to dominate a considerable area of sea to her own advantage by the pre-eminent skill of her seamen and commanders in the quick and effective deployment of the trieres. Thus she was in a position to develop the civilisation which remains one of the wonders of the world. How exactly was Athens able to found a political and economic hegemony on skill in building and operating a type of warship which was common to all aspirants to seapower? This is a question which has never been put, let alone answered. Only familiarity with the trieres given by practical experience of it will enable us to do both. Our first steps towards the reconstruction are beginning to indicate the sort of answers we are likely to get.

The Trireme Trust was founded in Britain in 1983 by some philhellenes, including a distinguished naval architect, who had the educational and scientific aim of building a reconstructed trieres. The first step in this direction was to be the design and construction of a 5.5 m section of the hull accurate in all details. An agreement was very happily reached with the Hellenic Navy that they should build and commission the complete ship in Greece. For its part the Trust would supply drawings and specifications, build in England and send out the Trial Piece when completed, and participate in the sea trials of the whole ship when completed. The Trial Piece proved its worth as a necessary experimental preliminary, serving to identify and solve many practical problems. It was demonstrated under oar in the river Thames at the Royal Henley Regatta in July 1985, where it created quite a stir among the assembled oarsmen, before being shipped out to Greece. In the meantime a scale model of the proposed ship on the specifications provided was made in Greece and is now on exhibition.

Why, it may be asked, are these first steps not sufficient? The ship is now defined by specification, building drawings, a scale model, and by constructing full-scale a tenth part of the hull. Why go to the trouble and expense of building, testing, operating and then maintaining a complete, full-scale ship? The answer is both more simple and more cogent in the case of the trieres than with most past types of ship, for the design and working of the trieres has been particularly inscrutable, and she had a particularly vital role in history. This irritating inscrutability has resisted resolution because the evidence relating to the oarsystem, on which the design entirely depends, has been, and to some extent still is, a matter of controversy. The design seems at last to be coming into the light, but the intricacy of the trieres is such that only a full-scale reconstruction, with trained men pulling her, will show whether the oarsystem which the evidence can be claimed to indicate is actually workable in practice.

There is another reason why, in the case of the trieres and of other wholly recreated artefacts, only a complete full-scale reconstruction will do. All the claims that I have made for conserved, partly or wholly recreated artefacts rest on their authenticity. The authenticity of Averoff, Constitution or Victory is beyond doubt, and there is enough surviving of the Marsala galleys, Mary Rose and the
Kyrenia ship to support a partial recreation. But in the case of the trieres not only has no wreck been found, but no wreck is likely to be found because if holed or swamped she did not sink to the seabed, there to be preserved as so many ancient merchantmen have been. The trieres can only then be recreated by careful piecing together of the evidence from various sources, and authenticity proved by full-scale experiment. The ‘trieres project’ has then more to gain than most such enterprises; also, of course, it has most to lose.

II Authenticity

An account of the piecing together of the evidence is out of place in this paper. But the story of the controversy is enlightening and may be briefly told. First a few words about the name.

The name ‘trieres’, ‘three-fitted’ might have been expected to give a clue to the oar-system. Literature and vasepaintings show oared warships playing an important part in Greek life from the earliest times, as is likely from the geography of the Hellenic world. In the Iliad and Odyssey (eighth century BC) there are twenty-oared ships, and in the Catalogue in Iliad II fifty-oared ships, both types presumably with one file of oarsmen on each side of the ship, as later vasepaintings show. Pride of place in the Catalogue is given to fifty Boeotian ships in which ‘120 young Boeotians went’. Thucydides says that they all pulled oars, and we are hardly entitled to doubt him. One file of sixty oarsmen is a physical impossibility. The ships then must have employed a two-level system, double manning of oars being unknown at this date. The two-level arrangement is confirmed for the end of the eighth century by a relief showing the evacuation of Tyre in 701, and possibly by an Attic vasepainting found in Thebes. The trieres, with a crew of 200, was invented about the beginning of the next century either in Phoenicia (as M. Basch thinks) or in Corinth (as I think). She could have been developed by the addition of a third file of oarsmen to the two files of oarsmen of the Boeotian-type 120-oared ship (i.e. roughly 30+30+30 a side). The Boeotian sixty-a-side ship seems to have been superseded before it could be given a name. But the two-level system reappears in later centuries in ships with twenty-five and fifteen men a side. These types did not need new names since they were fifty and thirty-oared ships, which already had names, ‘pentecontor’ and ‘triacontor’. However, the new three-level ship did need a new name, and was called ‘trieres’. There are plainly two possible ways in which this name could be interpreted. It could refer either to the three levels at which the oarsmen sat, or to the three files of oarsmen on each side of the ship.

Although the Italians in the 15th and 16th centuries used the names trireme, quadrireme, quinquereme to describe galleys with three, four and five files of oarsmen on each side, there has from the first in modern times been an assumption that the name trieres referred to three levels of oarsmen, an unfortunate assumption because it creates grave difficulties, indeed disbelief, when the names of the later types are considered, the tetrameris, pentameris and
hexereis built at Syracuse, and the still larger types built by Alexander's successors up to the monster tesseraconteres of Ptolemy Philopator. If trieres means a ship of three levels of oars, tessaraconteres means a ship with forty levels. But this is absurd. The absurdity was resolved, correctly by supposing that the names did not refer to the levels, incorrectly by proceeding to the false conclusion that none of them had more than one level of oarsmen.

Renaissance scholars, curious about the ancient warships, the Greek trieres and the Roman quadrireme and quinquereme, could see in Rome: (i) Trajan's oared three-level undecked flagship on the Column; (ii) the relief, now vanished, which was the original of the dal Pozzo drawing depicting the bow section of a three-level oared warship; and probably also (iii) the relief now at Aquila in Italy showing the stern section of a similar ship. Nevertheless, there were also to be seen in Italian waters galleys which the Venetians called triremi, quadriremi, quinqueremi with three, four and five files of oarsmen on each side at one level. In the earlier type of galleys alla sensile three oarsmen sat on each of many benches on each side of the ship, each oarsman pulling his own 9 m long oar. Later in the a scaloccio types gangs of three, four and five men together pulled massive 15 m oars. Naturally these were claimed to be the lineal descendants of the ancient Greek and Roman warships, all of which were accordingly, they thought, pulled by oars at one level.

Sir Henry Savile, tutor in Greek to Queen Elizabeth of England, protested against these claims as going against the ancient literature and "the ancient portraytures remaining yet to be seene". The literature he was thinking of probably included the passage (1704) in Aristophanes Frogs, where an oarsman is said to have made wind and worse in the face of a thalamax, a slang word for thalamios, the oarsman who sat in the hold. He noted too that there was no lineal descent from ancient to modern galley since Zosimus in the 5th century AD had said that the building of trierika ploia had long been forgotten in his day.

The view Savile represented, that of the scholars, was challenged by, among others, Lazar de Baif, the French ambassador to the Venetian Republic who claimed that a three-level trieres implied a four-level quadrireme and so on ad absurdum. The "ancient portraytures" were just wrong. A more formidable challenge was added in 1737 by the commander of Louis XIV's galleys, Barras de la Penne: a three-level oared ship must necessarily have been pulled by oars differing in length, and a synchronised stroke in such a ship would have been impossible.

The battle lines were thus drawn for the next two centuries. The scholars' case was much strengthened by the discovery on the Acropolis at Athens of the Lenormant relief, apparently showing the midships section of an oared ship with oars at three levels, of which the dal Pozzo drawing's original and the Aquila relief might well depict the bow and stern, all three representations being on the same scale. The new relief was confidently dated to the end of the fifth century BC.

In 1861-'2 a full-scale reconstruction of a Roman trireme was built on the
Seine at Clichy on Napoleon III's orders. It was a disastrous failure. The scholars were discomfited and the arguments were renewed for a one-level trieres using one or other of the Venetian oarsystems. However, by now the excavation of the Zea shipsheds by Dragatzes revealed the maximum dimension of the trieres (36 m long and 5.5 m broad), and inscriptions showed that the oarsmen numbered 170, and that the oars were no longer than 4.2 m. These hard facts ruled out both the Venetian systems which employed oars very much longer, and although it was possible to design, as Cook and Richardson did, an alla sensile galley with oars about the right length, the ship would have had a dangerously low freeboard; and in any case 170 oarsmen could not be accommodated on that system in a ship able to use the Zea shipsheds.

The stalemate was broken in favour of the scholars by meeting the two classical objections to a three-level oared ship. If the meaning of trieres is not a ship of three levels (which it nevertheless was) but a ship with three files of oarsmen on each side (as the word triremi meant at Venice), de Baif's objection disappears. The larger ships can be envisaged as having many files of oarsmen (pulling a scaloccio i.e. with more than one man to an oar), but at never more than three levels. The more serious practical objection of Barras de la Penne also disappears if it can be shown that a ship of three levels of oars does not need oars differing in length according to the level. My model in 1941 showed that this was the case.

The removal of these objections opened the way to the use of the literary, epigraphical and archaeological evidence in the design of a three-level oared warship. The consistency of such evidence, when pieced together, is remarkable, but by itself does not make a ship for which the claim can be made that it is either an authentic reconstruction of an Athenian trieres of the 5th/4th century or a workable seaworthy ship. The next step, taken by my colleague John Coates, was to apply to the historical data the laws of physics and the evidence about ancient shipbuilding gathered by the underwater archaeologists. The fact that, when this step is taken, only minimal options are open to the designer has made it reasonable to construct first the Trial piece and the model and now the full-scale ship.

To conclude: the trieres under construction is likely to be authentic in her main features, and therefore provide a valuable illustration for the reader of history and tool for the historian. Sea-trials of her under oar and sail will: (i) prove the authenticity of the design; (ii) give a vivid demonstration of an instrument of seapower in a historically important period; and, more particularly (iii) provide hitherto unavailable details of the performance of the trieres (a) under battle conditions and (b) in naval movements.

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AEGEAN SHIPS FROM THE 2ND MILLENIUM B.C.

Excavation holds many surprises for the archaeologist, and at times yields evidence for something that one would not expect from a particular place. In our case, a rescue excavation at inland Argos has brought to light a clay ship model, which provides information about construction of ships in antiquity.

The model,* of Mycenaen date, was made by hand of reddish clay, it is 21 cm long, 7,5cm wide and 4 cm high. Although part of one end is missing and projecting parts are broken, it is fairly well preserved (fig. 1). Its base is flat, so that, the model stands steadily, and its interior is concave. In the centre of the hull a projecting broad mass of clay has been broken off (fig. 2). At equal distances from it, two strips of clay run across the width of the hull. The preserved end has a small platform. At one side of the platform, near the gunwale there is a small projection and beside this a strip of clay, which is hung by the gunwale (fig. 3).

This clay model is a unique find for Argos, where till now no other representation of a ship has been found dating from the Late Helladic period.

A number of catalogues of the representations of ships from the Aegean Bronze Age have been published: the first collected by S. Marinatos in 1933¹, was
expanded by L. Casson, J. Sakellarakis, C. Laviosa, D. Gray, S.C. Humphreys and this last exclusively for the models A. Götlicher. In addition, a great number of seals decorated with representations of ships were published in the volumes of the Corpus Der Minoischen und Mykenischen Siegel. Other finds have been reported: representations of ships on a Middle Bronze Age jug from Argos, a ship incised on a stone mould from the palatial workshop of Thebes another indistinguishable in detail on a sarcophagus from the cemetery of Tanagra and a mast on fragments from the frescoes of Pylos. In a chamber tomb from Tanagra and a chamber tomb from Kastelli at Thebes clay models of boats were discovered. Two seals with representations of ships came from Crete, one from Makryialos and another from Anemospilia at Archanes. It was made clear by the excavator that the part of a clay model of a ship from Zakros represents a prow and a prow-man. Part of a stem of a clay model was identified among the finds from the acropolis of Mycenae. The initial publication of a picture of the Asine clay model of a boat inspired S. Washman to write about it in detail. K. Westerberg has completed the view of the seamanship in a broader area in her book about Cypriot ships. Generally in the Aegean area, clay models of ships are fewer than ships represented in other artistic modes, such as painting or seal engraving.

When one undertakes a study of a representation of a ship, the first thing that one asks is what end is the stem and what is the stern. A number of different criteria have been used, many of which were not considered convincing because the elements in the representations rarely allow precise identification. The fact that the clay model from Argos does not have both its ends intact does not allow us to apply either of the old arguments that the high end is the stem or conversely the stern, arguments that remained for years and are still being used as a starting point of discussion of ancient ships.

As a proof of his argument for a high prow, Casson cited evidence taken from the graffito from Enkomi, Cyprus, where the sail is represented bellying out toward one side of the mast and indicates that the ship is moving in the direction toward which the higher end is pointed. The argument that the higher end is the prow is supported at least for Mycenaen ships, by the discovery of the rest of the sherds of the pyxis of Pylos. It is proven that the sail was placed toward the stem, which can be identified because we know that the other end is the stern, where the steering oar is clearly represented. The earlier reconstruction of the pyxis showed by mistake the sail bellying out from both sides of the mast. The newly discovered sherds prove that the stem also had a high akrostolion (figure-head) giving it much more height, because it comes near the upper frame of the representation.

In general, for the Aegean area, the miniature fresco of the ship procession from Thera is considered to provide a solution to the problem, because there, too, the stem is higher than the stern. In addition to their contemporary elements, which aid the study of ships of the Middle Bronze Age, the vessels of the ship
procession contain many older elements which go back to the Early Bronze Age. This conservative aspect is due to the religious role played by the ships in the fresco.

Recently, Johnston reopened discussion arguing for a lower stem, firstly for the Early Cycladic ships of Santorini using as main arguments parallels from Predynastic Egypt and modern ethnological studies and the fact that on the large ships of Santorini the high stern has a decorative and not a functional character, a feature according to him, of ships which are represented on Early Cycladic frying pans. But, the Egyptian graffiti of ships are unclear enough and chronologically very far from the Cycladic representations, so that it is preferable to compare them to contemporary lead models from Naxos and the clay model from Palaiokastro. The large ships on the fresco from Thera though they are a millenium later than the Early Cycladic ones have elements that are related to them because they display archaistic characteristics that served the religious role they played in this particular scene. Even in the case of the ships which are represented on the clay frying-pans, one can't be sure if the high end is functional or a decorative addition. In some cases this end is decoratively differentiated from the rest of the hull and it is probable that the manner of its depiction is due to the formal nature of the Early Cycladic art. On the other hand the lead models from Naxos and the clay model from Palaikastro have a very thin point at their high end. The smaller opening of the angle of the hull and the stem is not enough evidence for one to conclude that they represent a type of craft different from the dug-out. Even if one accepts the decorative character of the high end for several Early Cycladic ships, must take into account the plain decorative akrostolia on the frying-pans and the graffiti of Naxos, elements link them with the stem of the ship in the scene on the miniature fresco. There we are sure that similar decoration belongs to the bow. The ethnological parallels are not sufficient for they can be used equally well to support the view of the high stem. In an effort to interpret the purpose of the ramshaped projection at the stern of the big ships on the miniature fresco of Santorini, one can look for parallels on Portuguese boats (xavega or saveiro) which have many similarities to the ships from Santorini, including a plain higher stem. However, the same ramshaped projection, which is observed at the stern of the ships from Thera and Northeast Asia is proven to have a religious ceremonial role. This same ramshaped projection on Early Cycladic ships is found at the lower end and at that period probably had only practical use. In other words, its purpose was to protect the hull when the ship was coming to land and to keep the ship in balance when it was loaded, it may even have served as a gangplank as it seems to be used by a human figure on the graffiti from Naxos. In any case this projection at the end of a ship identifies it as the stern.

As a result, we think that these arguments for a high stern are inconclusive and that other elements of representations of ancient ships should be examined in an attempt to identify the stem and the stern. Certainly the surest points of identification are: the direction of the sails, the position of the steering oar and the
position of the oarsmen.

In the Argive model the thinner end is broken and is preserved at the same height with the other one. On the platform formed on the oval end of the latter one, a low cylindrical projection is preserved from which the upper part is broken. It probably represents the beam that supported the steering oar, as presumably occurs on the clay model from Aghia Triada and again on Egyptian ships during the Old Kingdom. The identification of the place of the steering oar automatically leads to the recognition of the stern at this exact end of the ship. It is well known that Bronze Age ships in the Aegean as a rule had just one steering-oar placed at the side of the stern of the ship.

At first sight, it seems that the position of the steering-oar on the left side of the platform would make the handling of the ship difficult for a right handed sailor, who would sit on the platform (fig. 1 and 2). That this was not a problem is shown by the representation on a seal from the Numismatic Museum in Athens, where the steersman, sitting on the platform of the stern holds the steering oar with his left hand, while he handles the tiller with his right hand. The tiller is usually not depicted on representations of ships from the Aegean in the second millenium B.C. probably because it is a minor detail. There is no tiller on ships in the procession from Santorini, as it is clear from the way in which the steering-oars are used by the steersmen. The lack of a tiller refers to simpler ships of earlier periods and this reflects the religious character of the representation.

However, on the pyxis from Pylos where the steering oar is represented disproportionately large compared to the ship, the tiller and the rope which connects it, are indicated. On Egyptian ships its use and representation begin in the Old Kingdom and evolve becoming permanent in the Middle and New Kingdoms, as on Greek ships represented on Geometric pictorial pottery.

The other piece of clay (fig 1, 2, 3, sect. A-A), that looks like a heap under the platform of the aft becomes thinner as it goes up and falls out of the gunwale, where it is broken, probably represents the rope which was used to fasten the steering oar to the pole or to fasten an anchor. Its thickness is exaggerated compared to the other dimensions of the hull, but that is not surprising because a thick rope would have been necessary if we consider the Egyptian models of the New Kingdom for the steering oar and the Greek sources for the anchor.

The base is flat (sect. B-B), as is usual on many models of ships, without any indication of a keel. One would expect to see such a base on earlier boats, dug-outs which were made of the trunks of trees, during the third millenium B.C. and continued to be used in the Mediterranean till the 5th c.A.D. Other elements of the Argive ship model distinguish it from this category, but we cannot exclude the possibility that a long plank took the place of the keel. In contemporary Egypt of the New Kingdom the keel began to be used precisely at this period. One possible indication of a keel is seen in the angular cross section of the clay model from Mycenae. A keel is clearer on the representation of the ship on the sarcophagus from Gazi, where its small projection toward the stem is indicated. Both of these
contemporary representations of keel suggest that the shape of the base is a
convention providing a flat surface on which the model stood. A later piece of a
clay model from Mycenae dating from Late Helladic IIIC, bears a clear indication
of the keel.50

The ship is angular in section (fig. 3, 4, sect A-A), in contrast to the curving
shape of all the ships depicted on the frescoes from Thera and Crete in Middle
Minoan times.51 This tendency for straight lines and angles can be observed in
many representations of ships from the mainland and also from Late Minoan
Crete after 1.400 B.C. when the whole Aegean area shared common cultural
characteristics: for instance on the stone mould from Thebes,52 the Late Minoan
IIIB ship on the sarcophagus from Gazi,53 the ships on the sherds from Phaestos54
and the ship on the graffiti from Thebes.55

The ships of the Late Bronze Age Aegean, by having this general angular
profile can be distinguished from the category of small crafts with curving profile
which were built for short voyages and not for long distance trips. These small
boats resemble the larger ships, but there are other differences: In representations
many of these boats are highly decorated either with painted zones or akrostolía,
shaped as bird's heads or as other animals recalling the richly decorated ships for
the religious ceremony of the Nautical Festival of Thera. Certainly there were
decorated ships, which were not used for religious purposes, since Homer
mentions the so called "φοικοπάρης νῆες".56 In several cases these small boats
have religious meaning, either they have attributes with a sacred character or they
were found in a religious context. Also the fact that there are masts and that the
sails are either missing or furled as occurs on the ships of the Thera frescoes, is
evidence of religious conservatism which goes back to the small rowing crafts of
the third millenium B.C.

