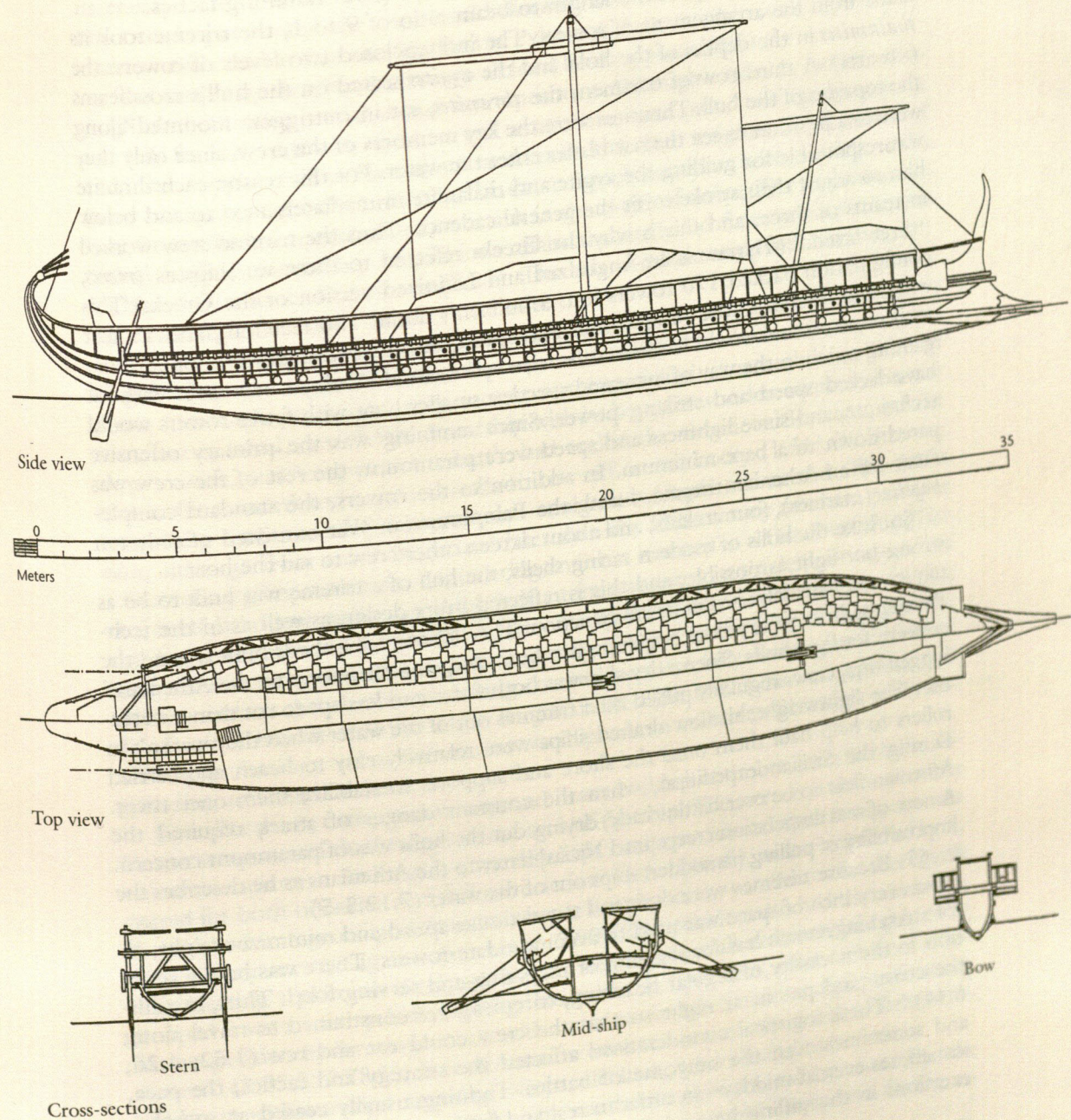# APPENDIX G
Trireme Warfare in Thucydides

§1. Ships, sea battles, and naval policy are key features in Thucydides' account of the Peloponnesian War. Thucydides—who served as a general and commanded a squadron of *triremes* himself (4.104.4–5; 4.106.3)—clearly viewed naval power as the key to supremacy in the Aegean (1.15); Athens' rise to empire and fall from glory was inextricably bound up with her fortunes at sea.

§2. The opening years of the Peloponnesian War saw the Athenian navy at the height of its glory: her ships were the fastest and most efficient afloat, and her oarsmen were superior in executing the complicated maneuvers by which sea battles were fought and won. But by the end of the war, the Athenian navy had collapsed: her generals had been outsmarted, her men were exhausted or dead, her ships were outmoded and defeated more than once by new tactics of naval warfare. Thucydides had a dramatic story to tell.

§3. He told it in snapshots—a moment of battle, an orator's defense of a certain naval policy, the snippet of a commander's exhortation to his men—and wrote for an audience intimately familiar with the ships, men, and often the localities and the battles themselves. These factors sometimes make it difficult for us to understand the details of what he is describing, though the general outlines are clear.

§4. The building of specialized warships already had a long history by Thucydides' day, and both warship design and naval fighting tactics had evolved substantially over the centuries. In earliest times, when fleets were used primarily for transport and the battle itself took place on land, warships were built to quickly carry as many men as possible to battle. Eventually confrontations took place at sea, but at first these earliest naval skirmishes hardly differed from the kind of fighting done on land: ships served simply as vehicles to get soldiers within close range of their enemy. Archers, javelin throwers, and hand-to-hand combat decided the outcome of battle. Gradually the ships themselves began to be used as weapons, and speed, maneuverability, and hull strength superseded the importance of transport capacity in warship design. By the time of the Peloponnesian War, naval strategy centered on the offensive capabilities of the trireme, a warship

Side view

Meters

Top view

Cross-sections
Stern
Mid-ship
Bow

APPENDIX G ILLUSTRATION
DIAGRAM OF THE MODERN TRIREME OLYMPIAS

whose main weapon was the ram mounted upon her prow. Success at sea depended on a strong crew of rowers skilled in carrying out ramming tactics.