In the internal part of the hull the base of the mast is (fig. 1, 2) preserved and
the fact that it is almost in the centre is a solid argument that the ship is to be
classified with large vessels. Though it is known that ships were sailing in the
Aegean since the beginning of the second millenium B.C. there exist only
representations of the vessels. The model from Argos is the second model of a large
ship to be found after the one from Aghia Triada which dates to the Late Minoan
IIIC period.57 It is not possible to know the height of the missing upper portion
which would have been made of fragile material. The clay might have been
completed in wood with a piece of cloth at the upper part, which would indicate
sails. Clay models of ships have been found in the Near East and Cyprus58 which
bear a hole where a wooden mast would be fixed.

We have described two clay strips, that cross the width at almost equal
distances from the mast (fig. 1, 2). The benches of a clay model from Mycenae59
are indicated in a similar way. In that example the strips occupy a limited area at
the bottom of the hull and their length does not reach the gunwale, as in the
Argive example and, moreover, they do not touch the floor but are a short distance
above it. Similarly, in the clay model from Aghia Triada60 the benches are placed
under the deck and do not reach the gunwale. Thus, these differences lead us to
the conclusion that the strips in the Argive ship do not indicate benches but rather
the cross beams of the hull.61 There is no reason for the number of the cross beams
to be realistic.

Some years ago, a clay ship model was published from Oropos.62 But since
the find was not from a stratified context it can only be dated by means of stylistic
criteria. It is thought that it may date to the Late Helladic III period because of the
type of its clay and paint.63 One specific characteristic of this ship is the ramshaped
projection of its base which can be compared to the projection on a piece of a clay
model from Athens64 and another from Phylakopi65 that are dated to Late
Helladic IIIC period. It is not easily compared to the sharp projection of the ram
of late Geometric ships. The projection on the Oropos model could not function
properly with an akrostolion. One assumes akrostolion was attached to this model
because of the two horizontal pierced holes as well as one perpendicular hole with
no opening. The fastening of the shrouds would be more easily done somewhere in
the interior of the ship and not at its far end.66 The closest parallel comes from the
newly restored pyxis from Pylos which depicts the akrostolion: it is certain that a
similar shorter ramshaped projection at the prow was a part of the keel.67 After a
detailed study of the representations of ships of the end of Late Helladic III
period, especially of the IIC period, one can conclude that all have such a ram at
the stem, which was not meant to ram as the ram of the Geometric period would
probably do, but was designed to help the ship pass through the sea and to land.
The most ancient representation of this technical achievement is found on the ship
from Gazi, dated to Late Minoan IIIB. It seems to coincide with the invention of
the keel of which the so called ram is the end. On the other hand it is not just
coincidence that the keel on New Kingdom Egyptian ships made its appearance at
the same time.68 That the ramshaped projection was not structurally independent
of the keel is shown by the ships on a Protogeometric crater from Alicarnassus69
and an Early Geometric sherd from Leftkandi.70 These intermediary examples
connect Aegean ships of the Late Bronze Age period with their representations of
the Geometric period. During the 9th century and especially the 8th century it
developed into a vessel of war suitable for conflicts with pirates, on long distance
journeys in search of colonies, although there is not any representation depicting it
in a naval battle.71 Its ceramic context dates the clay model to Late Helladic IIIA2-
B1 at the time of the peak of Mycenaean civilization and its greatest expansion.
Argos, where it was found, is mentioned in the Catalogue of the ships as one
important force; thus, it is natural that a model of a ship would be found there.
Although there is no evidence that Premycenaean mainland had a nautical
tradition, it has been suggested that the Mycenaeans were the creators of a great
navy.72 The main evidence is that on a tablet of Linear B from Pylos the largest
percentage of nautical terms is Greek. It is possible that the Mycenaeans
developed small ships into the stronger more powerful seafaring vessels.

When we look for a nautical tradition on the mainland during the Middle
Bronze Age, we find once more at Argos the representation of ships on a jug, which is the first depiction of a ship in the town and the only one predating the clay model. The fact that other such representations of ships exist on the mainland at this time as well as pottery imported from abroad prove that the mainland was not isolated. Distances between areas in the Aegean are so short that even a primitive boat could bring them into contact, and it has been shown that as long ago as the Mesolithic Franchthi imported obsidian from the island of Melos.

The little boats from the jug from Argos are crescent shaped, at their bottom parallel lines indicate oars and amidships there is a cabin with apsidal roof. The only contemporary representations of a cabin with absidal roof exist in Egypt, on the model boats of the dead from the Middle Kingdom. In the Aegean several representations of ships with a flat roof or without a roof have been found. To the second category belongs the cabin on the stern of the ship on the Theran fresco. The fact that their use was not practical but ceremonial is proved by their light weight construction unsuitable for travel in the open sea; the garlands which decorate them and the emphasis on the importance of the person who stands there. There are many talismanic Minoan seals, sacred objects themselves, which depict a similar cabin on the stern of a ship. Thus only the main part of the ship which is associated with religious beliefs, is represented. Isolated cabins decorated with garlands are painted on the walls of the West House of Thera. This representation has led to the identification of other cabins on fresco fragments from Mycenae. Their role is considered religious firstly because of the hieratic character of the procession of the ships and the direct association to the representation of the priestess of the West House, and secondly because of their decoration with garlands and their similarity to the unroofed litters from Crete.

The apsidal shape of the roof of the Argive ships is similar to a Mycenaean litter model of clay, which has been interpreted convincingly as having hieratic use. The position of the cabin in the centre of the hull is parallel to the position of the flat-roofed cabin on the gold ring from Tiryns, where a religious scene is also depicted.

As far as the ship procession of Thera is concerned the furled sail, the ramshaped projection of the stern, the paddles and the decoration are considered to be imitations of archaic prototypes. As far as we know these characteristics some of which are preserved on Middle Minoan seals, go back to the Early Cycladic ships of which no one had a mast or sails. On the ships from Argos besides the cabin and the lack of a mast, the parallel lines may indicate paddles, as those on early Cycladic and Theran ships. We conclude that the ship on a seal from the Stathatos Collection is also moved by paddles because the human figures are standing and face the stem. In addition, the religious character is proved by the long dresses of the figures, the ramshaped projection and the cabin of the stern.

On another seal from Anemospilia in Crete, a human figure is depicted
paddling a vessel which has a high stern, bird shaped at the lower stem, a characteristic of other sacred ships too.

Because the representations of ships from the Bronze Age Aegean, many times, contain religious elements, the study of ship construction is very difficult. The religious character of the ship is recognised by special features or by the excavation context, if for example the representation comes from a tomb or a sanctuary. A great number of ships have been discovered which have a certain religious role not only in the Aegean and the Orient, but also in Europe and it has been accepted that they are associated with vegetation deities and the cult of the dead, especially for people who live near the sea and rivers.80

The clay model from Argos does not give a clear indication about its role, by itself. Evidently it is not an accurately portrayed model of a ship, since its depiction is summary and unrealistic, at least as far as the flat base is concerned. It seems that it was destined to be an offering. This supposition is confirmed by its context, which consisted of fragments of anthropomorphic figurines, a piece of a throne model, fragments of animal figurines, a glass paste seal bearing the representation of a goat. The context and details such as the jewellery which is depicted on the anthropomorphic figurines and the flat base of the model are indications that this object had a religious aspect.

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* Argos Museum inv. No 6098

The photographs were taken by Ino Ioannidi and Lenio Bartzioti.

The drawings were done by the skilled hand of Maria Nioti to whom I am grateful. I also express my thanks to Dr. Carol Zerner who kindly revised my English text.

Notes

catalogue of the Aegean models of ships.


9. A. Δημιουργούλου, Μυκηναϊκά διακτυρικά έργαστήρια είς Θήβας, AAA VII, 1974, 165 fig. 3.

10. Θ. Φαράκλας, PIAE 1973, 23 Πίν. 10α.


15. J. and E. Sakellarakis, PIAE 1979, 388 Pl. 183γ.


17. A. Tamvaki, Some Unusual Mycenaean figurines, BSA 68, 1973, 256, fig. 24, Pl. 52 d.


20. The bibliography in which both the opposite opinions have been argued has been collected by Sakellarakis up to 1971, loc. cit. (supra n. 3) 198 and later by P. Johnstone, Stern first in the Stone Age? Int. J Naut A, 1973, 2, 3-11. Sakellarakis supports the opinion that the prow was higher and Johnstone that the ships could be directed by either end. J.H. Betts in Ships on Minoan Seals, Colston Papers XXXIII (1971) Blackman ed. Marine Archaeology, 332 rather in favour of the opinion at the higher stern, while P.F. Johnston, Bronze Age Cycladic Ships: An overview, TUSAS 7, 1982, 1-8 supports it strongly.


27. Renfrew, AJA 71, 1967, 1-20, Nr. 12-14, Pl. 1, 12.3 L. Casson loc. cit. (supra n. 2) 41, Gray loc. cit. (supra n. 5) G 14, A2, Götlicher, loc. cit. (supra n. 7) Nr. 328 Raf. 25.


29. Χ. Τσούντας, Κυκλαδικά, A.E., 1899, fig. 16-18. P. Johnstone, loc. cit. (supra n. 20) fig. 5.


34. A.J. Tilley and P. Johnstone, loc. cit. (supra n. 32).

35. L. Morgan-Brown loc. cit. (supra n. 14), 638, S. Wachsman loc. cit. (supra n. 33) where all the opinions are collected. The writer suggests that the projection had a ceremonial role even during the third millennium B.C.

36. C. Laviosa, loc. cit. (supra n. 4), 27, fig 27b Gray, loc. cit. (supra n. 5) G 18, C 32 Götlicher loc. cit. (supra n. 7) Nr. 319.

37. Lanström, loc. cit. (supra n. 26), 52, 147-7.

38. L. Casson, loc. cit. (supra n. 33, 1) 7.
40. L. Casson, loc. cit. (supra n. 33, 1) 7.
41. L. Casson, loc. cit. (supra n. 2) fig. 28, 1 Σακελλαράκη, loc. cit. (supra n. 3) fig. 9.
42. for ex. L. Casson loc. cit. (supra n. 2) fig. 74.

43. The right place for the anchor was at the stem and only a secondary one might be put at the stern. This information is given by the Greek texts and the Egyptian representation of Old Kingdom date D.E. Mc Caslin: *Stone Anchors in Antiquity*, 1980 56-59.

44. Landstrom, loc. cit. (supra n. 26), 100, 147.
46. L. Casson loc. cit. (supra n. 2), 8.
47. B. Landstrom, loc. cit. (supra n. 26), 107, 146.
48. C. Laviosa, loc. cit. (supra n. 4), 26, Göttlicher, loc. cit. (supra n. 7) Nr. 334.
49. C. Laviosa, loc. cit. (supra n. 4), 26, Göttlicher, loc. cit. (supra n. 7) fig. 9.
50. A. Tamvaki, loc. cit. (supra n. 17).
51. L. Casson loc. cit. (supra n. 2) 32-3 and (supra n. 33), 4 L. Morgan-Brown, loc. cit. (supra n. 14) 629-30.
52. A. Δημιουργός, loc. cit. (supra n. 9).
53. supra n. 49.
54. C. Laviosa loc. cit. (supra n. 4), 9-13, fig. 1—3.
55. Θ. Θυσίων, *Πλακάκια μέ έγχραρτους παραστάσεις εκ Θηβών ΑΔ 1969, 47-50, σχεδ. 2.
56. 'Οθόνη, XI, 124-5.
57. C. Laviosa loc. cit. (supra n. 4) fig. 27 a-d.
58. L. Casson loc. cit. (supra n. 2) fig. 20, Göttlicher, loc. cit. (supra n. 7) Pl. 1, n. 4, R.S. Merillees, *The Cypriote Bronze Age Pottery found in Egypt*, 188-9.
59. C. Laviosa. loc. cit. (supra n. 4) 26-7, fig. 26.
60. supra n. 57.
61. L. Casson loc. cit. (supra n. 2) 210-11.
63. B. Πετράκα loc. cit. (supra n. 62) 99 n. 21.
64. Gray loc. cit. (supra n. 5) C57, Pl. Gjc, Göttlicher, loc. cit. (supra n. 7) Nr. 336 317.
65. C. Laviosa, loc. cit. (supra n. 4) fig. 11a-b, Göttlicher, loc. cit. (supra n. 7).
66. C. Laviosa, loc. cit. (supra n. 4) 14.
68. Lanström, loc. cit. (supra n. 26).
69. Gray, loc. cit. (supra n. 5) D3, fig. 16B.
70. Lefkandi (1983) 267, Pl. 274, 918 and 284, 11.
73. E. Pontonotariou-Delaki loc. cit. (supra n. 8).
74. M. Shaw, loc. cit. (supra n. 11).
75. L. Morgan-Brown, loc. cit. (supra n. 14) 639.
77. CMSI supp. Nr. 167.
78. The long dresses were the only indication to suggest that the character of the scene is religious, for Chapoutier in the first publication, Amandry, Collection Statthatos (1948) 25, Nr. 36, Pl. 9.
79. J. and E. Sakellaraki, loc. cit. (supra n. 15).
80. Σ. Αξιοδείκτη ιεν. cit. (supra n. 49), a summary about the religious beliefs related to the ship.
LE BATEAU DE THÉSÉE, LE VASE FRANÇOIS ET LES TRIACONTOROI*

Il est utile, lorsque l'on s'intéresse à l'iconographie — et en particulier à l'iconographie de marine — de considérer aussi l'environnement culturel qui détermine la création d'images — la littérature, et les mythes. Je m'en suis convaincu en étudiant, dans la revue Archaeonautica 4(1984), p. 213 à 227, une image bien connue, le bateau sculpté sur la frise du petit trésor de Sicyone à Delphes: il s'agit non pas du premier navire venu, mais de la nef Argô elle-même, qui portait les cinquante Argonautes; la conséquence de cette observation simple est que ce bateau ne peut être qu'une pentecontère, et que l'on doit donner de lui, sur trois métopes successives du "monoptère" sicyonien, une image restituée plus ambitieuse et plus significative que celle que l'on imaginait. Je propose ici, avec une méthode identique, de considérer, pour la même période à quelques années près, un autre vaisseau illustré par le mythe, celui du héros athénien Thésée.

Chaque année, au printemps, au mois d'Anthéstéron, une théorie, avec un chœur de jeunes gens, partait d'Athènes à destination de Délos pour participer à la fête des Délas. C'était, disait-on, la conséquence d'un vœu fait par la cité à Apollon au départ pour la Crète de Thésée, pour obtenir du dieu le salut du héros et des jeunes gens qu'il emmenait. On envoyait alors, après avoir observé les présages par héroscopie, au Délon de Marathon (scholie à Sophocle Oedipe à Colone 1047) un bateau pour les transporter vers l'île sainte et les en ramener. Aristote évoque cette fête, et l'organisation du voyage, en rapport avec les attributions de l'archonte éponyme, au chapitre LVI, 3 de sa Constitution d'Athènes: Καθίστησί δὲ καὶ εἰς Δήλου χορηγοὺς καὶ ἀρχιδεσποτὰν τῇ τριακοντορίῳ τῷ τόις ἡθέους ἀγοντί. "L'archonte désigne aussi les chorèges pour Délos et l'archithéor pour le vaisseau à trente rameurs qui y conduit les jeunes gens". A partir du moment où l'on avait "couronné" la poupe de ce bateau, et jusqu'à son

* Il est inutile de multiplier les références concernant le vase François, exposé au Musée archéologique de Florence (inv. 4209); je renverrai seulement à la bibliographie donnée par E. Simon, Die Griechischen Vasen, P. 77 (mais on ajoutera Greek Oared Ships cité ci-après) et à l'excellente image en couleurs publiée dans le volume sur La Grèce archaïque de la collection L'univers des Formes, p. 62, fig. 56.
retour, on ne pouvait procéder à Athènes à aucune exécution capitale: c'est à cette circonstance que Socrate, en 399 av. J.C., condamné le lendemain du départ, dut d'avoir sa mort différée d'un mois; Xénophon le rappelle dans les Mémoires, et surtout Platon, qui mentionne à ce propos et la théorie et le navire, dans le Phédon, 38 ab. Il vaut la peine de citer assez largement ce passage, avec la traduction de Léon Robin.

ΦΑΙΔ. Tύχη τις αυτῷ ὁ Ἐξέκρατες, συνεβή· ἐν τῇ πρωτεραίᾳ τῆς δίκης ἢ πρῶμα ἐστεμένη τοῦ πλοίου ὤ εἰς Δήλον Ἀθηναῖοι πέμπουσι.

EX. Τούτο δὲ δὴ τί ἔστιν;

ΦΑΙΔ. Τοῦτό ἐστι τὸ πλοῖον, ὡς φασίν Ἀθηναῖοι, ἐν ὧν Θησεύς ποτε εἰς Κρήτην τοὺς δίς ἐπὶ ἐκείνους ὄχθες ἄγων. Καὶ ἔσωσε τέκαὶ αὐτὸς ἔσωθή. Τῷ οὖν Ἀπόλλωνι εὐξαντό, ὡς λέγεται, τότε εἰ σωθεῖν, ἑκάστου ἑτοὺς θεωρήσαι ἀπάξειν εἰς Δήλον· ἦν δὴ αἱ καὶ νῦν ἤτε ἐξ ἐκείνου κατ' ἐναυτὸν τῷ θεῷ πέμπουσιν. Ἐπειδὰν οὖν ἀφράτων τῆς θεωρίας, νόμος ἐστὶ αὐτῷ, ἐν τῷ χρόνῳ τούτῳ, καθαρεύειν τὴν πόλιν καὶ δημοσίᾳ μηδένα ἀποκτινώνυ, πρὶν ἂν εἰς Δήλον τε ἀφύκηται τὸ πλοῖον καὶ παλιν δεύρο. Τοῦτο δ’ ἐνίοτε ἐν πολλῷ χρόνῳ γίγνεται, ὅταν τύχωσιν ἄνεμοι ἀπολαβόντες αὐτοὺς. Ἀρχὴ δ’ ἐστὶ τῆς θεωρίας ἐπειδὰν ὁ ἱερεὺς τοῦ Ἀπόλλωνος στέψῃ τὴν πρόμαν τοῦ πλοίου· τοῦτο δ’ ἐτυχεν, ὅσπερ λέγω, τῇ πρωτεραίᾳ τῆς δίκης γεγονός. Τί ἀνάτι καὶ πολὺς χρόνος ἐγένετο τῷ Σωκράτει ἐν τῷ δεσμωτηρίῳ ὁ μεταξῦ τῆς δίκης τε καὶ τοῦ θανάτου.

PHEDON. – Il y eut, dans son cas, Echésrate, une rencontre fortuite, celle du jour qui précéda le jugement avec le couronnement de la poupe du navire que les Athéniens envoient à Délos.

ECHECRATE. – Et qu’est-ce donc que ce navire?

PHEDON. – C’est le navire sur lequel, selon la tradition d’Athènes, Thésée transporta jadis la double septaine, garçons et filles, qu’il conduisait en Crète. Il les sauva et se sauva lui-même. Aussi, comme la Cité avait, dit-on, fait à Apollon le voeu, s’ils étaient cette fois sauvés, de diriger tous les ans un pèlerinage vers Délos, c’est ce pèlerinage annuel qu’on a toujours, depuis cet événement et jusqu’à maintenant, continué d’envoyer au Dieu. Donc, à partir du moment où l’on a commencé à s’occuper du pèlerinage, c’est une loi du pays que, tant qu’il dure, la Cité ne soit souillée par aucune mise à mort au nom du peuple jusqu’à l’arrivée du navire à Délos et son retour au port. Or c’est parfois une longue navigation, quand il arrive qu’elle soit contrariée par les vents. D’autre part, le pèlerinage est commencé du jour où le prêtre d’Apollon a couronné la poupe du navire, et il se trouva, vous ai-je dit, que cela eut lieu le jour qui précéda le jugement. C’est pour cela que Socrate eut beaucoup de temps à passer dans la prison, entre le jugement et la mort.

Le bateau utilisé pour la théorie délienne était donc le bateau de Thésée. Et il s’agissait bien de la nef même du héros, non d’une réplique; une sorte de relique sainte, que l’on affirmait authentique. Le texte de Platon ne laisse aucune place au doute; et il est appuyé par un passage tout aussi clair de la Vie de Thésée de Plutarque:
23. I Tō δὲ πλοῖον, ἐν ὑμεῖς ἔπλευσε καὶ πάλιν ἐσώθη, τὴν τριακόντορον, ἀρχὶ τῶν Δημητρίου τοῦ Φαληρέως χρόνον διεφύλαττον οἱ 'Αθηναῖοι, τὰ μὲν παλαιὰ τῶν ξύλων υφαινοῦντες, ἄλλα δὲ ἐμβάλλοντες ἱσχυρά καὶ συμπιγγνύντες οὕτως ὡστε καὶ τοῖς φιλοσόφοις εἰς τὸν αὐξόμενον λόγον ἀμφιδοξοῦμενον παράδειγμα τὸ πλοῖον εἶναι, τῶν μὲν ὡς τὸ αὐτό, τῶν δὲ ὡς οὐ τὸ αὐτὸ διαμένοι λεγόντων.

- "Le vaisseau sur lequel Thésée alla et retourna estoit une galiote à trente rames, que les Athéniens gardèrent jusqu’au temps de Démétrius de Phalère, en ostant toujours les vieilles pièces de bois à mesure qu’elles se pourrissaient et en y remettant de neuves en leurs places: tellement que depuis es disputes des philosophes touchant les choses qui s’augmentent, à çavoir si elles demeurent, ou si elles sont autres, cette galiote estoit toujours allégue pour exemple de doute, pour ce que les uns maintenaient que c’estoit un même vaisseau, les autres au contraire soutenaient que non" (traduction Amyot).

Plutarque ne dit pas que le propre bateau de Thésée, ainsi précieusement conservé et entretenu, était utilisé pour la théorie mais le texte de Platon est sans équivoque. Et Platon ne dit pas que le bateau de la théorie était une triacontore; mais le rapprochement avec la Vie de Thésée, et surtout le passage cité plus haut d’Aristote, dans un traité sur la constitution d’Athènes, à haute prétention historique, est concluant. Le bateau de Thésée était un bateau à trente rames, qui avait donc un rôle dans les cérémonies du culte apollinien après avoir eu sa place dans le mythe; et il ne s’agissait pas d’une pièce de musée offerte à la curiosité dévote des Athéniens, comme on a pu le croire — et comme l’étaient, semble-t-il, la nef Argô exposée à Corinthe et le vaisseau d’Enée à Rome — : il naviguait tous les ans, véhiculant le chœur en l’honneur de l’Apollon de Délos; et si on le réparait avec soin, c’était pour le maintenir en état de reprendre la mer au printemps.

L’importance de la navigation mythique de Thésée vers la Crète et dans l’Égée cycladique est marquée encore à Athènes, cité marine, par une autre festivité: ce sont les Kybernesia, fête des pilotes, une fête corporative en quelque sorte, où l’on honorait spécialement, comme des saints patrons, les officiers de marine qui avaient accompagné Thésée dans son voyage; selon Philochore cité par Plutarque dans sa Vie de Thésée, Phaïax et Naissithoos, le premier ayant servi à la poupe, le second à la proue du bateau. Les liens avec les Phéaciens de l’Épopee homérique sont évidents: par le nom de Phaïax d’abord; mais aussi Naissithoos est cité au chant VI, 42 de L’Odyssee comme le père d’Alkinous et le fondateur de la cité maritime des Phéaciens. L’un et l’autre recevaient, nous dit Plutarque, un culte à Phalère, en relation avec le sanctuaire du héros Skiros. Or une inscription de 363/362 av. J.C. trouvée sur l’agora d’Athènes et publiée par William S. Ferguson dans la revue Hesperia VII (1938) (= Sokolowski, LSCG Supplément 19) — acceptation de cultes par les Salaminiens — mentionne, dans un contexte où manifestement le culte d’Athéna Skiros a une grande place, le sacrifice, au mois de Boédromion, d’un porc au héros Phaïax (ligne 90). Un peu plus loin, dans le même
texte, après le nom de Teucros, apparaît un héros du nom de Nausithoos, qui reçoit aussi le sacrifice d’un porc. La proximité des noms de Nausithoos et Nausiéros est assez frappante, et il s’agit, selon W. Ferguson, d’un même personnage.

Les fêtes de la mer — assez rares pour que celles-ci soient très remarquables — sont donc à Athènes liées étroitement au mythe de Thésée. Thésée était fils de Poséidon, et protégé par lui (on se rappelle l’épisode sous-marin de l’anneau de Minos, chanté par Bacchylide XVII [Snell], qui fait de Thésée un pionnier de la plongée); et l’expédition de Crète qui d’après certaines traditions entraîna des combats contre d’autres vaisseaux, symbolise d’une certaine façon une domination de l’Égée par Athènes, succédant à la thalassocratie de Minos. Cette aventure, d’autre part, par l’attention donnée au navire et à l’équipage, qui participent à l’exploit, peut être comparée dans la tradition légendaire à celle des Argonautes. La geste des Argonautes, certes, est plus développée dans ses aspects de croisière merveilleuse, engageant dans un parcours à faire preuve de sens initiatique sous-jacent la solidarité des membres de l’équipage, les kouroi recrutés par Jason. Et le navire Argé lui-même était divin, doté de vertus magiques. Mais on peut penser qu’Athènes avait développé autour de Thésée, héros qui lui était propre, des éléments mythiques à résonance semblable. Et il n’est pas étonnant que le navire de Thésée, connu et évoqué par exemple par Bacchylide, ait fait l’objet d’une attention particulière; c’était plus qu’un accessoire, il tenait une place importante, et la conservation affirmée de cette relique vraie reliait la légende à l’histoire.

Dans ces conditions, il faut s’intéresser plus qu’on ne l’a fait jusqu’ici au bateau de Thésée. Or il en existe une représentation peinte, unique mais admirable, qui nous en est donnée dès l’époque archaïque; c’est l’image bien connue sur le col du célèbre vase du Musée de Florence dit Vase François, peint par Clitias à Athènes vers 570 av. J.C. On voit, à droite, la farandole des sept jeunes gens et des sept jeunes filles, et Thésée lui-même en citharède, Ariane et sa nourrice; le bateau d’où ils débarquent est à gauche; il y règne une joyeuse animation; les rameurs sont encore à leur banc ou s’apprêtent à descendre, le pilote est encore à son poste. Le navire lui-même est figuré avec une attention au détail — rendu par la silhouette, la couleur, l’incision — toute particulière. La question se pose toutefois de l’aspect qu’avait ce bateau dans son intégralité, puisque, par suite de l’état lacunaire du vase, il en reste seulement la partie arrière; l’avant est perdu, à l’exception d’un tesson flottant, inclus dans la restauration en plâtre, conservant le dessin de la proue, avec un éperon en hure de sanglier.

Le bateau du vase François a été très souvent reproduit; son image apparaît dans toutes les synthèses sur l’histoire de l’art grec et sur l’histoire de la navigation; il a naturellement sa place dans l’ouvrage si précieux de Morrison et Williams Greek Oared Ships (et les auteurs signalent la parenté de sa poupe avec une autre représentation, sur un fragment également peint par Clitias) un dessin excellent a été publié dans le vieux recueil de planches de Furtwängler et Reichhold. Pourtant le problème de la restitution n’a été envisagé, à ma connaissance, par aucun archéologue. Un essai a été présenté seulement dans un
ouvrage utile et de grande diffusion sur la technologie antique: H. Hodges, dans sa *Technology of the Ancient World*, p. 154, fig. 109, fournit en effet un dessin restitué du navire. Mais cette tentative, qui prétend aboutir à une image certaine ("as near as one can hope to approach to a blueprint") reconstruit une coque pouvant accueillir au total vingt-six rameurs, treize sur chaque bord; ce qui est sûrement erroné (pour ne rien dire de la suggestion faite en outre d'équipes de nage éventuellement doublées, par superposition, ce qui ferait du vaisseau une penteçon-
tère). Il ne peut y avoir aucun doute: le bateau doit être une triacontore. D'abord parce que l'étendue disponible sur le col du vase pour la restitution l'autorise, et qu'il vaut mieux chercher là un vase d'un type connu et d'une certaine façon normal: c'est la raison pour laquelle J.S. Morrison, sans autre explication, propose une triacontore, dans le texte d'appel et dans la légende d'une illustration de l'ouvrage collectif *Archaeology of the boat*, p. 164-165 et fig. 112. Mais surtout parce que les textes que j'ai cités sont clairs; et l'artiste qui illustrait la légende devait, de toute évidence, s'y conformer. Le navire de Thésée était pour lui un morceau de bravoure, et il fallait le montrer à la fois dans toute sa gloire et dans la fidélité la plus absolue à la tradition épique.

Si l'on passe de vingt-six rameurs à trente, l'augmentation de longueur, par rapport à celle de la silhouette dessinée par Hodges qui a eu au moins le mérite de lancer la discussion, est assez faible, surtout si l'on réduit la dimension du château de proue. A partir du dessin de Hodges, très peu modifié, on parvient à la vue de profil présentée ci-contre, qui offre cette fois de bonnes garanties d'exactitude dans ses proportions générales. C'est bien le bateau qu'évoquent avec clarté les sources littéraires, et il ne saurait ête autrement conçu.

On compte, en l'état actuel de conservation du vase, neuf avirons, en rehaut blanc, visibles sur le côté gauche du bateau; ils ont été relevés avec précision sur le dessin de Furtwängler-Reichhold. Il est parfaitement possible de porter le nombre à quinze, sans que le bateau soit trop à l'étroit dans l'espace disponible à gauche jusqu'à l'anse du cratère. Le mât, abattu, partiellement visible dans la partie conservée, a dans cette hypothèse et si l'on pense qu'il a été simplement couché sans déplacement de son pied, son emplanture non pas au milieu du bateau, mais plutôt vers l'avant, ainsi qu'on l'attend.

Les signatures du potier Ergotimos et du peintre Clitias, en vieil alphabet attique, dont il reste les dernières lettres, sont faciles à restituer puisque nous les lisons ailleurs, complètes, sur le vase François. On s'aperçoit qu'elles occupent une place importante au-dessus des huit premiers couples de rameurs à peu près. Les personnages dans cette région de la frise ne pouvaient guère être représentés assis à leur banc de nage — à moins que ces bancs n'aient été figurés déjà vides.

Une bonne description de la partie conservée a été donnée dans GOS, ce qui dispense d'y insister (voir surtout p. 83-84, la notice de Williams, mais aussi p. 90 et p. 53); je voudrais seulement attirer l'attention sur quelques points.

1. La situation des rameurs indique très nettement que les zig sur lesquels ils sont assis sont placés à l'aplomb des potelets verticaux du bastage. Le point
d'attache des avirons est au contraire, en dépit de l'apparence, dans l'intervalle entre deux potelets successifs (Williams a ici raison contre Kirk dont l'observation est superficielle). La conséquence est importante pour l'appréciation de la construction de la coque: chaque potelet vertical, correspondant à un banc, donc à une entretoise, doit correspondre aussi à un couple — ce qui amène à se faire une idée du squelette du bateau. Les images qui nous sont parvenues peuvent du reste être toutes interprétées de la même manière, de l'époque géométrique à la fin de l'archaïsme: les pièces verticales du bastingage y sont toujours révélatrices de la même structure interne.

2. Ces potelets verticaux, ainsi directement liés à la structure essentielle du navire, portent deux lisses horizontales qui ont fonction de garde-corps, peuvent servir à accrocher des défenses mobiles protégeant les rameurs (boucliers, tabliers de cuir, etc.) et aussi à l'attache des manoeuvres lorsque le mât est dressé et la voile mise. Les lisses supérieure et inférieure sont attachées vers l'extérieur aux potelets par une ligature en croix de Saint André (on se souviendra ici du rôle des liens souples dans la construction navale archaïque grecque, attestée en particulier dans l'Iliade). Cet agencement du bastingage en barrière à claire-voie évoque les représentations géométriques du Dipylon, mais aussi les images fournies par la figure noire attique de la deuxième moitié du VIe siècle av. J.-C. La lisse supérieure s'interrompt normalement un peu au delà du dernier potelet qui suit le dernier couple de rameurs vers l'arrière du bateau. La lisse inférieure se prolonge au centre jusqu'au point d'attache du gouvernail, endroit où elle rejoint le plat-bord; elle marque là une inflexion et se superpose ensuite étroitement au plat-bord dont elle épouse la courbe montante.

3. Le dispositif de la barrière entourant le pilote est ici particulièrement bien représenté. On constate qu'il est indépendant du bastingage courant. On distingue très clairement, au niveau du coude du personnage assis, une lisse appuyée sur deux potelets figurés par des incisions, et s'achevant vers l'avant, un peu au delà du premier potelet, par une sorte de poignée modelée, amincie, puis terminée en boule, qui a pu avoir une fonction précise. Et il est évident que les deux potelets ne sont pas liés à la lisse inférieure du bastingage qui se poursuit dans ce secteur. Il faut en déduire —je ne pense pas que ceci ait été aperçu jusqu'ici— que cette rambarde protégeant le pilote était établie en retrait du bord de la coque. Rien de plus normal: il est nécessaire en effet que les avirons de gouverne puissent être inclinés et jouer dans tous les plans; et ce jeu ne peut être assuré que si la “cage” du pilote est ainsi en retrait. On retrouve le même dispositif sur la lampe de bronze de l'Erechthéion —qui a l'avantage d'être observable en trois dimensions— et, si on les regarde attentivement, sur d'autres images de navires en figure noire, par exemple sur la coupe nicosthénienne du Louvre, et sur un très beau tesson de l'Acropole d'Athènes.

4. Il faut prêter attention aussi à l'extrémité de la poupe: on discerne ici nettement, pour la première fois dans l'histoire de la peinture céramique grecque, l'agencement des pièces de bois qui la constituent: c'est un bouquet de charpente-
rie, issu du prolongement rectiligne ou courbe des principaux éléments de bordure de la coque, qui convergent à l'arrière du bateau. Certains vont tout droit vers l'arrière; c’est, en partie au moins, le cas pour la lisse limitant la “cage” du pilote. D'autres se redressent et se recourbent en crosse; deux tiges principales, qui semblent naître des précédentes, s'élèvent et retombent vers l'avant, s'achevant par des bulbes qui évoquent le végétal (et non des têtes de cygne, comme il est dit par erreur GOS p. 83). Le principe de formation de ce bouquet est donc fonctionnel —mais on le traite de façon décorative; et il peut porter aussi les symboles et les insignes particuliers identifiant le vaisseau. On le retrouve ensuite sur tous les bateaux peints avec les poupes et les proues des barques marine portugaises, où l'on observe en des croises composites et colorées la même association du fonctionnel et de l'ornemental. Je suggérerai que le terme aphlaston ou aphlasta, utilisé chez Homère et Hérodote pour désigner cette structure terminale, soit interprété étymologiquement dans le sens de “non coupé”.

5. Le problème du pont enfin est posé, par la façon dont les personnages debout circulent, dans l'axe du bateau, en arrière des rameurs du premier plan et de part et d'autre du mât couché; il devait exister une coursière, axiale, un plancher partiel chevauchant les zyga, à la même hauteur que les sièges des rameurs ou un peu au-dessous.

On découvre surtout l'équilibre général du profil: une coque, basse sur l'avant, avec une poupe très relevée. Le bateau est assez long, de l'ordre de 20 m. — l'échelle pouvant être donnée par l'intervalle entre les zyga ou entre les points d’attache des rames, mesurant, comme on sait, environ trois pieds dans le cas normal (0,90 m.+). Si l'on donne un espace de 14 ou 15 m pour les quinze rameurs de chaque bord, la poupe pourrait occuper 3m environ, et la proue une longueur de même ordre, ou un peu plus réduite. Ce qui donnerait une fourchette de 18 à 21 mètres.

La triacontore dont le vase François nous offre une image rapprochée, détaillée, vivante, est donc un vaisseau long, léger, très simple dans ses superstructures. Ses qualités tiennent sans doute à la finesse de la coque, taillée pour la course. Le peintre Clitias nous a donné là l'image d'un bateau de son temps, vers 570 av. J.C., à un moment où la pentécontère, un peu plus longue, était encore en grande faveur, et où l'on procédait aux premiers essais des trières. Mais le bateau à trente rames n'était pas un bâtiment négligeable.

Ici se pose la question de la place tenue par la triacontore dans l'histoire de la marine grecque. Ce type de bateau reste, curieusement, ignoré de l'épopée homérique; les vaisseaux tirés au sec devant Troie, qui ont transporté les contingents achéens, les vaisseaux de la flotille d'Ulysse au retour de Troie, successivement détruits, comme celui qu’arment les Phéaciens pour ramener le héros à Ithaque, sont des pentécontères; la pentécontère est le navire des épopées perdues, comme celle qui contait l’histoire des Danaïdes, ou l’aventure égyptienne d'Hélène. On rencontre aussi, dans l'Iliade comme dans l'Odyssee, des vaisseaux à vingt rameurs ainsi celui qui porte Télémaque à Pylos, ou celui que les prétendants
prennent pour lui dresser à son retour une embuscade. Le navire le plus prestigieux est alors la penteconttre; et on a l'impression précisément qu'à Ithaque, il pauvre, c'est un type de bateau qui, en l'absence d'Ulysse, n'est pas disponible, tandis que les Phéniciens, qui sont un peuple de marins par excellence, et prospère, ont ce navire tout prêt.