§5. Long and sleek, with a length-to-beam ratio of 9 to 1, the trireme took its name from the arrangement of rowers. The hull enclosed two levels of rowers: the *thalamites* in the depths of the hold and the *zygites* seated on the hull's crossbeams (thwarts). A third row of oarsmen, the *thranites,* sat in outriggers mounted along the topsides of the hull. Thranites were the key members of the crew, since only they were in a position to see the oar blades enter the water. For this reason each thranite was responsible for guiding the zygite and thalamite immediately next to and below him to adjust their stroke to fit the general cadence. Thus the trireme crew worked in teams of three, and this is why the Greeks referred to these warships as *trieres,* "three-fitted." (*Trireme* is an Anglicized and Latinized version of the Greek.) This configuration packed 170 rowers into a hull only about 120 feet long and 15 feet wide, and optimized the balance of power, speed, and maneuverability: a longer boat with more rowers would have been heavier and more difficult to maneuver without gaining much in the way of increased speed; a smaller boat with fewer rowers would have lacked speed and striking power. Since ramming was the primary offensive technique, and since lightness and speed were paramount, the rest of the crew was pared down to a bare minimum. In addition to the rowers, the standard complement for an Athenian trireme during the Peloponnesian War consisted of only ten *hoplites* (marines), four archers, and about sixteen other crew to sail the boat.

§6. Like the hulls of modern racing shells, the hull of a trireme was built to be as strong but light as possible, and this is reflected in its design as well as in the techniques and materials used in its construction. The elaborate shipsheds built around the Piraeus harbors to dry-dock warships also bear eloquent testimony to the Athenians' concern for light hulls. Since a dry ship was both faster and less apt to rot than a waterlogged one, crews regularly pulled their triremes out of the water when they weren't in use. The lightweight, shallow-drafted ships were relatively easy to beach and carried rollers to help haul them onto the shore and supports to stabilize them once there. During the Sicilian expedition, when the constant danger of attack required the Athenian fleet to be ever battle-ready, drying out the hulls was of paramount concern. A note of real desperation creeps into Nicias' letter to the Athenians as he describes the impossibility of pulling his sodden ships out of the water (7.12.3–5).

§7. Because triremes were designed to maximize speed and minimize weight, almost every inch of space was used to accommodate rowers. There was hardly room for stretching, much less for sleeping or preparing and serving food. Thus, in addition to the necessity of regular beaching, triremes were constrained to travel along the coast (and put in at night so that the crew could eat and rest (1.52; 4.26; 6.44).[7a] These logistical considerations affected the strategy and tactics, the pace, and sometimes even the outcome of battles. Fighting usually ceased at sunset—sometimes even at midday—in order to rest and feed crews quickly fatigued by their exertions in the stifling heat of cramped, closely packed quarters baked under the Mediterranean sun. In fact, several "naval" battles were won by one fleet surprising its enemy's crews ashore while they were on dinner break (7.40). Beaches where boats could put in and the crew could disembark for eating and sleeping were so vital to naval combat that the Spartans at Pylos could plan to drive away the Athenian fleet simply by denying it access to all local landing places (4.8).

§8. A shore camp was also vital as a repository. Although a trireme carried masts and sails for long-distance travel, as well as anchors, spare oars, cooking equipment and other supplies, when the ship entered combat all dead weight was left ashore or in an emergency jettisoned. Finally, the shore station served as both a refuge and a base from which to organize a new attack in the event of defeat. For these reasons, "naval battles" were often amphibious affairs that included fiercely fought battles on land for control of the shore (7.24). The loss of a base camp was a serious setback even for a fleet undefeated on the water.

§9. The trireme's light and slender hull can be likened to the shaft of an arrow; its point, the warship's offensive weapon, was the bronze-clad ram mounted on its prow. One such prow—the only ancient ram ever found—has been excavated off the coast of Israel, near Athlit. A warship with its buoyant wooden construction was slow to sink, and long after the battle had ended the victorious fleet scoured the waters for flooded and capsized hulls to tow off as war booty (1.54). At the very least, long timbers and the bronze ram could be salvaged and reused. The Athlit ram, although from a ship larger and later than the fifth-century triremes, provides a fascinating glimpse into the engineering and cost invested in a Greek warship. The ram itself, a hollow casing weighing half a ton, was cast in a single pouring—a feat that impresses even modern bronzesmiths. Its tip flared into fins rather than coming to a point in order to prevent it from getting wedged in the hull of its opponent, and the timbers that the bronze casing covered were carefully designed to distribute the shock of impact over the entire length of the light hull. Like our sophisticated military technology today, the ancient warship was an example of contemporary engineering at its highest level.

§10. The prow, then, with its ram and heavy buildup of timbers, was both the offensive weapon and the best protected area of the ship. The stern and sides were her vulnerable quarters. As long as a warship kept her prow toward the enemy, she was poised for both offensive and defensive action. Consequently, in the vicinity of land, the most advantageous position was a battle line drawn up parallel to the shore with prows facing seaward against the enemy (2.90). This position also had the advantage of protecting a place on the beach for the fleet to store all nonessential equipment stripped from a warship before going into battle. In open seas, a fleet achieved a defensive position by forming a circle with sterns toward the center and prows bristling outward (2.83.5; 3.78.1). A confrontation between two evenly matched fleets usually began with warships ranged in two parallel lines, prows facing one another.

§11. Only a commander with fast ships and skilled rowers could successfully take aggressive action. A commander less sure of his forces would simply wait for the at-

---

G7a It was this constraint that made the nonstop voyage of the second trireme to Mytilene so remarkable that Thucydides felt the need to explain how the crew did it (3.49).

tack, hoping to escape by means of evasive action. If the attacker faltered within close range, marine hoplites threw grappling irons to secure the enemy ship alongside and close-range fighting commenced between the crews of the two ships. The skilled Athenians, however, had a reputation for aggressiveness and were particularly proficient at executing two standard attack maneuvers. In the *periplous* ("sailing around") the faster Athenian ships outflanked the enemy, turned quickly, and struck from behind. Alternately, in the *diekplous* ("sailing through"), the Athenian ships broke through gaps between the enemy ships and then either immediately rammed their sides or turned quickly and battered their sterns. Ramming itself required great skill, for the enemy hull had to be hit with enough force to cause significant damage but not so much as to entangle the attacking ship in the splintered hull, preventing its crew from backing their ship away to safety. The triremes of all navies were theoretically capable of these maneuvers, but at the outset of the Peloponnesian War it seems that only Athenian crews had the expertise and discipline necessary to execute such tactics effectively.