Cependant la création de la penteconttre, son surgissement dans l'histoire de l'armement naval, a constitué un événement. On en trouve l'écho mythique dans l'épopée des Argonautes, citée dans l'Odyssee, donc antérieure à elle. Selon certains auteurs antiques la nef Argô était le premier vaisseau long de ce genre; Athéna avait veillé, règle en main, à sa construction, et le récit de sa mise en chantier avait occupé ceux qu’Apollonios de Rhodes désigne comme les “anciens poètes”. Qu'y avait-il donc avant la penteconttre? Nous disposons de si peu d'éléments pour reconstruire la protohistoire de la marine à rames grecque que le moindre indice compte. La considération des données épiques autorise une hypothèse: dans la chronologie légendaire, qui pour les Anciens n'était pas sans signification, la geste de Thésée, au sein de laquelle l'aventure crétoise est particulièrement ancienne, est celle d'un héros d'une génération antérieure à ceux que Jason enrôla pour naviguer vers la Toison d'or et la Colchide; de même que la geste des compagnons de Jason est elle-même antérieure à la guerre de Troie. Ne peut-on supposer que la triacontore a été utilisée avant l'avènement de la penteconttre — dont la naissance coïncide avec celle du navire Argô — et qu'elle était alors le principal navire à rames, celui des croisères hauturières et des exploits héroïques?

Cette hypothèse peut s'appuyer sur un texte historique. Hérodote, lorsqu'il rend compte, dans un récit assez développé, des colonisations successives de Théra par les Spartiates, puis de Cyrène par les gens de Théra, indique que la deuxième, vers la Cyrénnaïque, se fit avec des pentecontères, la première, conduite par Théras, avec trois triacontores (Histoires, IV, 147 et 156). L'expédition vers Cyrène date du VIIe siècle — la date précise serait 644 av. J.C. — et l'usage de la pentecontère est alors attendu. Mais la colonisation dorienne de l'île de Théra est beaucoup plus ancienne; elle se place sûrement très haut dans l'époque géométrique: J. Bévard, qui a tendance, plus que d'autres, à accorder confiance aux traditions, accepte de la faire remonter effectivement peu après le retour des Héraclides, soit au XIIe siècle av. J.C. On peut en discuter et préférer une date plus basse. Il reste que la précision donnée par l'historien et sur le nombre et sur le type des navires utilisés est frappante. On sera tenté de croire que le passage d'un modèle de bateau à l'autre, entre la période de la colonisation post-myénéenne et le haut-archaïsme, n'est pas fortuit, mais qu'il est lié à l'histoire de la technique navale. Nous aurions là une élément précis appuyant le raisonnement que suggère la réflexion sur les mythes.

Si l'on admet la valeur de ces indices, et l'hypothèse d'une évolution qui ferait de la triacontore le prédécesseur de la pentecontère comme "capital ship", il faut en mesurer les conséquences du point de vue de l'interprétation des poèmes
homériques. Ils sont l'aboutissement d'une longue stratification: quelle histoire reflètent-ils? Nous montrent-ils la civilisation mycéniennne, celle de l'âge géométrique, celle du VIIIe siècle av. J.C., époque où ils furent fixés par l'écrit? Le problème a été souvent posé pour l'armement du guerrier, pour les modes de combat terrestre, pour la géographie humaine, les institutions. Il ne l'a pas été vraiment en ce qui concerne l'équipement et la technique navale. On a remarqué seulement la conformité générale des descriptions homériques avec les bateaux que l'on observe sur les vases du Dipylon, de la fin du VIIe siècle: la pentecontre, vaisseau dominant dans les poèmes, y est représentée. Mais elle est absente des fresques de Théra: j'aurais tendance à penser qu'elle n'était pas un legs de l'époque préhellénique. Ce point apelle le débat; il s'agit non seulement de l'histoire des techniques, mais de la structure même des tissus sociaux. On a justement insisté sur les facteurs de solidarité originaux qui lient les groupes humains homériques: l'existence d'une marine à rames forte, avec des équipages à recrutement de genre "éphèbique", doit jouer un rôle que l'on n'a pas encore apprécié à sa valeur. Il existe une aristocratie, une chevalerie orgueilleuse de la rame, qui a ses paladins comme Ulysse, évidente au chant VI de l'Odyssée, dans le milieu phénicien, exaltée déjà dans les Argonautiques; et une civilisation propre des "vaissaux longs" dont il serait utile de dêgager les caractères et de suivre la croissance. On a beaucoup insisté sur le développement du combat hoplitique pour la constitution des classes et de l'ossature politique des cités archaïques. Pour certaines, du type "phénicien" — et beaucoup, insulaires ou côtières, sont dans ce cas — c'est l'engagement collectif sur les "vaissaux longs" qui est prépondérant. C'est pourquoi il serait de grand intérêt de pouvoir décrire — comme on suit plus tard le passage à la trière — l'avènement de la pentecontre. L'hypothèse de son arrivée relativement tardive dans le milieu égéen, et celle de l'antériorité de plus petits bâtiments, comme de la triacontore, est de nature à modifier, si elle recueille un accord, la vision que nous nous formions, et que nous devons réviser sans cesse, du monde homérique.

L'absence dans l'épopée de la triacontore pourrait s'expliquer ainsi: une fois l'âge de la pentecontre arrivé, la triacontore, qui avait perdu le premier rang comme navire de croisade, était toutefois trop puissant pour subsister comme vaisseau de seconde catégorie. A côté de la pentecontre dominante, on ne conservé, pour les plus petits voyages et les opérations de service, que le bateau à vingt rameurs.

La triacontore retrouve une place utile lorsque la trière remplace à son tour la pentecontre. Elle devient alors un navire de service, de reconnaissance et d'observation. Il y avait, lors de la deuxième guerre médique, des triacontores (trêcontores en ionien), mentionnées avec des pentecontères et des bateaux plus petits, dans la flotte de Xérès: Hérodote n'indique qu'un chiffre global (trois mille pour cette masse auxiliaire); mais il est remarquable que les triacontores soient mentionnées en tout premier lieu (Histoires VII, 97). Aux Thermopyles (juillet 480 av. J.C.), c'est une triacontore qui porte l'observateur chargé de
rapporter l'issue du combat de Léonidas à la flotte grecque stationnée à l'Artémision d'Eubée (Histories VIII, 21). En 425 av. J.C., Thucydide mentionne, à propos des affaires de Pylos, une triacontore: équipée pour la course, elle est prise à des Messéniens sommairement armés, dont les Athéniens récupèrent les boucliers en osier (IV, 9). Dans l'Anabase, Xénophon raconte que les Dix Mille — ce qu'il en reste — parvenus à Trapézonte sur la Mer Noire, se font donner par les Trapézontains une pentécontère et une triacontore: la pentécontère déserte avec son capitaine, un Spartiate; mais la triacontore remplit parfaitement le rôle qu'on attendait d'elle, la chasse et la capture des navires marchands (Anabase 5, 1, 16). Dans la Lettre VII (350 ab) Platon raconte comment, dans l'été de 360 av. J.C. une triacontore fut envoyée par Archytas de Tarente, sous couleur d'ambassade, à Syracuse, pour le tirer de la situation difficile où l'avait mis la défaveur de Denys. Surtout, les triacontores — et elles seules comme unités de petit tonnage— ont après le milieu du IVe siècle leur place dans la marine de guerre d'Athènes, avec les trières et les tétrères nouvelles: elles sont mentionnées dans les inventaires et les recensements d'agrs — par exemple en IG II² 1627, 1628n 1629, 1649. Leur nombre est relativement restreint certes: quatorze en IG II² 1629, si l'on additionne les chiffres des lignes 332 et 335. Mais ce ne sont pas des bâtiments négligés: on indique à l'occasion pour elles, comme pour les plus grands navires, leur nom et le nom de leur architecte. A la même époque à peu près, la valeur de la triacontore est illustrée par les navigations d'Alexandre sur l'Hydaspe et l'Indus — les principaux bateaux étant 80 triacontores — et par le périple de Néarque qui suivit, des bouches de l'Indus au fond du golfe Persique, avec les mêmes vaisseaux, qui remontèrent l'Euphrahte jusqu'à Babylone (325 av. J.C.; voir Arrien, Anabase V, 2, 4). Peu avant la mort d'Alexandre, la flotte constituée en Mésopotamie comprenait encore trente triacontores, pour douze trières, trois quadrières, quatre quinquérèmes, soit dix-neuf navires seulement de classe supérieure; et surtout les reconnaissances envoyées vers l'Arabie avec Archias, Androsthrènes, Hiéron de Soloi, utilisaient des triacontores (Arrien, Anabase VIII, 20). Manifestement, on a préféré, pour ces missions aventureuses de reconnaissance, ce type de bateau, de dimensions moyennes, à tout autre.

Je pense donc que le bateau de Thésée est le symbole pour l'époque post-myénéenne de la suprématie d'un navire qui avait déjà ces qualités; ce modèle a connu une éclipse assez longue, due à la primauté de la pentécontère, qui représente un sommet durable dans l'évolution de la culture matérielle du préarchaïsme et de l'archaïsme helléniques. La pentécontère déclassée, il a repris l'avantage pour les missions qui n'exigeaient pas l'emploi de la trière et des vaisseaux plus lourds.

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Reconstruction du navire de Thésée peint par Klitias sur le vase François, par Michel Rival (CNRS, Centre Camille Jullian, Aix-en-Provence).

Restitution schématique du navire de Thésée.
(Henry Hodges, *Thechology in the Ancient World*, p. 154)

Reprise schématique de la restitution, le bateau étant reconnu comme triacontore.
HELLENIC TRIERES AND BARBARIAN TRIERES
AT SALAMIS, TECHNICAL INFORMATION

Upon learning about the defeat at Marathon, Darius decreed mobilization in all the cities of his vast empire to gather ships, soldiers, horses and supplies. Herodotus (VII, 1) relates that, after the edit, Asia was engrossed in the organization of the war against Hellas for three years. Later, however, the Egyptian revolt and the king's death postponed operations.

Xerxes who succeeded Darius, first of all subdued Egypt and then dedicated the following four years to the organization of an expedition against Hellas. Finally, in the fifth year, he began the war. At Dorikos on the Thracian coast (Doris, the present Gulf of Enez) the king decided to proceed to taking stock of his forces (Herodotus, VII, 184/195): 1,207 trieres and 3,000 pentekontors, all provided by the subdued populations and manned by their own crews for a total of 517,000 men, 1,700,000 infantry soldiers, 80,000 horsemen plus a total of 20,000 Arabs and Libyans as cart and camel drivers. To the above figures should be also added cargo carriers and servants following the Army.

On its way across Europe the Persian Army was joined by the Armies of other countries obliged to fight under the Persian king's ensign: 120 trieres within a crew of Hellenes from Thrace and contiguous islands and 300,000 soldiers from some twelve regions of Thrace.

Herodotus does not hand down any such detailed information as to the preparation of the Hellenic war. In his History (VII, 144) there is only a hint to the
fact that the will of Themistocles prevailed insofar as the Hellenic policy on the sea was concerned and that he succeeded in having the one hundred talents intended for distribution among the citizens assigned to the construction of two hundred trieres.

As a matter of fact the Athenians decided to wedge a sea war against the Barbarians "embarking themselves in mass on board the ships" as Herodotus puts it. It is likely that Themistocles was finally able to put his naval plan into effect after the ostracism of Aristides, a fierce antagonist to the plan. The date referring to such an ostracism is uncertain though it may be placed between 485 and 482 B.C. However, Athens must have developed a war climate three or four years before Xerxes' arrival in Hellas. Some perplexity may exist as to the cost of each triere, bearing in mind the information afforded by Herodotus. Anyway it must be evidenced that Cornelius Nepotis reduces to one hundred the number of the trieres actually built and that Plutarch confirms this figure.

At the time labour was certainly rather cheap, a labourer's salary probably amounting to three obols per day. A talent, therefore, covered the due to a labourer for 12,000 working days and there were no Trade Unions to fix the duration of the daily hours of work. Beyond doubt it was timber for construction that constituted the heaviest expense then, as Athens imported it. Anyway, at Artemisium, the Hellenes lined up against the Persians 271 trieres, of which 147 were Athenian (including the twenty ones consigned to the Chalcedians) and nine were pentekontors. Later, at Salamis, the Hellenic trieres were 378, of which 180 were Athenian, without including the two Ionian ones that had deserted the Barbarians. Each triere was equipped with two hundred men: the rowers that constituted by far the most numerous group, the armed men (hoplites, archers and slingers) forming a small group and the men intended for other duties on board.

However Herodotus informs us that Xerxes also embarked thirty armed Persians in addition to the staff supplied by the various subdued populations. Each triere had therefore a crew of 230 men on board.

According to Plutarch, The Life of Themistocles eighteen armed men, of whom four were archers and fourteen were hoplites, belonged to the body of the two hundred men on board the Hellenic triere.

But an inscription on an obelisk, found near Trezene in Argolis, which is probably a transcription of a decree proposed by Themistocles on the eve of the war, informs that the men on board each Hellenic triere were fourteen of whom ten were "epibatai", (a general term referring to soldiers serving on board) and four were archers.

However, if, as it is logic to believe, the army on each triere supplied by the subdued populations was equal in number to that on board a Hellenic triere, the armed men on board each of Xerxes' trieres were three times as many as those on board each ship belonging to Themistocles.

The congruous difference in the number of armed men on board each of the units of the two hosts suggests the hypothesis that Hellenic trieres lacked a
continuous deck from bow to stern such as had been probably constructed on the trieres belonging to Xerxes' fleet.

The validity of such a supposition is confirmed by Thucydides (1,14) when he writes that the trieres belonging to Themistocles ("οἵτω εἶχον διὰ πάσης καταστρώματα") were not yet endowed with a deck running from end to end.

On the subject of Xerxes' ships it is interesting to make a special mention of those that were laid down for the construction of two decks in the Hellespont. (Herodotus, VII, 21).

Herodotus relates (VII, 34/36) that 360 pentekontors were moored from Abydos, on the Asiatic coast to the opposite coast of the Chersonese in order to form a bridge on the side of the Euxine and 314 trieres were moored to constitute another one on the side of the Aegean.

Each of the two bridges were made up by vessels floating closely to each other and they practically blocked the passage in their sea-area to such an extent as to make it necessary to leave three channels open for the navigation of small boats. It is likely that the realization of these channels was obtained by interrupting the continuity of single decks through the removal of one hull. Herodotus relates that trieres and pentekontors had been linked together in order to form one solid structure. "Πεντηκοντάρως καὶ τρίτρας συνθέτεις" ...having linked together pentekontors and trieres... - he writes. In fact mooring was then effected by means of a double anchorage on both sides of the structure. Herodotus remarks: "very long anchors were sunk" (that is to say that many lengths of cables were threaded through the anchors) "both of the bridge towards the Euxine and of the other one".

The ratio 360/314 between the number of the pentekontors and that of the trieres should therefore stand for the ratio between the width of the two types of ships employed. Roughly speaking the width of a triere was 15% wider than that of a pentekontor.2

Plinius relates in his Naturalis Historia (VII, 57) that the inhabitants of the Isle of Thasos were the first to equip their ships with a continuous deck and that before then people either fought from bow or stern. ("...tectas longas Thasii: antea ex prora tantum et puppi pugnabatur") The Roman naturalist, however, does not specify the time when they altered their ships, but it must certainly be placed in the century preceding the first Persian expedition against Hellas. If we must accept what Plinius states, we must conclude that at the time of Xerxes' enterprise the Athenians could not ignore the technical achievements of the people from Thasos and therefore there is reason to believe that the technology, that inspired the projects for the Hellenic trieres and the one adopted for Xerxes' fleet were different.

For the former Themistocles must have concentrated on speed, manoeuvrability and stability of the hull, qualities that have always been primary and essential for the navy. In the opinion of the Athenian strategist a triere was to rely on the strength of the rowers and the ability of the helmsman during a battle. Therefore his trieres had a small draught and a saving in weight on top due to the relatively
low bulwarks in respect to the surface of the water and a deck that did not run the whole length of the hull.

The trieres of the Persian fleet are likely to have complied with the principles of the contemporary naval architecture according to which the number of armed men on board constituted the main element in the performance of the tasks expected from a man of war, hence the necessity for a continuous deck running along bulwarks that were rather high above the water in order to favour the eventual intervention of the army.

But in this way the trieres were certainly less stable and their function was reduced to that of a platform for hoplites, archers and slingers. The above conclusions are proved by the information handed down to us by the historians who commented those enterprises. Plutarch writes (The Life of Themistocles, XVI, 1) that Themistocles not only chose the sea area but also (and this is not common knowledge) the proper time for the naval battle before engaging the Persians at Salamis. He knew —Plutarch adds— that at a certain time in the morning the strait between the small island of Salamis and the Attic coast was regularly subjected to a strong wind that roughened the sea. Themistocles waited for this time to attack in order to take advantage of the superior keeping of his hulls. And in fact, during the battle “the high floating and low-bulwarked” Hellenic trieres were not affected by the weather conditions while those of Xerxes, with a high bow, top-covered by a deck and generally heavy swung in the wind and sea and ended up by offering their sides to the Hellenic rostra. And such was actually the main strategic object Themistocles had borne in mind when choosing the project for his trieres.

Plutarch’s synthetic relation of the battle of Salamis is undoubtedly more effective than the sporadic anecdotes of Herodotus on the same subject. Herodotus does not go into the merit of the technical superiority of the Hellenic trieres over the Barbarian ones and so the rapid information he affords (VIII, 86) on the different ways of fighting of the two fleets (the Hellenes with their ships orderly arranged, the Barbarians with theirs disorderly positioned) would be deprived of any value without the explanation about the different behaviour at sea of the opposing trieres which Plutarch affords uf later on and which has already been dealt with here before.

Moreover the merit of the victory deserved by the project Themistocles had chosen for the construction of his vessels, would also be overlooked.

However, in his history, Herodotus criticizes Xerxes’ trieres at least once, even if he attribute the authorship of the criticism to a certain Ionius from Samos. After Salamis the Hellenic fleet at anchor near the island of Delos watched from afar the Persian fleet moored at Samos.

Herodotus comments (VIII, 132) that “Fear ruled the space in between them”. But Egistrato from Samos managed to overcome the perplexity of the Hellenic strategists and led them with their trieres towards Asia maintaining that (IX, 90) “Barbarian ships do not handle well in heavy seas”. The battle of Mycale followed
and then the beginning of the war for the freedom of Ionia.

To conclude it seems fair to presume that the shape of the Hellenic trieres must have been comparatively different from that of the Barbarian ones.

Anyway some historians dealing with the same topic, maintain that the construction of a high deck did not modify the shape of the trieres and mention the error into which fifteen Barbarian trieres incurred when, at Artemision, they sailed towards the Hellenic fleet mistaking it for their own. (Herodotus, VII, 194) However it is impossible to base a question of shapes on a passage by Herodotus.

The fifteen trieres were to sail, along with the whole of Xerxes' ships, from the open shores of Southern Magnesia towards the Pagasiticos Gulf. It was a short and easy voyage. Herodotus writes: In the meantime they lost all contacts with the other units of the fleet «τετράχον τε διστατα» as they were last. A predicament that would have had no consequence had not the fifteen astray trieres missed the right direction: «Πολλαὶ ἐξαναθείσαι», their route being deviated too much off shore - Herodotus simply remarks.