§12. Swift confusion could descend upon even well-trained rowers once an engagement commenced and more than once turned the tide of battle (2.91, 3.77). Therefore, skilled and experienced crews were a prime commodity and rival navies competed fiercely for personnel. Rowers were generally free men hired on at decent wages; slaves were employed only in unusual circumstances (1.55; 8.15). Thucydides tells us that Athenian (6.31) and Corinthian (1.31) *trierarchs* (trireme commanders) offered substantial bonuses in an effort to lure well-trained crews, and that desertion from one navy to another was frequent (7.13). In an effort to keep her crews intact, the Athenian custom was to pay half in advance and the remainder upon completion of the voyage (8.45). The going rate in Athens was one *drachma* per day—the standard workman's wage—to row in the lower two levels of a trireme (the thalamite and zygite positions). Thranites received an additional bonus. At these rates (along with the wages of the rest of the crew), it cost about one *talent* per month to operate each trireme (for *drachma* and *talent,* see Appendix J). One major advantage of Athens' imperial income was that it allowed her to maintain fleets at sea every year and thereby bring her crews to a decisively superior level of skill in relation to those of her opponents.

§13. Their navy was an evocative symbol of the power and discipline of the democratic state for all ranks of Athenians. Even members of the upper class actively participated in the maintenance and operation of her fleet. Wealthy and powerful individuals were assigned one-year commissions as commanders (*trierarchs*) of triremes. Their appointment served as a form of tax, for while the state provided an empty ship and the crew's wages, the trierarch was responsible for outfitting and maintaining the vessel with funds from his own pocket. Their financial investment gave the upper class a powerful voice in setting naval policy, and many decisions made by Athenian commanders had at least as much to do with domestic politics as with field strategies.

§14. Of course, Thucydides, an Athenian, wrote a history of Athens, and his story is clearest in its portrayal of Athenian policy. Yet many other states—Corinth, Syracuse, and Corcyra, among others—had powerful navies and, like Athens, their ship-of-the-line was the trireme. All triremes were basically alike in design, so that the crew of an Athenian trireme could comfortably operate a Peloponnesian or a Phoenician trireme, and vice versa. But certainly the number of warships and skilled rowers a state could muster varied greatly. At least in the early decades of the war, few could directly challenge the fleets and experienced crews of the Athenians. Thucydides' battle descriptions give us an indication of the tactics developed by Athens' enemies to counteract her superior might at sea. For example, since the classic Athenian naval maneuvers required plenty of sea room (2.89), one straightforward measure taken by her enemies was to avoid engaging in battle on the open seas. Whenever possible, they took advantage of topography and challenged the Athenian fleet in confined waters such as the harbors of Pylos and Syracuse, where it was impossible to execute the periplous or diekplous. Confinement not only prevented the Athenians from employing their prowess at rowing but also increased the ever-present danger of ships running afoul of one another. Once fleets were locked in a standstill, fighting was reduced to hand-to-hand combat and tactics and weapons differed little from those used on land (1.48). The Corinthians (7.34) and the Syracusans (7.36) carried this strategy one step further and rebuilt their navy to suit the new demands of warfare based on strong hulls and brute force. Thucydides' description is too brief for us to understand the exact nature of the alterations, but it is clear that they redesigned their prows so that the force of collision would be aimed against the Athenians' unprotected outriggers. Rowers rather than hulls were damaged, but the effect was the same: with their wings clipped, the Athenian triremes became sitting ducks and were easily overcome by the heavily manned ships of their enemies. Over the course of the war, tactics developed to counteract Athenian rowing prowess became standard battle strategy. For navies relying on such strategies, hull strength and capacity to carry marines became more important than speed and maneuverability, and the design and operation of the classic Athenian trireme was eventually superseded by the demands of new kinds of warfare.

§15. Athens ruled the sea during the period when she alone, due to her imperial income system, could finance the training, manning, and sustained operation of large numbers of triremes capable of executing sophisticated maneuvers. Thucydides eloquently described this heyday of Athenian naval might. But as the war dragged on, Athens' opponents developed new strategies and modified their ships to gain a major victory in Sicily, and then obtained financial support from Persia with which to challenge Athenian supremacy in the Aegean, and ultimately to destroy it. Almost a century would pass before the final eclipse of the trireme, but Thucydides' account heralds the beginning of the end.

Nicolle Hirschfeld
Department of Classics
University of Texas at Austin

APPENDIX S

Trireme Warfare in Herodotus

§1. Herodotus describes a vigorous era in the history of the maritime traffic and warfare in the Mediterranean. Greek[a] and Phoenician colonies anchored far-flung trading networks north to the Black Sea and west along the African and European coasts to Spain and even beyond the Straits of Gibraltar.[b] Sea lanes had to be policed, colonies protected, parochial navies developed and increased. Furthermore, naval strength, always a prerogative of coastal and island states, became an important factor in the expanding domains of inland powers such as Sparta[c] and Persia. The jostling of all these escalating commercial and political interests in the seas of the Mediterranean fostered developments in ship design, construction, and handling.

§2. Herodotus is one of our primary sources for these developments. But he assumes a firsthand familiarity with seagoing ships of the Greeks and Persians, and so his abbreviated references do not provide us with the complete manual of ancient seafaring in the archaic Aegean[a] that we would have liked. It is not easy to complete the picture. There are images of ships, primarily on Attic pottery, but they are difficult to interpret. Underwater explorations have yielded only cargo ships; ancient warships have left few traces. Men jumped off sinking ships, and without the weight of human ballast, the empty wooden hulls floated just below the surface and were often salvaged before they sank completely. Those hulls that did sink to the seafloor had no cargo to protect them from marine predators and deterioration, and so there is now little or nothing left for underwater archaeologists to discover. Especially conspicuous is the lack of Phoenician testimony; we know of the ships and maritime achievements of these most excellent seafarers and sea fighters mostly through secondhand, often hostile accounts. Thus Herodotus' story remains the essential account of archaic maritime history.