Now consulting a map of the sea area involved, it is possible to establish that Herodotus's "deviation" is likely to mean that the trieres headed southward instead of steering to port round Sepia Cape after passing the straits between the coast of Magnesia and the little island of Sciaithos, an error probably due to over self-confidence and presumption. It was so that the fifteen trieres headed towards the Artemision Promontory where the Hellenic fleet was moored, for they thought it to be their own ignoring their mistake in the route. "The Barbarians saw the Hellenic fleet from afar (Κως κατείδον) — Herodotus points out — and believed them to be their own". In the end it was the Hellenes who watched the movements of the Persian fleet, who set out to attack and thus deluded the expectations of the enemy. The fifteen trieres were captured without a fight.

As a conclusion, in the development of the events, merely touched upon by Herodotus, there is no clue as to the shape of the trieres with or without a deck. The supposition already mentioned and based on Plutarch's information according to which a more or less marked difference existed between the two sorts of vessels is therefore still valid.

The success at Salamis was a proof of the efficiency Themistocles had expected from the projects of his trieres and for many years ships were built after their models in Attic shipyards. In his Life of Cimon, Plutarch reports (XII, 2) that in 466 B.C. Cimon attacked the Persians by the mouth of the river Eurimedonte in Pamphilia (the present Gulf of Adalia) with 200 trieres which "since the very beginning were perfect as to speed and manoeuvrability owing to their exceptional construction under Themistocles". These 200 trieres could not be those that fought at Salamis as some experts maintain. Apart from the fact that those vessels would have been more than fifteen years old, when by the Eurimedonte, a condition which must not be overlooked if taking into consideration the efficiency of a hull, we learn from Herodotus that the Athenian trieres were 180 altogether at Salamis and ignore how many of them were either damaged or sunk in battle.
The decline of Themistocles began in 471 B.C. that is nine years after the naval battle at Salamis and five years before the one by the Eurimedonte. In the interval between Salamis and his fall in disgrace he, no doubt, maintained his preminent position on decisions concerning the naval policy of his city also in consideration of his fame as an excellent strategist.

The interpretation of Plutarch’s passage could then convey the idea that after Salamis Athens continued to build the trieres planned by Themistocles since the very beginning while developing a plan for the expansion of their fleet. (In 478 an Attic League was constituted with the purpose of establishing a supremacy at sea) The new ships were fast and easy to steer though still lacking a continuous deck from bow to stern.

In fact in the same passage by Plutarch we read that Cimon, in anticipation of a probable battle in the narrow space between the river banks deemed more convenient to increase the number of armed men on board rather than exploit to their full extent the intrinsic qualities of the hulls. “He obtained even wider trieres by having a planking (διάβασιν) added to their decks so that the men on board, feeling safe for the presence of numerous hoplites, might assault the enemy more fiercely”.

As a rule, translators turn the word “διάβασιν” into “deck” and so write that Cimon added a deck to the other decks. But “διάβασις” was not a naval term at the time and its translation into “deck” contained in the dictionaries, is a modern Civil Engineering word that must be intended as such. For example, when the Athenians decided to withdraw from Syracuse by land, the Syracusans hurried to preside “ἐποιήσαν τάς διαβάσιτις” that is the bridges on the rivers. (Thucydides, VII, 74) Therefore, in the case under examination, the translation of “διάβασιν” into “planking” seems more exact, for it evidences, above all, the occasional intervention of the constructor on the pre-existing structure of the hull.

In other words Cimon had a platform built in his trieres that were in all cases devoid of a continuous deck and had it fixed to the top extremities of the bulwarks. Owing to building exigencies he was then obliged to let the planking protrude from the verticals of the bulwarks and, in the end, this added to the width of a triere. Plutarch writes: “Cimon widened the triere”.

The above considerations seem sufficient to demonstrate that the construction of Themistocles’s trieres without a continuous deck was due to the choice of a project and therefore must not be attributed to a less progressed technique on the part of Attic shipyards, as a superficial perusal of the already mentioned expression by Thucydides may lead to think.

In book 8, Chapter 188 of his Histories, Herodotus hints at the problems created to hull stability by a continuous deck laden with armed men on board Xerxes’ trieres. The historian writes that there was a version of the return of Xerxes to Asia that differed from the one by which the Persian leader had chosen, to go back, the same way he had followed to reach Hellas. At Eione on the Strymon (the present Gulf of Orfani) the Persian king might have gone on board a
Phoenician ship with his notables, the latter being accommodated on the deck otherwise allocated to armed men. During the navigation, since a storm menaced to sink the ship, the helmsman seems to have said to the terrified king that a chance of survival would be afforded by the removal of the men from the deck. On Xerxes’ order the notables most likely dived into the sea thus avoiding a shipwreck at the cost of their lives.

Herodotus, however, does not believe this version for, as he writes in the next chapter, there was an alternative solution by which both the many Persian notables, who were the King’s guests on board, and the triere itself could be saved. It would have actually been sufficient for Xerxes to invite his nobles to go below deck and take the place of an equal number of Phoenician rowers doomed to be thrown overboard once on deck.

This passage by Herodotus evidences the lack of space inside a triere. The Persians on deck could find room for themselves below it only taking the seats of the rowers: so many Persians = so many rowers.

As to the decision which, according to Herodotus, Xerxes should have taken in such a predicament, it sheds doubt on the naval technical knowledge of the historian. The danger for the triere to capsize was pressing and asked for a prompt decision, quite unlike a substitution of the men located on the two levels of the ship. Moreover a choice of this nature might have favoured the ship to capsize. These orders Herodotus attributes to Xerxes are two of the steering instructions “faciti ammuina” that are so often repeated as a joke on our ships nowadays.

To conclude it is possible to establish that the reason brought forward by Herodotus to exclude the version of Xerxes’ voyage on a Phoenician ship bound for Asia is deprived of foundation. On the contrary, if we are to accept Plutarch’s version The Life of Themistocles Xerxes had but the sea to reach Asia. The latter actually writes that Themistocles deceived the king with a message to spur him to leave Europe, since the Hellenic fleet was about to sail towards the Hellespont to dismantle the bridges of vessels the king had ordered to assemble across it. At the time the approximate figure of 120 miles of sea between Eione and the coast of Asia, to be covered, roughly speaking, in one day’s navigation, would have, no doubt, constituted the shortest and safest way back for Xerxes mainly after the warning by Themistocles.

Certainly that high continuous deck erected on the triere influenced in a negative way the initial stability of the hull, which became even more precarious when it was ready for war with a load of some fifty armed men. On the Phoenician triere carrying Xerxes to Asia, the number of Persian notables may have been even higher than that of the armed men usually assigned to a triere in war time. The unavoidable confusion on the way back from a defeat is likely to have slackened the control over the men waiting to board, while the chance the Persian notables were given, that is to reach Asia in the shortest time possible, may have created, amid the general discomfort, the comprehensible tension that led them to crowd up round the triere. If this actually happened the stability of the hull must have been

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even worsen.

However, whether the voyage to Asia on a Phoenician ship took place or not, in the unfortunate situation of the hypothetic navigation mentioned by Herodotus, the decision to relieve the deck of the triere of a rather heavy load would have certainly been the only way out for the helmsman in his attempt to gain stability and save the ship.

By the way it is interesting to underline the knowledge possessed by Herodotus in the field of the problems involving a ship with so many men massed on deck and of decisions to be taken in case of danger. Therefore the innermost meaning of the passage by Herodotus must be looked for in the condition of scanty stability of a decked triere armed for war.

Information has reached us as to the development of a triere continuous deck in Attic shipbuilding. Certainly the passage by Thucydides already mentioned, according to which the trieres of Themistocles "were not yet equipped with a continuous deck from bow to stern" leads to the conclusion that at the time of the historian also Attic trieres were endowed with such a continuous deck. And perhaps it was Cimon who started off the process of modification on the trieres of Themistocles.

However, it is a matter of fact that the crew of the Hellenic trieres amounted to 200 men at the time of the Peloponnesian war as it did some fifty years before at the time of the Persian war. The consequence is that the number of armed men to be embarked could not be higher.

It was so that the Hellenic Trieres, even though endowed with a continuous deck, continued to fulfil their role of units of attack driven by body strength to ram with their rostra as they did in the time of Themistocles.

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Notes

1. We read in Thucydides (VIII, 20) that, in the winter 412, Tissaferne decided to halve the salaries of the crews reducing them from one drachma to three obols per day. After the protests of the crews an agreement was reached on the basis of which the three daily obols pro capite were inclusive of five more trieres, i.e. 55 trieres with 11,000 men instead of the 50 with 10,000 men actually constituting the fleet. Thus a man's salary of three obols was increased to 3.3 obols with a 10% increase on the amount initially offered by Tissaferne. The Persian decision to reduce the salaries of the crews to three obols per day had obviously considered that men on board were better paid than those ashore.

2. The covered launching area of the port of Zea, now submerged by the urban expansion, suggests that Hellenic trieres had a beam of about 6.5 metres. Accepting this value a pentekontor must have had one of about 5.5 metres.
THE ROLE OF THREE-DIMENSIONAL RESEARCH
IN THE KYRENIA SHIP RECONSTRUCTION

Through the medium of nautical archaeology, well-preserved shipwrecks often clarify what could only be surmised before. For instance, scholars long believed holkas to be broad, tubby, and comparatively small merchant vessels as illustrated by vase paintings and models.\(^1\) The discovery of the Kyrenia ship confirmed this, but additionally provided details such as principal dimensions, tonnage, the types of timber used for construction, and the graceful lines of the hull. It clarified vague construction details, too. Homer hinted at the methods of mortise-and-tenon joinery,\(^2\) but only a discovery like Kyrenia could be expected to provide so many precise details—joint spacing and size, the direction of tapered pegs, the wood types employed, tools used to cut mortises, etc. Without a doubt, the introduction of underwater archaeology has added an important dimension to the study of ships and seafaring.

But archaeology cannot supply all the answers either. Some materials are so fragile that they are destroyed by the most careful removal of overburden, some do not survive recording and conservation, and recording techniques still lack perfection. The greatest obstacle lies in the fact that no shipwreck is completely preserved—there are gaps where nothing survived, topsides and ends usually disappear completely, and distortion belies original hull shapes.

Another dimension can be added to the study of ship construction and handling that overrides some of these shortcomings of archaeology and archival studies. In my laboratory it is called three-dimensional research, a form of experimental archaeology utilizing models, mock-ups, replicas of individual hull components, fragment assemblies, or other physical devices designed to solve problems. Eighteen such devices were used to enhance research on the remains of the Kyrenia ship. They ranged in size from a working model of the mast step to a two-meter-long replica of the hull’s midship section; some were as simple as a single planking scarf, while others duplicated every joint, nail, and curvature in the original hull. The replica launched last June is the latest and most elaborate of these testing vehicles.

**The use of models and replicas**

Three-dimensional research can be a powerful tool when used to interpret the remains of sunken ships. Most of the devices used in Kyrenia research provided some new information, while a few others merely confirmed what was suspected before. One model was not worth the effort of building, but this too is part of research. The program as a whole was extremely successful, contributing new information which could not have been determined from any other source. Indeed, we could not have built the present sailing replica with such confidence and accuracy had it not been for the experimental models.

Three-dimensional research vehicles—let's call them models for the rest of this
presentation—have the potential of probing subject areas that graphic and archival research cannot satisfy. The nature of their construction is such that one is forced to duplicate the original builder's movements, thereby revealing techniques and processes. Their shape permits volume interpretation where only areas could be interpreted graphically. Their bulk and strength are increments of the prototype, permitting a better understanding of these characteristics. Their comparative strength sets limits for error, and their resistance to unnatural curvatures refutes blatantly false assumptions. Most importantly, these models must answer the laws of physics and geometry, and thereby their conclusions can be proved.

Like all other forms of investigation, however, the resultant value of research models is directly related to the faithfulness of reproduction and the extent of applied information. One could not expect to obtain reliable information from the Kyrenia replica had it been built from different materials or by different techniques than its prototype. But by using oak tenons and pegs, making at least some of the mortises by ancient procedures of drilling and chiseling, installing them with similar dimensions and spacings, and occasionally testing hull strength, it became obvious that these fastenings were much more than connectors for plank edges. Essentially they were little internal frames whose size and spacing were carefully regulated to add considerable strength and stiffness to the hull.

One cannot replicate an ancient ship, or even draw its hull lines, by directly reproducing what is seen on a shipwreck. That vessel has been distorted and flattened into the seabed, some of its members being bent or cracked to shapes and sizes which now contradict their original and true characteristics. First it is necessary to understand what to build, how to build it, and how to obtain the most information from it. That is a long and involved process which is now being prepared for publication; this paper discusses the more important processes briefly, and describes a few of the models used to implement them.

Interpretation of the Kyrenia ship began with the start of excavation. Cargo distribution and seabed hull dispersion are important in the study of hull construction. After a site plan of the vessel was produced, hull parameters could be determined and structural components identified. As soon as timbers were excavated and stored in fresh water, they were protographed individually and full size drawings were made of each of the fragments. Descriptive catalogs also were compiled. So far all the reconstruction work could be handled by graphic methods, but already details appeared which were not recorded previously, and construction techniques surfaced which we did not understand. The answers to many of these new mysteries could not be solved by literary or graphic investigation. It was at this early stage of the project that models were first employed as aids in the study of the hull. They were simple, crude models, but nevertheless they provided the answers we needed to proceed with our work.

One example of these early models was the one used to solve the riddle of the patch tenons. "Patch tenon" was the name we gave to those curious fastening devices which had one end exposed on the inner or outer surface of planking,
appearing as rectangular "patches" (fig. 1). In all cases these tenons were found in association with planking that was not as degraded as most of the hull planking, suggesting that they represented some sort of repair or replacement. But some authorities had assumed that replacing rotten strakes on classical hulls would have been difficult or impossible because of the method of edge-fastening employed in the construction. The only way to answer such a question with certainty was to duplicate what we saw and experiment. In this case a section of the port bow, consisting of a suspected replacement strake with 7 patch tenons and its adjacent strakes and frames, was reproduced exactly as found on the original hull. In relatively short time the purpose and method of installation of patch tenons was understood, as was the way in which ancient ship carpenters replaced rotten strakes.

I do not mean to infer that the basic function of the patch tenon could not have been interpreted graphically. Indeed, I was certain of its function before I built that little assembly of planks and frames. But the three-dimensional aspect of that experiment additionally suggested the reasons for the particular shape of the patch tenon. One has to actually drive these things, experience the resounding snap when they are correctly shaped and driven into place, and feel the rigid attachment they create in order to understand why they were so made. There were additional advantages in making these strakes and performing an actual repair, and herein lies the real benefit of three-dimensional research. Duplicating the work of the ancient shipwright automatically reveals unexpected problems and techniques which ancient builders experienced. Engineers call this phenomenon "spin-off", the accidental acquisition of knowledge beyond that intended for the project through the familiarity and confidence gained by frequent and concentrated experimentation. Probably no greater benefits have come to mankind than through the spin-offs of space research, but we experienced some interesting ones of our own on the Kyrenia project.

The patch tenon experiments contributed two additional revelations which were important to our understanding of ancient construction. The first came when the strange edge angles and shapes of the replacement strakes were considered; that revealed the nature and sequence of all the repair work done on the Kyrenia hull. This information has been published already and will not be included here. The second matter has been mentioned in previous papers and soon will be published in great detail, but it deserves some consideration at this conference. It became apparent in our models that after the rotten strakes and their adjoining tenons had been cut out of the hull, the replacement of the strake could follow the same procedure used in modern wooden hulls. The frames were already there; it was necessary only to nail the new strake to the frames as is still done in the eastern Mediterranean. But that was not the way it was done. Our ancient shipwright carefully and laboriously cut a series of replacement mortises and tenons at the same spacings as the original construction, shaped the new plank surfaces and edges to fit in all directions, and installed a very strong repair without
any frame support. Only after all this work was completed did he add the frame nails, an extra measure of security to be sure but not an actual necessity according to the strength of our model.

The use of these strong patch tenons illustrated the degree of importance our ancient shipwright placed on the mortise-and-tenon joints and how secondary he regarded the role of framework. No graphic or literary study could have made us appreciate this fact sufficiently, because it was the strength and functionality of the model alone which could provide such information. This, more than any other experiment, illustrated the differences between shell-first and frame-first construction.

Another of the more basic model types used in the Kyrenia project was the mould-and-batten model, an early method of determining hull shape. It would not be wise to attempt to reassemble wreck remains without first learning something about the vessel's design and construction. The original function of these models was to supply such information. But even after the hull fragments were reassembled there would still be questions about its design and construction. The Kyrenia shipwreck was exactly that—a wreck. Like so many other shipwrecks in the Mediterranean, it had lost its ends and topsides, had been smashed and flattened to the seabed by the weight of its cargo, was partially distorted by the disorderly release of its joints and fastenings, and had much of its strength and bulk destroyed by rot and teredo. Dimensional change automatically resulted when individual fragments were removed from their seabed environment and treated chemically. While the reassembly of such remains presents a good illustration of the original hull, it cannot possibly supply all the answers. The reassembly in Kyrenia castle provided most of the information used to construct Kyrenia II, but some of the details had to be acquired by the same models or types of models first used to determine hull design and construction techniques.

The final lines drawings of the Kyrenia ship were the result of a combination of information sources, most of which was confirmed by three-dimensional projections. Timber dimensions were taken in the waterlogged state. In the event that original dimensions had been altered on the seabed or during freshwater storage, a distinct and not infrequent possibility with waterlogged wood, additional dimensions were derived from impressions made by the contact of one member against another. Total distances along curved frame and plank members were checked against the sum of the individual fragment measurements which were joined to them. With Allepo pine hulls such as Kyrenia, curvatures tend to be reliable along surfaces where cracks and breaks do not exist but are suspect where cracks are present. Therefore, in addition to recording existing curvatures of frames and planks, curvatures between cracks and breaks were recorded individually and plotted as the geometric sum of a series of arcs. The plotted curvatures then were checked against those of contacting members, nail and joint spacings, and other supporting data. All of this information was combined and compiled directly on hardboard sheets which described the hull shape visually. The
hardboard moulds were marked with all sorts of information: planking seams, nail locations, important tool marks, etc. When enough of these moulds evolved, it was possible to project the hull lines by connecting them with thin wooden battens along their marks for plank seams, level lines, and buttock lines (fig. 2). This presented a far more accurate interpretation of the hull shape than that derived exclusively from existing hull shapes or from the reassembled hull remains. It had the additional advantage of requiring a careful study of every fragment surface, thereby assuring a thorough investigation of all areas of the hull.

In all there were five mold-and-batten models used to develop the final Kyrenia lines, and it took several years to arrive at what I considered to be the most accurate set of lines possible. This was because each new process in the reconstruction presented additional information which could be applied to a more complete or accurate set of architectural drawings. The layman might not have detected much difference between the first set of drawings and the final set (fig. 3), but indeed there were important differences to those interested in the finer details of ancient construction. Three of the models were mere assemblies of hardboard moulds and thin wooden battens; two others were rather complex with detailed fragment drawings on milar attached to posterboard skins. These mould-and-batten processes are no longer used in my laboratory reconstructions. The simpler procedures are done with computer graphics; those demanding more precision are accomplished on what is known as a fragment model (fig. 4).

An example of how modern and contemporary models can be combined to solve problems may be seen in the mast support studies. The excavated mast step and what were thought to be two partner beams were modeled in pine (fig. 5) after graphic studies did not supply the information I believed to be attainable. Only after extending these partner beams in the experiments did it become evident that they closely resembled the arrangement found in a Cypriote clay model (fig. 6). In fact, there were excavated parallels for some of the other timbers indicated in the mast support structure on that model. By rearranging our model to resemble the partner and stanchion arrangement in the clay model, all of which satisfied excavated evidence, it was possible to reconstruct the step and partner assembly shown in figure 7. It is exactly the reverse of that found in the clay model, whose mast would have reclined in a forward direction.

It is impractical to describe here the construction and function of all the other models used in reconstructing the Kyrenia hull, but one other deserves brief consideration. Some models have value only because they disprove faulty theories or illustrate what could not have been. Such was the role of the sailing model, a 3-meter-long glass reinforced plastic (GRP) vessel configured to evaluate excavated rigging artifacts, test hull characteristics, and perhaps learn something about ancient sailing techniques (fig. 8). Although not intended to fulfill the functions of a sophisticated tank model, it did reveal a lot of facts about the hydrodynamic properties of the hull; the replica has already confirmed some of these findings.
We also were able to observe some of the basic principles of sailing with brailing gear, the use of quarter rudders (steering oars) with this type of hull, and values for centers of effort and lateral resistance. But most of this information came in a negative way, revealing what should have been on the model rather than what we put there. The sail, which was higher than it was wide, was found to be much less efficient than one of lower aspect and greater breadth would have been. Obviously, those vase paintings showing low, wide sails are not mere stylizations. Its area of 700 square feet seemed about right, however, and early indications are that the replica will confirm this sail area.

The stem, whose vertical portion had disappeared on the wreck, was configured in rounded form. The mold models and the excavated evidence pointed to a short, upright stem but there were a few good arguments for a round stem which could not be ignored. One of the ways to help prove or disprove the stem configuration was to test the sailing and displacement characteristics of each shape. Hence the GRP model was given a round nose. The sailing tests indicated that this gave her poor lateral resistance, and suggested that our earlier drawings of a vertical stem were correct.

On the sailing model, a set of balanced quarter rudders were mounted in the quarter rudder position. They represented paired blades of the type we found on the Kyrenia wreck (fig. 9). But our tests revealed that this was too large a blade, resulting in oversteering or erratic handling. In short, our model (and subsequent tests) was telling us that it would have been better to use oars with single blades of the type we had found. This certainly satisfied the evidence better than double blades, and the resulting replica-type oar was reconstructed (fig. 10). There seems to be a contemporary parallel to such a blade in the black vase painting of a pirate vessel attacking a merchantman which, although the painting is not disciplined enough to use for interpreting details, certainly is suggestive of the way in which the Kyrenia ship may have met her fate.

The Kyrenia blade, which I believe was part of the starboard rudder at the time of sinking, was 7 cm thick at the top and tapered to a 3 cm thickness along its bottom edge; maximum width was 32 cm. Its reconstructed length of 1.7 m is based on the tapering blade thickness which survived, the arrangement of fastenings, and the hull depth and waterline which it had to satisfy. The loom had disappeared completely, although it impressed its dimensions on the blade before doing so. Copper strapping holding the upper end of the blade to the loom had been torn away as well, but the metallic residue remaining in the grooves left little doubt as to the thickness or identity of this material. The nosing, which must have been wood, was thought to be made from the same kind of Turkey oak as the tenons and false keel. The original blade was made of pine.

Loom length, tiller design, and attachment to the hull are completely hypothetical, being based on contemporary evidence and the structural patterns found elsewhere. On the model tests it was determined that steering was more efficient on a tack when using only the leeward rudder. Downwind steering could
be accomplished equally well with one or two oars. This assumption remains to be tested on the replica.

These were but a few of the many three-dimensional approaches to our study of the Kyrenia hull and rig. I do not mean to infer that models can replace graphic and archival studies in historical ship interpretations. Both are very important ingredients of reconstruction. But models can often make significant contributions where results cannot be acquired by other means.

There are weaknesses and shortcomings in these three-dimensional vehicles, though. One needs a certain degree of manual dexterity to design and produce them. They are rather time-consuming and, therefore, can become drains on project funding. For these reasons, our laboratory is experimenting with graphic computer methods of some phases of cataloging and reconstruction. But I predict that models will always have an important niche in the study of shipwrecks. The green screen of the computer and the similar surface of the drafting paper present only modern technological atmospheres. Nor do they possess the ability of wood to restrict and discipline the thoughts of the researcher. When one builds a faithfully executed model, even in scaled-down size, he is forced to duplicate the same processes, suffer the same problems, and feel the same strength and soundness in his wooden reproduction. There is no better way to crawl into the mind of the ancient shipwright.

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Notes

1. Two examples of holkas illustrations are the paintings on a 6th century B.C. Attic black-figure cup in the British Museum (see J. Morrison and R. Williams, Greek Oared Ships, 109, pl. 19), and the 6th century Cypriote clay model in the Cesnola collection of the Metropolitan Museum of Art in New York (see L. Casson, Ships and Seamanship in the Ancient World, ill. 94).


4. Steffy (supra n. 3), 95-99.

5. A number of drawings and models with rounded stems were produced as part of the research for reconstructing nonexistent bow areas. When overwhelming evidence favored a bow as on the replica, the rounded hull experiments were abandoned. Unfortunately, some of these earlier drawings and photographs inadvertently reached the public, resulting in a few paintings and models by others showing the Kyrenia ship with a round stem.

Fig. 1. Patch tenons on replacement planks and installation details (author).
Fig. 2. Two views of a simple mould—and—batten development model (author).

Fig. 3. The lines of the Kyrenia hull (author).
Fig. 4. A fragment type of development model (photo Cemal Pulak).
Fig. 7. The reconstructed mast supporting system as used on the replica (author).
Fig. 5. Mast and partner stanchion steps as excavated (author).

Fig. 6. Copy Cypriote clay model. (In the British Museum).
Fig. 9. The blade of the quarter rudder excavated near the stern of the vessel (author).

Fig. 10. The reconstructed rudder blade (author).
Fig. 8. The sailing model. (Susan Womer Katzev).
THE TORRE SGARATTA SHIP

The site was located by fishermen before World War II, and was excavated in 1967 and 1968 by a group from University of Pennsylvania Museum, under the direction of the Author and Dr. Attilio Stazio, then Superintendent of Antiquities for Taranto. Dr. John Ward Perkins, of the British School at Rome, was senior advisor.

The cargo of the ship consisted of 42 blocks of rough cut stone -18 sarcophagi and 23 blocks, six of which were of alabaster. The sarcophagi had marble sheeting stowed inside them. Most of this sheeting was broken, although one group was recovered intact, and the weigh of the cargo was estimated at 160 metric tons.

Surviving ship's wood include several fairly large sections of tenoned hull planking, frames, wales, a mooring bitt, a piece of the keel, and the mast step for the artemon. A wooden mallet of the sort perhaps used by masons was found in good condition.

Six coins were found, all bronze. The best preserved appears to be from Lesbos, a Roman Imperial of the emperor Commodus. This would date the wreck to the end of the second or beginning of the third century A.D.

A considerable amount of pottery was recovered, most of it badly worn and eroded. It consisted of bricks, assumed to be from the cooking fire; roof tiles of at least two distinct types, curved and ridged; large amphoras and storage vessels; cooking pots; and fine ware.

Of the large amphoras and storage vessels none are restorable, but they included some very large fragments. At least fourteen separate vessels with an inside coating of resin or some similar substance can be distinguished with certainty, and probably as many more with no inner coating. Most of this category were dark in color, many with a cream or pale slip on the outside. There were a few sherds of red clay, and one distinctive vessel which Dr. Fausto Zevi informs us he has also found at Ostia.

Of the fine ware there are fragments of plates, bowls, and Samian type ware, and grooved bowls. None of these appears to be of Italian origin, nor do the large vessels mentioned above, but there are enough characteristic rim profiles and preserved surfaces to make it possible to indentify their source. Preliminary work on the fine ware by Dr. William Phelps of the British School in Athens indicates that all the pottery comes from Asia Minor. One group of fragments is well identified as Chanderli Ware, from what is now the Izmir region of Modern Turkey.

A C-14 analysis of the wood, done at the University Museum's Applied Science Center for Archaeology, has given a Radiocarbon date of 79 plus or minus 44 B.C; using the half life value of 5370 years. This is a very reasonable date, considering that the sample came from planking; all the planking was cut from heartwood, which was at least one hundred years old when cut and put into the
ship.

The discovery of patches, on the planking, during the 1968 season, confirms the radio carbon dates indication that the ship was old when she sank. These patches were put on with iron nails, unlike all other below water parts of the hull, which was fastened throughout below the waterline with wooden trunnels and copper nails.

Samples of the wood used in various parts of the construction were sent to Mr. B. Francis Kukachka, of the United States Department of Agriculture Forest Products Laboratory in Madison Wisconsin. One of the most interesting identifications was the one made of the packing branches, which served to fill out uneven places in groined frames where they met the inside of the ships planking, and were undoubtedly part of the original construction of the ship. These were Tamarix, which M. Kukachka has seen used as dowels in small Egyptian artifacts.

The ship, judging from the size of the planking, was larger than any ancient seagoing ship found to date: the only comparison is with the planking of the Nemi barges, which was about one third larger.

Although the bow and stern had gone, as well as all the ships upper works above deck level, enough survived under the sand so that we will someday, hopefully be able to make a valid partial reconstruction of a large roman ship of a type that has not been previously studied.


The wood of the ship is at present stored in fresh water tanks at Castel San Angelo, in Taranto: The chemical preservative (Topane) that had been added seems to work well enough.

The tanks were last visited in 1984, and although tanks have gradually dried out, the wood appears to be slow drying well enough because of the high humidity of the vaults where it is stored.

Figure 15.

Planking averaged 72×220 mm and was *Pinus Sylvestris*. The construction seems to be in a similar tradition to the Nemi Ships. No complete planks were found, but it seems likely that runs of plank were long, well over five metres. The planks were morticed at 35 mm intervals with mortices that penetrated 83 mm. There was no evidence of caulking.

Tennons were live oak 11×120×167mm, attached with 11mm treenails of *Laurus (Nobilis)*. It was clearly evident that, as at Antikythera, (See *Transactions American Philosophical Society* Vol 55 Part 3 June 1965 "The Antikythera Ship") the plank to frame fastnings were in many cases driven through tennons, showing clearly that this was a shell first construction.

Plank to frame fastning was on 250 to 300 mm centers, using 20mm oak treenails. These had been made with a drawknife or plane, not turned.

Although we found copper nails, these seem only to have been used at butt
ends of very long planks, and in scarf joints.

The 20mm treenails correspond to 3/4 inch English measure, it is interesting that treenails in plank on frame vessels of similar size, from 1600 onward, seem to average 1 1/4-1 1/2 inch. This is an indication of the high sophistication of the Roman shell first shipwright. It is clear that he was depending on the strength of the tenning for a good part of the structural strength of the hull.

Framing was 153x80mm, or 3 1/2x6 inches and was live oak. This is very light when compared with 18th century frame first practice. A typical ship, the Lord Dartmouth, of 1774 with keel for tonnage of 76 feet breadth 27 feet, had lower futtocks of white oak sided 10 1/2 in the middle running to 9 inches in the upper end. (American Neptune Vol lv 1944 pp 207-212 given in W.A. Bakers Maritime History of Bath Maine 1973 pp 101ff).

Stringers or Ceiling was Pinus Sylvesteris and measured about 200 by 60 mm. It was only recovered in one small area across two frames (see drawing 6 above frame IAF). It appears to have been treenailed with oak treenails driven into frames from the inside.

The Keel: (fig. 7, DOQ 4, IAG)

Survived as an extremely fragile fragment of oak. The two suspected keel pieces were worm eaten and very fragile: They both measured about 450mm square. This compares well with Lord Dartmouths 13x15 Inch Keel.

The Mast Step (Fig 10, IAA.)

ELM. The largest piece of wood, measuring 220cmx40 cmx40 cm Approx. Notched at each end (to take frames??) with an approx 55 cm by 15 cm deep slot cut in its middle. Found at the extreme southern end of the excavation, not connected to any other timber. It does not appear to have been attached to other timbers, as treenails and fastning nail holes are not apparent. (Note that this piece has not been thoroughly studied, because of its weight and fragility, and the absence of lights and lifting equipment in the cellar where it is stored).

I have proposed elsewhere (See History of Seafaring, Ed. George Bass Thames and Hudson 1972, p. 72, fig. 11) that this massive piece is the step for the Artemon of a vessel similar to the well known Europa graffito from Pompei. If further study shows that there are indeed no fastnings, this would go far to prove that ships of this type had Artemon rigged so that the vertical angle of mast and sail could be changed at will by adjusting the backstay. We are now planning furthur research on this interesting possibility.

Whales: (Drawing 8 IAL and EIF)

No. IAF seems definitly a whale, as its average width is 280mm and its thickness averages 90mm, as opposed to the standard planking thickness of 72mm or a little under 3 inches. This compares well with Lord Dartmouth 3 inch bottom planking and 4 inches streaks below the whales (4 inches = 103 mm approx) IAL, although the same width as the rest of the planking, is definitely thicker.
CONCLUSIONS about the ship, so far:

It is obviously very difficult to compare a Roman shell first vessel with an 18th century frame first vessel, except in very general terms. However, taking into consideration the differences, some comparisons seem valid.

Lord Dartmouth was chosen to compare with the Torre Sgaratta ship because she is typical of her type, that is a moderate sized heavy displacement ocean carrier, and her scantlings are well described in the builders contract quoted. If the Torre Sgaratta ship is reconstructed along the lines of the Europa, her dimensions work out to something like 20 metres on the keel and 33 metres over all, that is 23 or 24 Metres on the water line. Lord Dartmouth’s tonnage measurement was according to the “old measurement”, which gives a measurement closer to the waterline length than that of the actual keel (See Fast Sailing ships by David R. McGregor Lymington 1973 p. 27 for a discussion on this).

While hull forms have changed in the past two thousand years, the mechanical properties of oak and pine and the holding power of treenails have not.

The comparative evidence of the scantling sizes when compared with “Modern” traditional practice as in Lord Dartmouth, seem to point then, to a vessel with a carrying capacity of around 180 tons, which fits in well with the 160 ton estimate of the cargo (Made by Robin Pearcy, a professional quantity surveyor). Reconstruction of the vessel along the lines of the Europa graffito is very tentative, but fits in with the above tonnage.

Construction of the vessel was highly sophisticated, in an old tradition (See comparisons in History of Seafaring quoted above) There was no evidence of caulking of any kind: Planing 20 foot planks of the dimensions used so accurately that the natural swelling of the pine made a tight seam, would be a daunting task for a highly skilled shipwright, today.

It seems likely that the vessel was old when she sank: She appears to have been partially refastned with copper sometime after the original construction (although this is not proven). It is certain however, that she was patched with tenoned patches of pinus sylvestris fastned on with iron nails, presumably in her old age. Traditionally this seems a practice common when an old ship is being “patched up” rather than rebuilt, as electrolytic reaction will cause a rapid disintegration of the iron in the presence of copper fastnings.

The possible influence of frame first techniques on scantling sizes.

The Torre Sgaratta ship, as we have seen, is very lightly framed compared with vessels of similar tonnage built in the tradition that had emerged at the end of the 18th Century, typified by Lord Dartmouth. There is a good engineering reason for this. (Personal communication with Parker Marean III, Naval Architect, of Wiscassett Me.USA)

Large frame first vessels which are conventionally planked, are traditionally caulked. Lining off planks so that they had a proper caulking seam with a slight
gap outside, but tight inside so that caulking could not be “driven through” was a craft specialty in 19th century shipyards everywhere. When the vessel was launched and “took up”, the planking swelled against itself with the help of the caulking forming a rigid structure. In short, the compression created by the pressure of plank on plank was an important factor in the strength of the hull.

This compression had to be supported from the inside: Thus the massive framing and thick fastnings of traditional frame first vessels to provide the tension reaction.

In the case of the Torre Sg aratta ship, lighter frames were appropriate, as the tension reaction produced by the swelling of the pine planking was taken up by the tennons and the dowells (Treenails) that held them.

This may well explain the longevity of the Torre Sg aratta ship and others of her type. A Frame first, conventionally planked and caulked vessel can only be kept watertight so long as she can hold her caulking. Once plank to frame fastnings loosen, she must be refastned: If framing is rotten, or so penetrated by fastnings that it will not hold the plank in place, it must be replaced. The finite ability of framing to hold fastnings rather than the longevity of materials limited the usefull life of vessels like Lord Dartmouth to 15 to 25 years.

Drawing 15 shows the fastning pattern of a typical part of the Torre S g aratta ship. Plank to frame treenails are shown as black dots. It will be seen that the pattern is irregular, although the appearance of treenails next to each other seems to indicate refastning with treenails, near other treenails: Additional evidence that the ship was old when she sank. the fastning pattern of a frame first vessel is very different. The first set of treenails would be driven at the top after and bottom forward part of the plank as it joined the frame. When refastned, a third treenail would be driven top forward: At the next refastning bottom aft. The final fastning would be driven in the last possible place that had strength to hold it, the middle. When that ceased to hold the vessel was worn out, and had to be condemned unless she could be reframed.

It appears then, that ancient shipwrights conceived of this kind of framing as being a supporting part of the whole rather than the main strength element. Additional evidence for this is what seems from the evidence to have been general practice in vessels of this kind: frames did not run to the keel and were often not attached to floors.

Boxing

The practice of installing a new layer of planking over an old one was called “Boxing” in the 18th century. It does not appear to have been very common, but was definitely used to rehabilitate some kinds of old vessels. Double planking is still used in high quality yacht construction, where synthetic compounds make a seal between the layers. However, in view of the nature of the frame first concept as described above, it is probably not very effective as a repair method unless done over a framing system which is still sound. In the case of a tennoned hull first, condition of the framing would not be nearly so critical. Both the Titan and the
Grand Congloue ships appear to have been “boxed” (see reconstructions of both keel sections by Ch. Legrand in ATTI 1961 p. 70.)

It seems likely that the additional layer of planking in both hulls is part of an extensive overhaul rather than original construction.

Could the patches in the Torre Sgaratta ship have been a preliminary step to “boxing” the whole hull?

Furthur possibilities for study:

Luckily, the timbers from the hull remain in good condition in the Castel San Angelo in Taranto. There is a great deal more to be learned from them. New evidence produced by the very competent study of the Lacydon ship (Le Navire Antique du Lacydon by J.M. Gassend, Musée d'Histoire de Marseilles), which was much better preserved, gives us a new approach to the Torre Sgaratta ship. Although the vessels are not the same size, they are probably from about the same date of construction, and exhibit similar techniques: The pattern of the inner stringers, for instance, seems to resemble what we see at Torre Sgaratta. The theories of the construction method of the Lacydon ship which resulted from a study of whether treenails were driven from outside or from inside are an exciting advance, and we should take a better look at the treenailing of Torre Sgaratta. The patterns may be similar: If so the work of Gassend et al., applied to Torre Sgaratta will take us another step towards understanding shipbuilding in antiquity.