Warships

§3. He recounts the age of the development of the *triereis* (anglicized as "trireme"), the oared vessel that would become the premier warship of the classical world. In the centuries between Homer and Thucydides, warships evolved from transports that carried warriors to the battlegrounds where they disembarked and fought on land, to fighting machines designed to ram and sink opponents on the seas. During the long transitional period before triremes achieved their classical form and purpose (and even then), many navies relied on a third option: using ships to carry troops on deck for launching missiles at the enemy and engaging in pirate-style boarding at sea. Whether the battle plan depended on boarding or ramming, successful maneuvers against the enemy depended on the rowers (sailing and wind being too variable to be counted on in battle), and thus developments in warship design focused on increasing the number of oars, and thereby power, without sacrificing efficiency. There came a point beyond which it was not feasible to lengthen wooden hulls for the purpose of adding rowers—the increased length made the hulls either fragile or too cumbersome—and the most significant change in warship design thereafter, in the centuries preceding the Persian War, was the incorporation of a second and eventually a third level of oarsmen. There is no unambiguous evidence for where and when these advances were made or how quickly they spread. Scholarly debate on these topics is lively.

§4. Herodotus' narrative portrays a general adoption of triremes over the course of the sixth century, but the specific dynamics of that shift are difficult to define, partly because Herodotus so often uses vague vocabulary. The term that he uses most frequently in his catalogs of fleets and descriptions of naval maneuvers is *neus* (the Ionic form of *naus*, whence "nautical" and "naval"), a word that simply means ship. Context is the indication that *neus* means a warship (rather than a merchant ship),[a] and sometimes it is clear that Herodotus is referring specifically to triremes. But there are many instances when the reference cannot be defined. His narrative does indicate that the changeover was gradual, for the fleets of the early fifth century are still an amalgam of older and new-model warships. The old-fashioned vessels were triaconters (thirty-oared) and penteconters (fifty-oared, with either one or two levels of rowers). Triaconters are listed in the catalog of Xerxes' fleet (7.97), and a triaconter served as messenger ship to the Greek navy stationed at Artemision (8.21.1).[b] Penteconters were still substantial elements of the navies mustered in 480.

§5. Probably during the tyranny of Polykrates of Samos[a] (533–522), and certainly by the time of the Ionian Revolt (499), the trireme had become the cutting edge of naval power. The trireme is thought to have taken its name from the arrangement of

S.1a Greece (Hellas): Map S, AX.
S.1b Europe, Phoenicia, Euxine (Black) Sea, Africa (Libya), Spain (Iberia), Straits of Gibraltar (Pillars of Herakles): Map S, locator.
S.1c Sparta: Map S, BX.
S.2a Aegean Sea: Map S.
S.4a Herodotus occasionally modifies *neus* with *makre* ("long") to specify a warship; a *neus strongule* ("round") means specifically a cargo ship. The term *ploia* usually signifies vessels other than warships.
S.4b Artemision: Map S, AX. Triaconters in the Persian fleet, 7.97; among Gelon's ships, 7.163.1; among the Greeks at Artemision, 8.12; at Salamis, 8.48.
S.5a Samos: Map S, BY.

rowers. In its classical form, the hull enclosed two levels of rowers, and a third row of oarsmen sat in outriggers mounted along the topsides of the hull. Only the topmost rowers were in a position to see the oar blades enter the water, and each rower in the upper bank was responsible for guiding the two rowers below him to adjust their stroke to fit the general cadence. Thus the trireme crew worked in teams of three, and this is why the Greeks referred to these warships as *triereis*, "three-fitted." This configuration packed 170 rowers into a hull about 120 feet long and 15 feet wide, and optimized the balance of power, speed, and maneuverability: a longer boat with more rowers would have been heavier and more difficult to maneuver without gaining much in the way of increased speed, while a smaller boat with fewer rowers would have lacked sufficient speed and striking power. During the classical period, since ramming was the primary offensive technique, and since lightness and speed were paramount, the rest of the crew was pared down to a bare minimum. In addition to the rowers, the standard complement for an Athenian trireme during the Peloponnesian War consisted of only ten marines, four archers, and about sixteen other crew to sail the boat.[b]

§6. At what point the trireme attained its classical specifications is a matter of debate. There is likely to have been significant variability among the earliest models. Certain fleets of archaic triremes had a reputation for better performance. Herodotus praises especially the ships of the Sidonians among the Phoenicians, and the Samians, Athenians, and Aeginetans[a] among the Greek fleets. But he does not specify whether this is a matter of construction, crew, or condition; his stock praise is simply that the ships "moved best in the water." If this was a matter of design, the differences cannot have been conspicuous, since there are several incidents of confusion between enemy and friendly ships in the *Histories* (for example, 7.194.1, 8.87.4). Herodotus does mention that Phoenician triremes could be distinguished by the figureheads on their prows[b] (3.37.2), and at least some ships carried individual insignia (8.88.2, 8.92.2), but in general and at least externally all triremes must have looked essentially alike.[c]