In my professional work as a marine surveyor, I have inspected hundreds of wooden vessels, large and small, of many types, built of widely differing materials. It is a conspicuous fact that framing nearly always deteriorates before the outer planking of the hull, unless a hull’s bottom planking has suffered damage from worms, which only happens if the vessel is neglected.

It has been remarked by Richard Steffy and others, including the shipwrights who built the Kyrenia Ship Replica, that shell first, tenon construction is much more expensive in both labor and materials. However, if a well built shell first ship lasted a lot longer than a frame first ship, this comparison might be negated. An intensive study of refastning patterns in both ancient and modern traditional ships might solve the problem.

Acknowledgements

A full list of those who contributed to the project would take more space than the comments published here. However it seems appropriate, as this is being published in Greece, to mention the Greek organizations and individuals that helped us: Epirotiki Lines; The Nikos Kartelias Diving Center (Piraeus); Leonidopoulos and Sons (Piraeus); Photo by Peter Throckmorton; Drawings by Joseph Conroy, Diana Wood, Joan Throckmorton and Roger Wallihan (Surveyor).

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1. Sarcophagi and marble blocks in position.
2. "W" shows areas where wood was found.
4. Section through N. end of site, showing remnant of keel IAG.
5. Architect levelling.
6. Wood at N. End of site.
7. Wood at N.E. of site.
8. Wood in S.W. corner.
9. Treenail types: normal frame and (bent) tenon type.
10. S. end of site showing mast-step IAA.
12. Patch.

PATCH

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Planking from the Nemi ships, showing details of construction. (see G. Ucelli: Le Navi di Nemi, Roma 1980, fig.103)

Reconstruction of planking from the Torre Sgaratta wreck.

15. Reconstruction of planking from the torre sgarrata wreck.
"IKRIA" ON MINOAN SEALS

In spite of the fact that our information regarding the extent of the sea power of the Minoan civilization is quite clear (Thucydides 1.4), and the presentation of maritime life in its objects of art quite intense, the depictions of vessels on works of art of that era (ceramics, frescoes, stone-seals, etc.) are not as frequent as one would expect.

Such depictions as have been saved, in their greatest part, are objects of worship or symbols of a certain stereotyped form and not so much faithful depictions of the actual vessels which roamed the waters of the Aegean at the time when Minoan Crete prevailed there. Thus, the studies of the experts in such matters regarding these ancient vessels are restricted to the material we have, which originates from representations of vessels on engraved ringstones or seals, their depictions in clay, or the very few clay models which came into our hands.

This is very poor material for the researcher who attempts to re-create the vessels of that time and who has engaged himself with vessels, in one or the other manner, and one can comprehend how many technical obstacles arise at each step of his efforts.

Those who painted on jars and other receptacles, having to depict a vessel within the narrow limits of a vase or urn, did not hesitate to mutilate it so as to make it fit the surface they had at their disposal, indifferent of the fact they were deviating from the original or not. Engravers, having to engrave a complicated depiction of a certain vessel, full of details, preferred to simplify it to such a degree, that it became totally useless as an object of study. More specific subjects, composite, such as vessels, presented many difficulties to these artists, which could not satisfactorily be solved, the more so when they attempted to blend them into their perspective. Frequently, those who study these things attempt to trace details which are impossible to trace and be verified from the schematic works of the creators, who had to engrave, within the limited area of a ringstone or a seal, a complex object such as a vessel.

These limitations were not solely limitations of space or area, but also of shape. The engraver had to adapt the shape of the vessel to the cyclical or elliptical limits of the seal or ring-stone, with the result that, although his work was an artistic masterpiece, his model was deformed, to the extent that it became entirely
unsuitable for pure scientific study. Those artists were alike to the poet who attempts to create, within the pre-determined form of a sonnet. Another reason for inaccuracies in the depictions was the fact that ships are always an enigma, for landsmen and artists who are also seamen are very rare.

All these things as is only natural, have led to basic differences of opinion and have given rise to limitless and, frequently fruitless, discussions among all those who engage in the study of the ships of that era.

Our subject, however, today will not be entirely of Creto-Minoan vessels, as they are depicted on the seals which have reached our hands. This matter has been discussed and will surely be discussed further by many who are more specialised than us. We shall simply attempt to place only a part of them under scrutiny and, specifically, the superstructures which are shown on certain vessels depicted on seals of the Minoan period, in comparison with the vessels shown in the fresco of Thera, discovered during the 1972 excavations and later.

One of the many questions which arose from the study of certain Cretan seals was what had the artist wanted to depict by engraving a curious superstructure close to the one end of the vessel?

This superstructure is generally formed of three king posts, which seem to have something like netting spread between them, that culminates at the top in something like crescents. Certain others depict a flat roofing. The height of this superstructure usually reaches the height of the decorative part of the vessel's end or somewhat higher. (fig. 1).

The various scholars have at times expressed diverse opinions like that they might be a schematic depiction of masts and sails or spread fishing-nets, or deck cargo, or fishing tools etc. None one of them, however, has expressed himself dogmatically, and all declared their doubts regarding what these superstructures could be.

Specifically, S. Marinatos, in his now outdated article concerning the Creto-Minoan marine (1933) tendered the idea that the superstructures were rather a depiction of the ship's mast, with the sails unfurled, which the engraver, in his attempt to give it in perspective, presented in this manner; that is, in fact, the central kingpost, represents the actual mast and the two side posts the outline of the sail, whereas the crescents at the top represent the folds of the sail.

R.W. Hutchinson (1962) wrote: "Some Minoan seals depict ships with three masts jointed by a lattice pattern with crescents on top giving an impression that it is a deck awning formed of matting slung on poles, as shown on Early Dynastic and Late Pre-dynastic drawings in Egypt. Marinatos, however, interpreted these as masts and sails, and Sir John Myres in a letter to me suggested that while the lateral line might represent a mast, the outer vertical lines might be halyards depending on the yard arm. It might even be argued that these were sprit-sails. The sagging lines of the crescents seem also consistent with the suggestion of a tentlike deck cabin, but I must confess that such a cabin seems less appropriate for the Aegean Sea or the Libyan
Sea than for the river of Egypt.

Whatever the true explanation, it is clear that this ship with the three masts or poles is a type quite distinct from the ordinary cargo ship with the great square sail.\(^2\)

L. Casson (1971) also writes: "One particular series of seals all of about the same age—ca. 1400 B.C.—and make, show a type of vessel very much like the above with two key differences. First, the prow consistently ends in a pronged ornament; this is a traditional Cretan device, for it appears on ships of 1600 B.C. and earlier as well as on the schematized ship-symbol that appears as a writing sign in tablets of 1400 B.C. and later. The stern is never shown in full so that, although it is clearly rounded like the prow, we know nothing about its decoration. Secondly, these vessels, instead of a mast and square sail, have some apparatus which the artist represents by two, occasionally three, poles linked by cross-hatching. Sometimes there is no cross-hatching and the poles then seem to have whatever the cross hatching indicates wrapped about them and lashed into place. To interpret these ships as two and three-masted, as is so often done, cannot be right. Aside from the intrinsic unlikeliness of such rigs at this time—the rest of the evidence points to single masts only—other, unambiguous, seal-pictures show how the Cretan artist drew a mast and sail. Perhaps the enigmatic up-rights and what lies between them are a stylized representation of deck cargo; perhaps they are symbols of some sort, like the half moons that so often appear in connection with the up-rights.\(^3\)

J.H. Betts, (1973), examining these same seal-stones, remarks: "The superstructure on these vessels remains enigmatic. It often has three upright members and these have been regarded as masts, but ships with more than one mast are not otherwise known in Minoan representations. The pair of pendent tubular-drilled semicircles might be furled sails and the diagonal cross-hatching between the uprights, rigging. Or again, the central upright might be the mast and the two outer ones are edges of a full sail the semicircles would then be the top edges of the sail hanging in two loose folds from the yard-arm; but the yard-arm itself is never shown and the diagonal cross-hatching is different from the vertical/horizontal lines conventional for sails on the first type of talismanic ship representation. In any case, there are often more than two semi-circles between the uprights. In examples with only two uprights they are often much fatter and the semi-circles, instead of hanging between the uprights, either surmount them or seem to go round them. Here the bulging uprights are perhaps intended to be tied-up bundles of cargo. Full circles occasionally replace semi-circles, and some examples suggest that the superstructure may be some kind of deck-canopy. All these features tend to disintegrate and become even more confused, descending into an almost meaningless fantasy of straight and semi-circular cuts.\(^4\)

Finally L. Basch (1987) in "Le Musée Imaginaire de la Marine Antique", expresses the view that there is depicted a square sail open between two masts placed athwartships and not longitudinally and the engraver presented it in this way because he could not place them in their perspective. In support of this opinion he mentions many examples of sails of this type in ancient and modern
vessels considering this style of sail as an ancestor of the well known sprit sail of today.

And this so as to confine ourselves to the better known researchers.

A common characteristic of all the above scholars is that not one of them is completely satisfied with his theory, and all allow a measure of doubt to emerge from their writings. Thus the query remains.

Let us now turn our attention to another kind of depiction of vessels of the same era. This is the known fresco of Thera, which was uncovered at the Western as it is called, house, in the fifth room on the Southern wall.

This wall painting was a fertile field for research for all those engaged in the study of ancient ships. It threw a new light on many problems concerning them, but also raised certain new ones.

We are not, of course, going to deal today with all the details of the ships of Thera. Much has already been written and surely much more will be written in future, by specialists on this subject. We are going to deal with only one element of these vessels of the mural, and specifically the stern superstructure. (fig. 2).

On the seven large vessels of the mural appears a superstructure at the stern. It is composed of three kingposts and three horizontal bands, and it has been accepted that it is covered with hides of bulls. Between the central and upper bands this leathern covering culminates in concave surfaces. A man is sitting within this structure, and his head projects over its upper edge, consequently the structure is open on top.

This is reinforced by the fact that a helmet, made of boar’s teeth, is hung on the central post, which proves that it is of Achaean style. There is no doubt that this position is that of the captain of the vessel, as the steerman who follows his orders is right in front of him.

The height of this superstructure reaches, and frequently passes, the height of the sternpost, together with the figurehead of the stem. Marinatos named these superstructures "Ikria". Other scholars later, like Mr. Dumas and Miss Nanno Marinatos, called them "palaquines" or "litters".5

And here, please excuse us for one digression referring to the meaning of the term that Marinatos selected to apply to this stern structure. The term "icria" (ικρία) in the plural is an homeric word of a rather controversial meaning. In homeric dictionaries we find the meaning as "ship’s decks" (II:15. 676, Od: 3.353 5.252, 12.229, 15.283, 24.74), considering that the homeric ships had not a continuous deck but two small decks, one fore and one aft, and in the middle part were open. This last part was the "antlon" (ἄντλον). Other scholars consider as "icria" the sides or the side beams, assuming this from Od: 5.252, and some others the planks that cover the beams and therefore the ship’s floor.

In the Souidas Lexicon the meaning is: "standing poles or ship’s flooring". In Iliade (15.676) Ajax "with big jumps passes the “icria” of the ships" (ἀλλ’ ὁ γε νηῶν ἴκρι ἐπίχετο μακρὰ βισδάθον). In Ulisses’ wreck the ship’s mast "falls on the head
of the helmsman and he fell from 'icria' into the sea like a diver' (ὁ δ' ἄρνευτηρι ἔνυκως κατπελτ' ἀπ' ἴκριοφίν. 12.411-414).

The construction of "icria" is described by Homer when Ulisses prepares his crude boat. Circe advises him to fix in his boat "icria" such high that will bring him far away to the foggy sea: (ἀὔτ' ἴκρια πῆξαί ἐπ' ἀνήφ' ὑψοῦ, ἀὔτ' ζε φέρσαι ἐπ' ἴκριοφίνα πόντον Od. 5.163-164).

The "icria" is the space where Telemachus would slip if Nestor was not going to give him lodging space. (οὐ θὴν δὲ τοῦδ' ἀνδρός ὁ Ὀδυσσής φίλος νησὶς ἀπ' ἴκριοφίν καταλέγεται 3.333) and there Ulysses slept during his return voyage to Ithaca on the Phecean ship (νησὶς ἐπ' ἴκριοφίν γλαφυρῆς ἓνα νύγερτον εὐδοι πρώμης, 13.74-5). In Vakchilidis Theseus jumps into the sea in challenge of Minos from the well made "icria". (ἀλλ' ᾑπάκτων ἀπ' ἴκριων σταθεῖς ὁροῦσε - Vakchilidis XVI 82-4) Heliodorus in his Aethiopica mentions that: "Some hide in the ship's hull, while others raised the cry to do battle on icria" (τῶν μὲν εἰς τὰ κοίλα τῆς νεώς καταδομένων, τῶν δὲ προμαχεῖν ἐπὶ τῶν ἴκριων ἄλληλοις παρακελευσμένων. Aeth: V24.2).

It appears that the brails were handled in icria. "In icria made fast the brails around in fine bitts" (ἐπ' ἴκριοφίν δὲ κάλως ξέστησιν περόνης διακριδόν ἀμφίβαλόντες) mentions Appolonius Rhodius in his "Argonautica" (I 566-67).

"Icria" on the vessel's aft part are mentioned often in ancient writers, but in vessels depicted on geometric vases similar structures appear also in the fore part. The "icria" on the bow are mentioned only once in the homeric poems and specifically when Ulisses stands on them armed eagerly expecting for Scylla. (εἰς ἴκρια νησὶς ἐβαίνον πρώρης 12.229-30).

From all the above it becomes obvious that we have not the exact meaning of the term "icria" and the naming of this super structure by Marinatos by this term can be considered rather arbitrary. On this Mrs Show comments: "It should be made clear that nowhere does the term clearly imply 'cabins'".

And now back to our subject.

Let us compare these two depictions, that is those of the Cretan-Minoan seals, with those of the sterns of the vessels in the Thera mural. Their similarity is obvious. That is, we have three kingposts standing on the deck, which are jointed at their tops by inverted crescents.

In both depictions these crescents are double; moreover, the flat covering shown on some of the seals exists in the superstructures of the vessels of Thera. On certain of the seals we can observe some things like shrouds towards the stern, which seem to support the superstructure. Similar shrouds appear also in the biggest of the Thera ships, the one that Marinatos called "Pelias".

Furthermore, as Betts remarks, the artist who made the stone seals, in certain instances "marks off the edge of the illustration at the unfinished end of the vessel with a single vertical line or with two such lines" (fig. 3).

In the Thera mural we also find two vertical lines in the same position. Are these the kingposts of the tent which protected the passengers?
After this comparison it is, we believe, somewhat difficult to accept that the depictions of the Crete-Minoan stone seals could represent anything else but the “ikria” of the vessels of that time. In other words, we would say that the artist, in this manner, wished to depict the ‘brain’ of the vessel.

Something like the present day ship’s bridge, and symbolically, the captain himself. Thus can be explained the depiction of a series of ‘ikria’ in room four (bedroom) of the Western building, where the ‘icria’, as a motif, is repeated eight times. Marinatos originally christened this theme “banner”, but later identified it as the “cabin” at the stern of the ships depicted in the so-called miniature fresco.7

It is worthwhile here to mention that it has recently been reported that similar “icria” are represented in a fresco that dated approx between 1300-1200 B.C. which was discovered by Tsountas in the Mycenean palace one hundred years ago, in 1886. (fig. 4)

The similarity between the two pictures is obvious. But there are also certain differences. Specificaly one basic difference between the two pictures (Thera-Mycinae) is that while the side covers of the cabins of Thera are hollow on the top, those of Mycenai are straight-lined.

Another difference is that the uprights of the Thera fresco end up in a lotus flower, those of the Mycenean we do not know how they ended up given that the top of the fresco is destroyed. Also on this latter the uprights appear to be placed at the exterior of the cabin and can be seen as a whole, while those of the former are placed in the interior and only their tops appear above the cover. The difference, according to Mrs. Shaw, can be attributed to the different material that was probably used for their construction.8 Specifically in the Mycenean fresco it appears that straps of material were placed horizontally and covered from the horizontal planks of the skeleton, while in the Thera fresco in the cabins it is obvious that every side is made of ox hide, given that the decoration is continuous without interruption above and under the planks of the skeleton. Constructions similar to Mycenean shape can be observed also in certain cretan seals. (fig. 5)

Obviously here we have to deal with two different types of “icria” in vessels of that era.

From other information we know that a similar depiction is found in Thebes, but this is not yet published.

If we accept the above explanation, we can conclude that the section of ships shown on the Minoan seal, is the stern and not the prow, as certain scholars originally believed. This viewpoint is supported by the fact that the stern was always related to the captain and the control of the vessel. We see this in Mycenean vessels, the triremes of classical times, where the captain’s seat is located there; in medieval galleys, in Byzantine vessels, where we have the centarchu’s “kravvatos”, etc. It iw worth adding here an extract from Artemidorus Daldinos of the second century A.D. from his “Onirocritica”, where he mentions that in dreams: “a mast of a ship stands for the owner (kyrios), and a fugurehead (antiprosopon) for the proreus, while the stern ornament (cheniskos) stands for the
captain, the rigging the sailors, and the yard the toicharchos".9

Let us not forget also that, as generally accepted today that the town excavated by Marinatos at Thera had a special position within the Creto-Mycenaean sphere. Apparently its upper class lived on the richest cultural level. They were so rich that they were able to have their houses painted with frescoes of unparalleled beauty. Their way of life was governed by the norms of the Cretan culture, and it is most probable that they themselves were of Cretan origin... The West House at Akrotiri is probably the house of a captain or shipowner.10

After all this above, we can reach the conclusion that these seals, particularly, were something like present day captains’ seals, and were used to ratify documents or seal cargo samples, etc., or furthermore, as J.H. Betts states, concluding from other observations, "...the ships which occur in Minoan art almost all have some kind of symbolic, semi-religious or occult significance. The illustrations tend, especially in the late Minoan period, to be schematic and to over-emphasize certain features of the ship, perhaps those which had some special magico-religious significance".11

This superstructure, therefore, on the stern, apart from its practical importance, that is the command of the vessel, in Cretan-Minoan times seems to have been the symbol of the captain of the vessel, something like the present-day tiller or the ship’s steering wheel; something which made the person who could use it proud enough to use it as a decorative theme, even in his bedroom.

Captain A.I. Tzamtzis.
Akti Themistokleous 296
18539 Piraeus-Greece.

Notes

5. C.G. Doumas - Thera, Pompeii of the ancient Aegean, Thames and Hudson 1983 pg. 83.
    Dr Nanno Marinatos - Art and Religion in Thera, Athens 1984 pg 47.
I. "Ikria" on Minoan seals.
2. Aft part of Thera fresco vessel.


5. Cretan seals with Mycenean type “Ikria”.
4. Mycenean "Ikria".
"LA CONSTRUCTION NAVALE A PSARA AVANT LA FIN DU XVIIIe SIECLE D’APRES UN TEXTE DE NICODEMOS: UN EXEMPLE DE TYPE DE CONSTRUCTION ALTERNEE?"