§7. The number of marines on the decks of these early fleets of triremes did vary,[a] and scholars debate whether these differences in the number of fighting men are indicative of substantive differences in ship design and/or battle tactics. Essentially the question is whether marines played a primary or auxiliary role in offensive tactics. Or, put another way, at what point did ramming strategies supersede the old-fashioned conception of warships as troop carriers? How one understands Herodotus is the linchpin to this debate. Can Herodotus' descriptions of certain ships/fleets as "better at sailing" or "heavier" (8.60.α) be understood in terms of number of marines on board and/or modified designs? How many marines would necessitate modifications to ship design (added deck space, for example)? Does a report by Herodotus of an increased number of marines indicate a fleet built for
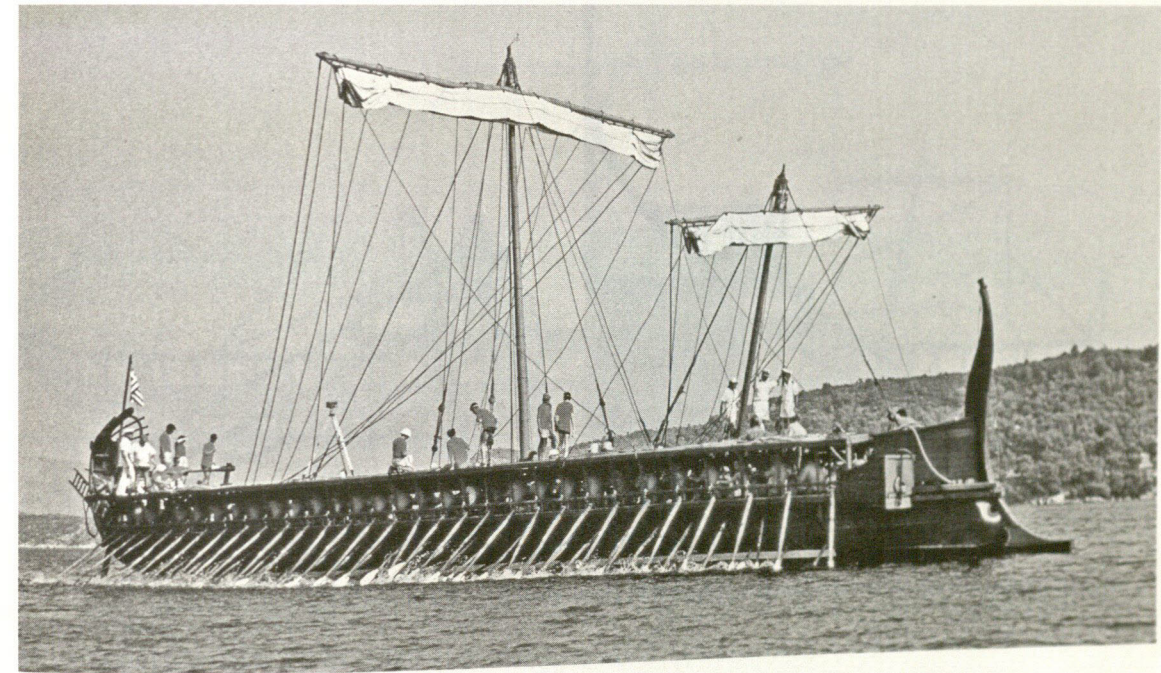

FIGURE S.1. THE MODERN TRIREME *OLYMPIAS*, BEING ROWED BY STUDENTS.

boarding tactics, or does a small number of marines suggest a battle strategy reliant on ramming?

§8. One indirect indication of an increased emphasis on ship handling might be the existence of facilities for hull maintenance. Hull speed would have become a vital factor with the advent of ramming tactics. Thucydides records that the naval commanders of the Peloponnesian Wars, when ramming warfare reached its apogee, were concerned with keeping their hulls from becoming waterlogged while on campaign,[a] and archaeologists have uncovered the foundations of the shipsheds in which classical Athenian triremes were berthed in Peiraieus, their home port.[b] Herodotus also mentions such concerns in connection with triremes. He states it clearly when he specifies that Xerxes' fleet (powered by triremes) halted at Zone[c] to "dry out" (7.59.2). The connection is not made explicit in his passing reference to Polykrates' boathouses, but perhaps it is not chance that this is the same ruler whom he records making the transition from penteconters to triremes.[d] Whether or not Herodotus' description of Nechos' (610–594) fleet of triremes is anachronistic, it is perhaps not coincidental that he mentions gear for pulling ships out of the water (*holkos*) in the same sentence (2.159.1).

S.5b   See Figure S.1 for a photograph of the *Olympias*, a full-scale trireme constructed in Greece and sailed, rowed, and tested in the 1990s; and Figure S.2 for a construction and manning diagram of the ship.

S.6a   Sidon: Map S, locator. Athens, Aegina: Map S, BX.

S.6b   See also Samian ships (not triremes) with boars' heads on their prows (3.59.3).

S.6c   In the catalog of Xerxes' fleet (8.89–95), the different contingents are described in terms of their armor, weapons, and dress, but not by distinctive triremes.

S.7a   The Chians at Lade fought with a complement of 40 marines (6.15.1). (Chios, Lade: Map S, BY.) Xerxes sailed with an additional 30 marines on deck (7.184.2). Kleinias' crews of 200 conform to the classical standard, namely, 10 marines (8.17).

S.8a   *Thucydides* 7.12.3–5.

S.8b   The size of these trireme shipshed berths has helped scholars and marine designers determine at least the maximum dimensions of triremes. See Figure S.4.

S.8c   Zone: Map S, AY.

S.8d   The term which Herodotus uses for "shipshed" in 3.45.4, *neosoikoi*, is a general one, and it is possible that these boathouses had been built for the pentecceter fleet, or even for nonmilitary use.
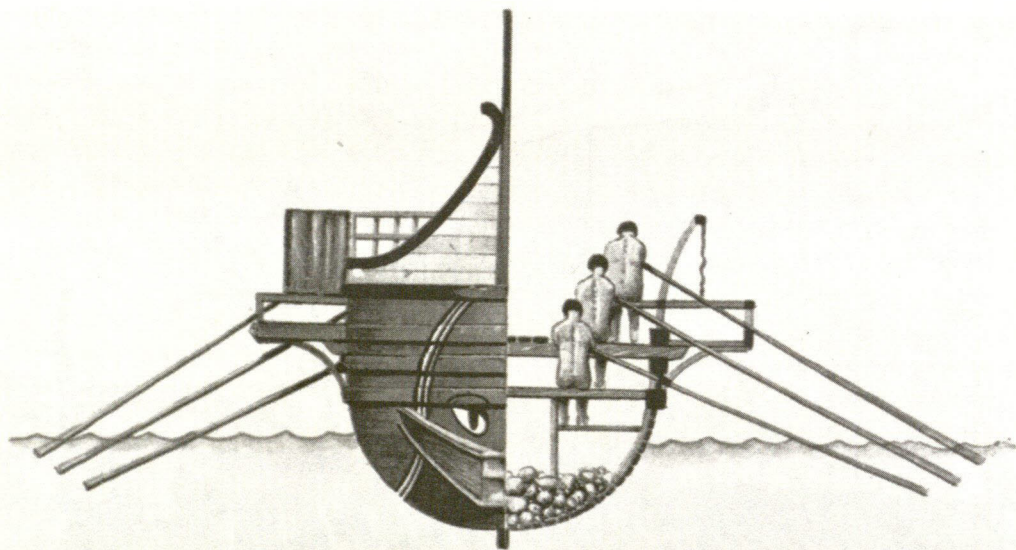
FIGURE S.2. CROSS-SECTIONAL DIAGRAM OF A TRIREME, SHOWING PLACEMENT OF ROWING STATIONS.

Sea Battles

§9. Herodotus' account of the battle of Salamis[a] is his most detailed description of a naval engagement; he was a boy when the battle took place, and as a native of Halicarnassus,[b] he must have heard about it—and especially Artemisia's role—directly from participants on the Persian side. There exists a second contemporary source, the Athenian tragedian Aeschylus, who probably took part in the battle. His drama *The Persians* played before an audience that undoubtedly included many who had fought at Salamis eight years earlier. The two authors disagree about the numbers of ships on each side[c] and the locations of their ships and tactics at the initial attack.[d] These discrepancies highlight the uncertainties of Herodotus' method, reliant primarily upon oral and, most often, secondary or even tertiary sources.

§10. It should be remembered, too, that literary considerations influenced his narrative. So, for example, the figure of Artemisia, who certainly existed and whose reported actions may well reflect reality, also serves to illustrate the themes of inversion[a] and transgression[b] and resulting confusion that pervade this history. Herodotus'

S.9a Salamis: Map S, BX.
S.9b Halicarnassus: Map S, BY.
S.9c Herodotus: 1,207 Persian vs. 380 Greek.
Aeschylus: 1,000 Persian vs. 300 Greek.
S.9d For detailed discussions, see J. S. Morrison and J. F. Coates, *The Athenian Trireme* (1986), 59–60, and, most recently, D. Potter, *Bryn Mawr Classical Review* 2006.03.29 (a review of R. T. Wallinga, *Xerxes' Greek Adventure: The naval perspective. Mnemosyne supplement 265* [Leiden: Brill, 2005]).
S.10a A common theme of Herodotus' ethnographic

accounts is the depiction of foreign customs as an inversion of the normal order. So, for example, Egyptian women urinate standing up, but the men sit down.
S.10b Boundary crossings and boundary violations, physical and behavioral, are a central theme of the *Histories*. Herodotus characterizes especially the Persian Kings with such actions, as, for example, Xerxes' crossing of the Hellespont (Map S, AY) or his treatment of the son of the Lydian Pythios (Lydia: Map S, BY).
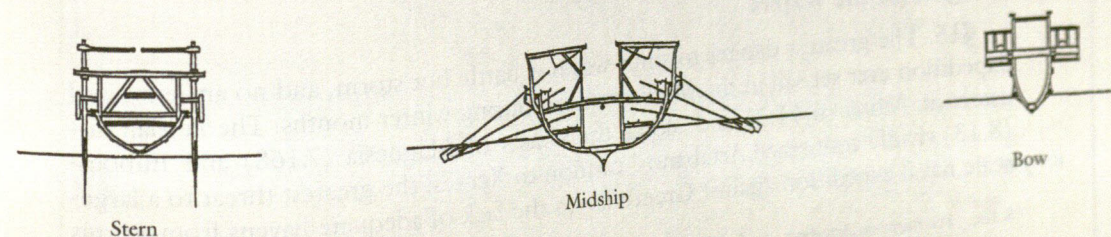

Side view

Meters

Top view

Cross-sections

Stern

Midship

Bow
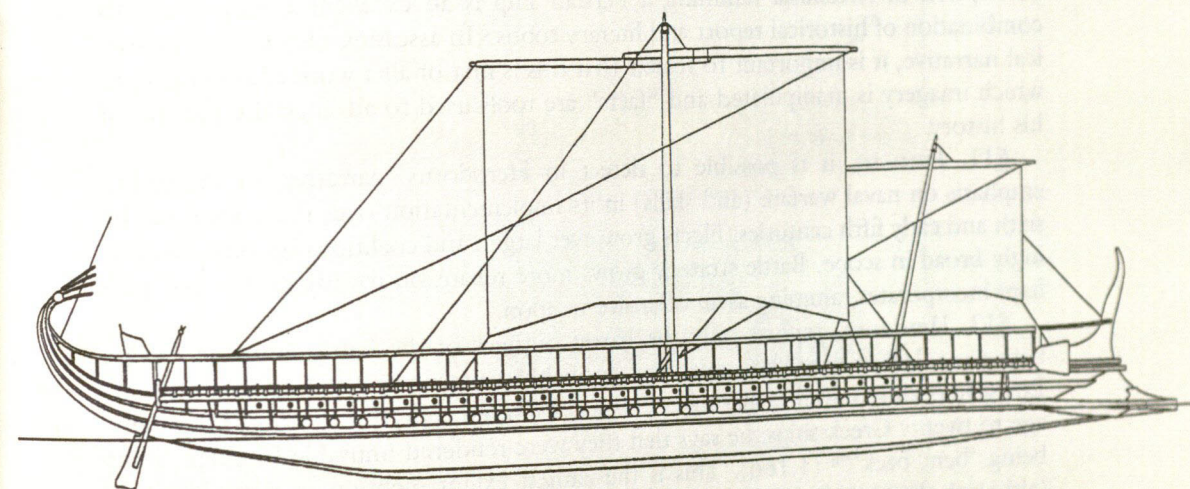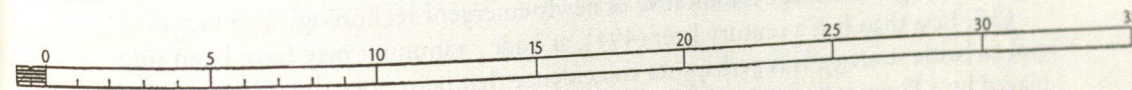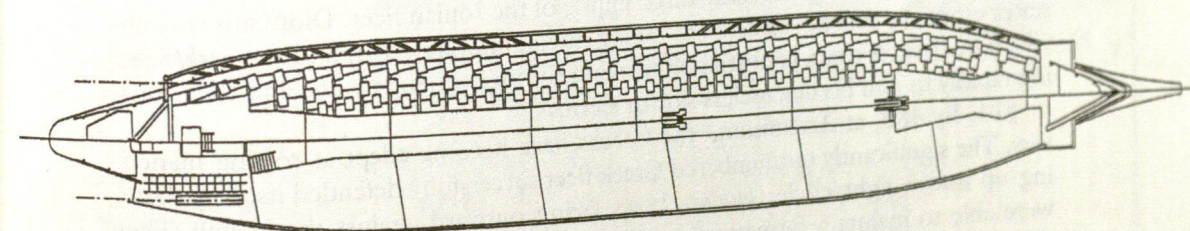
FIGURE S.3. DIAGRAM OF THE MODERN TRIREME *OLYMPIAS*.

description of Artemisia ramming a Persian ship is an excellent example of this combination of historical report and literary topos.[c] In assessing Herodotus' historical narrative, it is important to realize that this is first of all a work of literature, in which imagery is manipulated and "facts" are tools used to advance the themes of his history.