Il peut paraître curieux comment une communication qui traite la construction navale à Psara avant le XVIIIe siècle, s’inscrit dans le contexte d’un Symposium sur la construction navale antique. J’espère vous démontrer, dans la suite, que ceci est justifié.

L’île de Psara, devenue tragiquement célèbre en 1824, se situe dans la partie orientale de la mer Égée. Les habitants de Psara ont évacué leur île peu après la chute de Constantinople. Malgré le manque de renseignements suffisants on sait que l’île a été périodiquement repeuplée par des peuplades venues de l’île d’Eubée et de la Thessalie. Ces nouveaux habitants se sont occupés de l’agriculture, de la pêche et du petit commerce maritime au moyen de leurs sacolèves. Les habitants de Psara n’étaient pas tellement réputés comme des savants constructeurs de bateaux mais, surtout, comme des calfsats très habiles.

Un texte du contre-amiral Nicodémos sur la construction navale à Psara avant la fin du XVIIIe siècle, nous révèle l’existence d’un mode de construction très ancien. La précision sur les faits, le vocabulaire technique très juste et l’économie dans la description, rendent ce texte très valable et démontrent la compétence de son auteur, vis-à-vis son sujet. Les principales phases de construction décrites dans ce texte, sont les suivantes:

"Une fois les dimensions du bateau définies d’après la décision du propriétaire sur la longueur de la quille, le maître-charpentier construisait et assemblait la quille, l’étrave et l’étambot."

L’auteur ici ne nous précise pas si le constructeur utilisait de gabarit pour tracer les contours de l’étrave et de l’étambot, comme ceci est très souvent fait aujourd’hui.

Le maître-charpentier fabriquait ensuite un gabarit à l’aide duquel il construisait les varangues de la partie médiane du bateau. On ne sait pas de quelle façon le maître-charpentier de cette époque dessinait son gabarit du maître-couple, mais il est très probable qu’il eut utilisé une méthode proche à celle qu’on observe aujourd’hui. Dans ce cas il aurait dessiné la moitié de la varangue du maître-couple (fig. 1), c’est-à-dire une coupe transversale de la moitié de la carène au niveau du maître-couple. Avec ce même gabarit il déterminait la forme des autres varangues de la partie médiane du bateau.
Il posait, alors, l'ensemble de la quille-étrave-étambot sur les chantiers et commençait la construction proprement dite (fig. 2).

Après avoir posé les varangues déjà fabriquées sur la quille, il fixait une lisse en bois depuis l'étrave jusqu'à l'étambot, sur les deux côtés du bateau (fig. 3). Ces lisses devaient s'adapter parfaitement sur les faces extérieures des varangues déjà en place. Le constructeur était alors guidé par ces lisses pour déterminer les formes des varangues des deux extrémités du bateau. Après avoir fabriqué et posé ces dernières, il plaçait encore deux couples de lisses superposées (fig. 4). Entre la première et la deuxième lisse il posait les demi-couples en les assemblant sur le côté avec les extrémités des varangues et en les ajustant ensuite (leur forme étant obtenue grâce au tube métallique placé entre ces deux lisses)2 fig. 4.

Entre la deuxième et la troisième lisse il posait les allonges de la même façon. Une fois toute la membrure en place, il balançait les couples de façon que la membrure soit symétrique.

L'auteur nous explique que ce mode de construction s'appelait «μνόγαβαρι», ce qu'on peut traduire par “construction à mono-gabarit”, du fait qu'on utilise un seul gabarit pour déterminer la forme de toutes les varangues de la partie médiane du bateau.

Lorsque la membrure était en place le maître-charpentier complétait la construction avec la pose du bordt.

Ce type de construction s'inscrit, évidemment, dans le contexte de la construction “sur squelette”. Tout au moins certaines phases de la construction présentent des caractéristiques du “shell-first”. Ces caractéristiques observées dans la conception du procédé utilisé encore aujourd'hui dans la construction traditionnelle en Grèce, occupent une place prédominante dans la construction navale à Psara avant la fin du XVIIIe siècle.

Dans cette construction le “mono-gabarit” détermine la forme d'une partie, plus limitée en hauteur, de la membrure, c'est-à-dire seulement les varangues qui occupent la partie médiane du bateau, alors qu'en construction traditionnelle actuelle en Grèce, l'ensemble de la membrure (varangue + demi-couple + allonge) de cette partie du bateau, est déterminé par ce gabarit. Dans ce type de construction le rôle des lisses est aussi plus important pour la détermination d'une plus grande partie de la membrure. De cette façon la forme de la membrure est surtout basée sur l'approximation et la capacité du maître-charpentier de tracer la forme de la carène à l'œil. Dans cette construction les lisses jouent beaucoup plus le rôle d'une partie d'un bordé provisoire qui détermine la forme de la membrure, que le font dans la construction traditionnelle actuelle. Mais les rapports entre ce type de construction et le “shell-first” s'arrêtent là, puisque ces lisses ont été placées et ont pris leurs courbure grâce à la pose préalable de la partie médiane de la membrure.

On découvre, donc, un système de construction où les caractéristiques d'une construction “sur squelette” et d'une autre en “shell-first” s'altèrent pendant le déroulement de ses premières phases.

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Nous sommes alors ici en présence, d'un mode de construction qui s'inscrit matériellement dans le type de construction "sur squelette", puisque la membrane est posée avant la pose du bordé, une membrane qui joue un rôle primordial dans la résistance de la coque. Mais ce mode de construction est également proche, dans sa conception, au "shell-first", puisque une grande partie de l'évolution de la coque est déterminée grâce au système des lisses et grâce à l'expérience et l'oeil du maître-charpentier que ce système suppose.

Au cours de cette communication nous avons avancé l'idée que le mode de construction décrit dans ce texte, se trouve dans la suite d'une très ancienne tradition. Nous ne sommes donc pas étonnés de découvrir qu'à quelques points près, le même mode de construction a été proposé par Richard Steffy dans son étude préliminaire sur l'épave de Serçe Liman. Mr. Steffy propose le procédé suivant comme le procédé probable employé à la construction de ce navire du XIe siècle:

Après avoir posé les varangues de la partie médiane du bateau, grâce à des lisses provisoires ou, comme il le pense, plutôt grâce à quelques virures du bordé posées préalablement et qui correspondent en réalité à des lisses fixes, le reste de la membrane était déterminé grâce à ces lisses ou à ces virures.

Si on tient compte des trois procédés de construction exposés ci-dessus, on peut facilement retracer l'évolution d'une technique navale commune depuis le XIe siècle jusqu'à nos jours. Au cours de ces mille ans, l'évolution s'est produite vers une construction de plus en plus dépendante de la membrane. Les quelques virures du bordé posées préalablement au cours des premières phases de la construction du type de "Serçe Liman", deviennent des lisses provisoires au type de construction appliquée à Psara avant la fin du XVIIe siècle. Cette évolution s'est continuée pendant les deux derniers siècles avec l'augmentation de la quantité de la membrane posée avant la fixation des lisses.

En conclusion on pourrait dire que le texte de Nicodémos affirme l'existence d'un mode de construction qui a, peut-être, été développé au cours de l'évolution de la technique du "shell-first" vers une construction basée essentiellement sur la membrane. Cette évolution a dû être très lente et des caractéristiques importantes du "shell-first" ont longtemps été conservées dans la construction navale en Méditerranée orientale, une région où ce type de construction a particulièrement été employé.

On peut aussi avancer l'idée que ce mode de construction aux caractéristiques d'une construction alternée, est en rapport étroit avec une série de types de bateaux dont les lignes d'eau des deux extrémités tendent d'être symétriques, dont leurs dimensions sont proches et plutôt petites ou moyennes et dont l'apparition est effectuée dans une région géographique limitée, la Méditerranée orientale.

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1. Contre-amiral Constantin Nicodemos. Il est né avant la fin du XVIIIe siècle. Figure importante de la Guerre pour l'Indépendance de 1821. Après l'indépendance il fût sénateur et ministre.

Le texte est le suivant:

«Étions anéanti que la vive...»

Les couples de la partie arrière du caïque sont définis et posés de la même façon.

Les couples des extrémités de la membrane sont composés de deux demi-couples symétriques, cloués sur l'étrave et l'étambot ou sur le genou et la marsouin, sur les plus grands caiques». 

Notes
Bibliographic


K. Νικόδημος, ὑπόμνημα τῆς νῆσου Ψαρῶν, Ὀλύμπια 1862, τόμ. 1ος.


Captions:

Fig. 1. Fabrication du mono-gabarit: Coupe transversale de la moitié de la carène au maître-couple. Procédé observé à Spétses en 1983.

Fig. 2. Assemblage quille-étrave-étambot.

Fig. 3. Pose de la première lisse.

Fig. 4. Pose de la deuxième et de la troisième lisse. Pose du tube en métal.

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FIGUREHEADS ON GREEK AND ROMAN SHIPS

The identifying symbols of ancient ships are features that have been somewhat neglected by students of maritime matters. From the fish standards of early Bronze Age Cycladic vessels to the beasthead terminations of prows of Moselle river boats of the Roman Empire such features intermittently appear throughout the ancient world. In this paper I should like to draw attention to a number of specific examples, the problems they raise, and the information that they provide about this minor but interesting aspect of ship construction in antiquity. Although I can offer only one example (in this case a bull) —on a first century lamp hanger from Pompeii— of its appearance in the position just below the bow of much later and better known figureheads at least a small number seem to have been intended as in the case of more recent vessels to identify the ship bearing it.

In a sense the animal head rams of archaic Greek ships like the famous kylix by Exekias in Munich and many others like it provide the first examples of a large coherent body of material employing a representational form at the prow of an ancient ship. Boars' heads are by far the commonest form that these rams take, no doubt because of the similarity in purpose to the slashing tusks of the real animal; one might nevertheless wonder whether we are not dealing with an artistic convention (at least in the case of the more realistic examples) than with a real piece of documentation: how many impacts would such a ram survive with its iconography intact? It is perhaps not accidental that its appearance is mostly limited to the second half of the sixth century and then only to Attic black figure and early red figure vases. I should mention one curious reappearance of the type much later on in the first century and early second century after Christ: from a monument thought to have been a temple in Rome to the emperor Claudius comes a fountain in the form of a boar's head ram that to my knowledge has never been properly studied or published while even later in the reigns of Trajan and Hadrian such rams appear on coins of Nikopolis, Augustus' new foundation near the site of his victory at Actium in north-western Greece. It might be suggested that the last two examples perhaps represent not main rams but proemboloi, the secondary upper rams that become increasingly common in the Hellenistic period. At first plain, these minor rams soon take on the form of different animal protomes like the lion's head on the Poplicola relief at Ostia or wolf's head on a funerary plaque in Rome. In a similar position but structurally useless as a ram as
it has no support is the crocodile prow ornament on the famous Praeneste bireme relief, generally taken as evidence of the ship's association with the fleet of Antony and Cleopatra at Actium. The Pobjlicola relief also presents a good example of another type of figure that may appear at the prow of a Roman warship, the head inside the roundel that terminates the stem post. The Athena head there finds parallels in the ship parts commemorating naval victories on triumphal arches at Orange and Poitiers — to which I shall return later — and its earliest comparrandum seems to be on a "three dimensional" head of Athena at the prow of a galley on a coin issued by Q. Lutatius Cerco in 109/8 B.C. A very late example, perhaps deliberately archaizing, may be found on a series of coins from Abydos dated to A.D. 193-236 where a similar head of Athena appears.

I should now like to turn to a number of literary references that clearly indicate the presence of what one might call denominative figureheads. The most striking of these passages appear in the Augustan poets Vergil, Propertius, and Ovid and have hardly been noticed by students of ancient ships. One of the earliest is Propertius’ poem commemorating the new Temple of Apollo on the Palatine; the poet recalls the great struggle at Actium and the ships of Octavian’s enemies:

"...as for the prows bearing figures threatening with Centauric stones
you will find them hollow beams and painted fears.”

In Book 10 of the Aeneid Vergil uses a similar reference in his description of an Etruscan fleet coming to the aid of Aeneas and his allies:

"...he moves the huge Centaur forward with oars;
that ship stands over the water and lofty
it threatens the waves with an immense stone.”

Other ships in the fleet bear the figures of a tiger, a Triton, an Apollo, and a Mt. Ida (perhaps a personification) with Phrygian lions by the ram. It also seems likely although the poet does not say so explicitly that the ships in the boat race in Book 5 also bear figureheads: they are the Centaur, the Scylla, and the Pristis or sea monster. Such monster prowed ships may have suggested to Ovid the image of the sea monster that attacks Perseus and Andromeda in Book 4 of the Metamorphoses:

"...swift as a diving, tossing, knife-sharp-nosed ship that cuts the waves driven by the sweat soaked arms of young men, the dragon sailed up.”

Commentaries on these passages by classicists have passed over their nautical significance and the standard texts on ancient ships have passed most of them over too. Several years ago, however, I published two clear illustrations of this type of prow ornament and suggested that they may represent Antony’s flagship at Actium. They are handle plates from large double nozzled lamps made in Egypt in Augustan times; found in the Fayoum they were sent to the British Museum in the late 19th century and preserve not only the usual type of plate (possibly made in Egypt rather than in Italy) but also a unique example of a local blue faience copy of an Italian type. In each case —the faience copy is much debased— there is
a centaur at the prow with a rock poised over its head. An even more remarkable
example is to be found on a relief of a naval battle in the Medina Coeli collection
in Spain, a relief that has received little attention although it has been available to
scholars since de Montfaucon's publication of it in the 18th century. At least six
galleys are involved in spirited conflict and one sinks before a ship with a centaur
at its prow. Unfortunately the creature's arms are missing but they appear to have
been holding up something, perhaps a rock. Both centaur and soldiers are out of
scale with the rest of the scene but that is of course often the case. Clinging to the
ram of the centaur prowed vessel is a survivor; that ram may have ended in an
animal's head as is the case with the ship above it which has in fact a ram's head.
There is a ram's head on the proemboles of the centaur prowed ship, which might
suggest another sort of protome on the main ram. It is unfortunate that so little is
known about this relief for if it is genuine (and no one appears to have questioned
its authenticity although there are certainly some odd things about it) it may well
be a representation of the battle of Actium.

The centaur prowed ships in Vergil and Propertius and on the British
Museum lamps thus appear to suggest a well known vessel of the early Augustan
age to which the Median Coeli relief may also refer. Another possibly Augustan
but more generic sort of figure head is to be found in a group of statues set up as a
trophy in the southern French town of St. Bertrand de Comminges, ancient
Lugdunum Convenarum. They were found about sixty years ago and although
they have been the subject of several studies, notably by Charles Picard, they have
never been properly published and indeed some scholars have dated them to the
Trajanic period. Picard argues that they were set up under Augustus to
commemorate his victory at Actium. The central statue of the group seems to be
made up of a Tritoness (first identified as a Siren) on the prow of a ship to which a
ram, probably of bronze, was attached separately. Crowning the Tritoness was an
eagle on a globe, which perhaps indicates that we are dealing with the iconography
of victory rather than with a realistic rendering of an actual ships as Tritons
frequently appear as metaphors for Octavian's naval triumphs in the propaganda
of the years just after Actium.

A monument mentioned earlier, the great triple arch at Orange, has usually
been dated to the Augustan or Tiberian periods although all commentators have
admitted anomalies in such an early dating like, for example, the arcuated lintels
on the side faces. Indeed Mingazzini in 1968 and Anderson in an unpublished
paper given at the annual meeting of the archaeological Institute of America in
Toronto in 1984 presented some interesting arguments for dating it to late
Antonine or even early Severan times, which incidentally would result in making
the trident rams depicted the latest known examples of the type. Of special
interest here are the figure heads that appear in place of the stem post on six bow
sections. Only two of these now survive in recognizable form and they show a
Triton and a sea monster. For the latter there is also a good parallel in a wall
painting from Pompey depicting two vessels in a ship shed of some sort —one
seems to be supported on stocks—where a similar monster headed prow is to be 
found; one recalls the Ovidian image as well as somewhat similar one in Valerius 
Flaccus’ Argonautika where Hercules saves a maiden chained to a cliff from a 
monster of the deep. To return to the date I must say that I do not feel 
comfortable bringing the arch and thus the trident ram down so late; although it 
has been usually said to appear no later than Neronian times there are in fact 
examples on the bronze coinage of Sidon dated to 82/3 A.C. and indeed as late as 
the coinage of Trajan from Nikopolis one appears although that may be 
archaizing and referring to the trophies Augustus set up in his great monument at 
Nikopolis. Similarly the curving stem posts with heads in the roundels that 
appear among the naval trophies on the arch do not appear elsewhere any later 
than the first century after Christ. Until students of Roman sculpture and 
aritectural ornament settle the question of date, however, I feel reluctant to cite 
the navalia as evidence for early imperial ship decoration although it does seem to 
me that they support the earlier date.

A group about which there is no chronological uncertainty appears on coins 
of Hadrian of the early second century. At least three types of Tritons and an 
Athena are shown at the prows of galleys, one of which is even under sail. Some 
of the former face right, some left; some have the arm bent back, some forward. A 
horn or conch shell is prominent in each case, however. I have my doubts about 
the stability of the tall thin Athena and indeed the inherently unstable position of 
a figure head at the prow of a vessel subject to the shocks of ramming probably 
explains their rarity.

My final examples are the latest (from the third century A.C.) and from 
merchant vessels, or at least from ships without rams. A remarkable sarchophagus 
now in the Belvedere Court of the Vatican Museum depicts a harbour scene with 
various vessels, among them one with a Triton at its prow and another, 
tantalizingly borken, with what looks like the drapery of a Victory. Examination 
of the 17th century Dal Pozzo Albani drawings of this piece when it was in better 
condition, however, reveals that what we probably have here is the trailing edge of 
a sail being furled but about the Triton there is no doubt. Whether the ships can be 
treated as documentary representations depends in part on the interpretation of 
the scene for some scholars have argued that it depicts an actual port (perhaps that 
of Rome) while others regard it a mythical land of the afterlife with souls sailing to 
it. Whatever its purpose it does represent one of the last images of a ship’s 
figurehead in antiquity and more than a millenium was to go by before they 
appeared again.

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Notes

1. For the best discussion but one still with numerous omissions see L. Casson, *Ships and Seamen*ship in the Ancient World* (Princeton 1971) 344-348; he notes that the term *antiprosopon* may have been used for figureheads.


5. M. Oikonomidhou, ‘*H νωοματωκοπία τῆς Νικοπόλεως* (´Αθηνα 1975) pl. 14, no. 42-43 (Trajan); pl. 14-15, no. 3-6 (Hadrian).

6. For Poplicola see Casson, pl. 125.

7. For a convenient illustration see Casson, pl. 130, 132.


9. Propertius, 4.6 11.


11. For example, Casson omits them.

12. See note 2 above.


15. The basic study of the arch remains that of R. Amy et al., "L'arc d'Orange", *Gallia* Suppl. 15 (1962).

16. Amy, pl. 55.

17. For Trajan see Oikonomidhou (note 5), pl. 14 no. 38-41; for Sidon see Ben-Eli (note 8), p. 64, no. 53.