§11. Even so, it is possible to detect in Herodotus' narrative an increasing emphasis on naval warfare (and skills) in its implementation over the course of the sixth and early fifth centuries. Fleets grow ever larger, and coalitions become increasingly broad in scope. Battle strategy grows more reliant on rowing tactics and perhaps incorporates ramming as an offensive weapon.

§12. Herodotus reports only the barest outlines of the battle at Alalie (535), between a fleet of sixty Phocaean ships (probably penteconters) and a Carthaginian-Etruscan coalition double that size.[a] Of special interest is his description of the damage to twenty Greek ships: he says that they were rendered unusable by their "rams being 'bent back'"[b] (1.166). This is the earliest extant mention of rams in battle (although there are earlier depictions) and, as discussed above, it is possible that this awkward image of damage is indicative of newly emergent technology and tactics.

§13. Less than half a century later (494), at Lade,[a] ramming may have been integral to battle strategy. It is perhaps no coincidence that here, too, the primary role is played by a Phocaean commander (Dionysius), in spite of the fact that he heads one of the smallest contingents (only three ships!) of the Ionian fleet. Dionysius concentrates especially on two maneuvers: sailing in column (*epi keras*) and the *diekplous*,[b] which in classical times consisted of breaking through an enemy line and then turning rapidly to ram his defenseless side or stern.

§14. By 480, at Artemision,[a] the Greeks have become adept at rowing maneuvers. The significantly outnumbered Greek fleet successfully defended itself by drawing up into a tight circle (*kuklos*), bows facing outward against the enemy. They were able to maintain formation and fight successfully until nightfall put a halt to the action.

Dangers on the Waters

§15. The greatest danger to ships was not battle but storm, and no ancient naval expedition ever set sail in the Mediterranean during winter months. The Persian disasters at Athos (6.44.2) and along the coasts of Magnesia (7.168) and Euboea[a] (8.13) vividly confirmed Artabanos' caution to Xerxes: the greatest threat to a large-scale naval expedition against Greece lay in the lack of adequate havens from storms

S.10c For more on Artemisia, see R. V. Munson, "Artemisia in Herodotus," *Classical Antiquity* 7 (1988), 91–106.
S.12a Alalie (Corsica), Carthage: Map S, locator. Phocaea: Map S, BY.
S.12b Literally, "They were bent back as to their beaks." Other suggested translations: their rams were "buckled," "twisted off," "badly bent."
S.13a Lade: Map S, BY.
S.13b Literally, "to sail through and out." Later sources associate this maneuver specifically with ramming,

but Cawkwell argues that the fully developed *diekplous* was not employed until the Peloponnesian War and that Herodotus' use of the word indicates only a maneuver used to bring the marines into fighting range. See Appendix H, The Ionian Revolt, n. 4Cf, and G. Cawkwell, *The Greek Wars. The Failure of Persia* (Oxford: Oxford University Press, 2005).
S.14a Artemision: Map S, AX.
S.15a Mount Athos, Magnesia: Map S, AX. Euboea: Map S, BX.
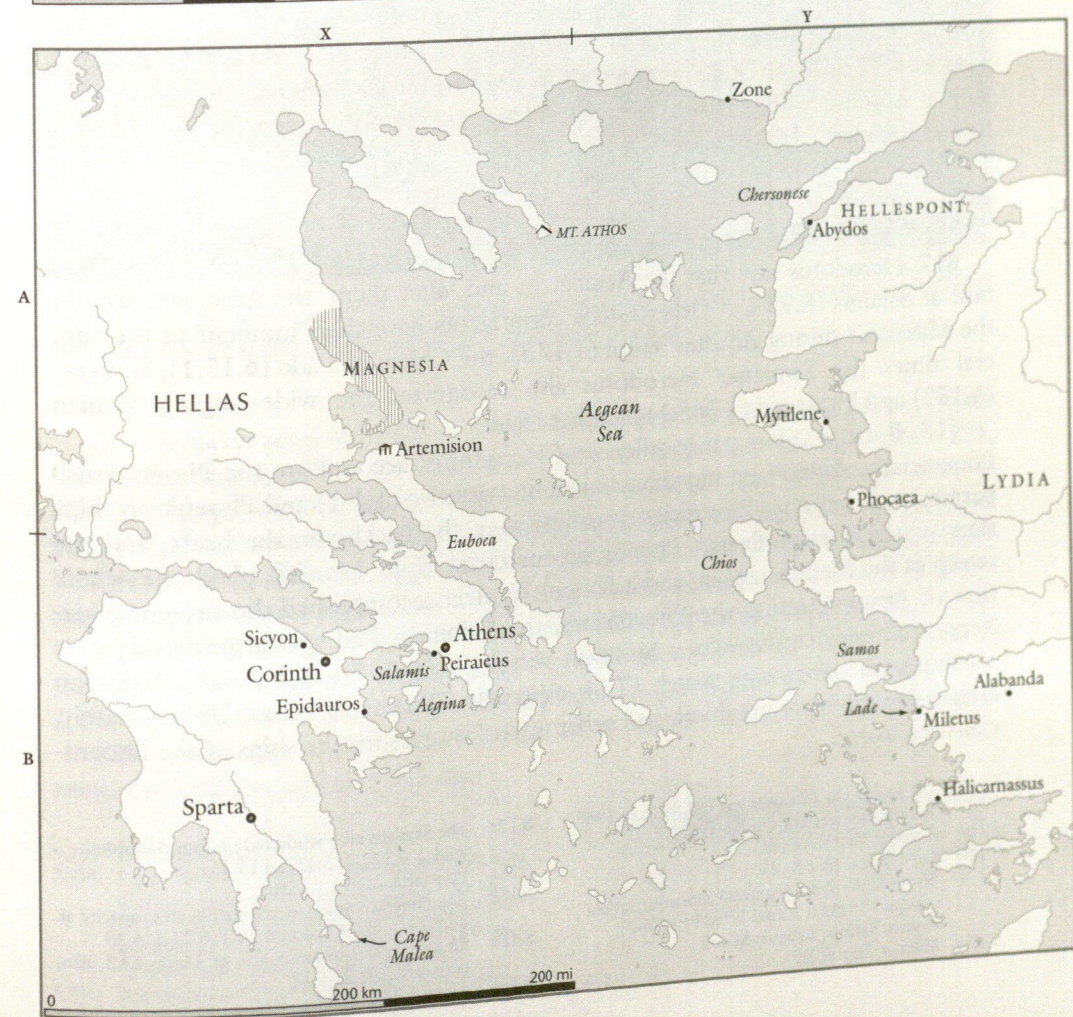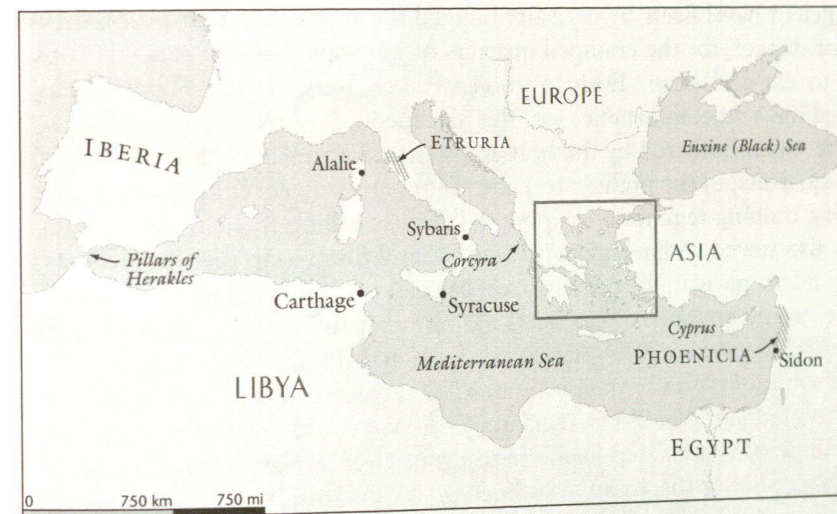
(7.49.2–3). Ancient naval fleets by necessity hugged the very coasts that posed their most imminent danger, for the cramped quarters of warships required regular stops for the crew to eat and sleep. Even in good weather, long stretches in triremes became exceedingly uncomfortable for the oarsmen. Rowers on the modern *Olympias*[b] were much bothered by the heat and stench that quickly permeated their close wooden quarters; in the prelude to Lade, Dionysius' rowers endured only one week of daylong training regimes on shipboard before rebelling (6.12.2–4).

§16. Ships also stayed within sight of coasts because these were their guideposts. Stars were no aid to navigation in the narrow latitudes of the Mediterranean; preserved ancient "admiralty charts" (*periploi*) indicate that mariners set their courses primarily by coastal landmarks and estimated speeds and distances. Herodotus may have obtained some of the information he cites for the areas of seas and lengths of rivers from such mariners' handbooks. Apparently Darius could not get his hands on such a guide, and so his first step in the invasion of Greece was to send ahead an expedition to reconnoiter the Greek coastline (3.136.1). In fact, Herodotus notes several instances in which lack of detailed knowledge of the Aegean coastline caused troubles for the Persian fleet (7.183.2, 8.107). The Corcyrians,[a] on the other hand, used local knowledge of geography and weather to their advantage, citing the well-known storms off Cape Malea[b] as a plausible excuse for not joining the Greek coalition at Salamis (7.168.4, 4.179.2).

Seafaring Nations

§17. Herodotus says that the Aeginetans and, after them, the Athenians fought best at Salamis (8.93.1).[a] Other Greek contingents have their moment in the sun: the Milesians[b] during Alyattes' reign (1.17.3), the Chians at Lade (6.15.1), and several times the Samians.[c] Herodotus also recognizes the wide-ranging Samian (4.152) and Phocaean (1.163.1) merchant fleets.

§18. But the sailors par excellence of Herodotus' account are the Phoenicians.[a] Phoenician colonists and merchants open his narrative (1.1.1) and Phoenician ships permeate its entirety. Phoenician warships were the backbone, the heart, and the stars of the Persian fleets,[b] Phoenician merchant ships (*gauloi*) plied the whole sweep of the Mediterranean, and a Phoenician fleet accomplished the circumnavigation of Africa.[c] Among the Phoenicians, the Sidonians had special pride of place: Xerxes' chosen flagship was a Sidonian vessel (7.100.2, 7.128.2), and a Sidonian warship won the rowing match (7.44; especially 7.96) at Abydos.[d] Unfortunately, archaeological, iconographical, and other textual sources for the ships of the Phoenicians are sparse.

FIGURE S.4. A LATE-NINETEENTH-CENTURY PHOTOGRAPH OF THE REMAINS OF FOUNDATIONS AND COLUMN SUPPORTS OF THE ATHENIAN SHIPSHEDS AT PEIRAIEUS.

§19. It makes sense that Xerxes turned to his expert Phoenician sailors to provide the cables that spanned the Hellespont.[a] He turns also to the Egyptians (7.25, 7.34.2). Egypt was, of course, the source of papyrus.[b] But there are hints in Herodotus' narrative that the Egyptian facility with cables was due to more than their being the source of the raw materials. It is possible that these people of the Nile were also premier builders and sailors of seafaring vessels. Herodotus associates triremes with Nechos (2.159.1), which would be the earliest appearance of these ships. Further indication of Egyptian seamanship may perhaps underlie the reports (2.102.2, 4.43) that "Sesostris" and Sataspes started their voyages of exploration in Egypt.[c]

§20. In contrast to the seafarers, there are those who are not so inclined: Amazons, the Lydians, and the Persians.[a]

S.15b The keel of the *Olympias* was laid down in 1985 and the ship was launched in 1987.
S.16a Corcyra: Map S, locator.
S.16b Cape Malea: Map S, BX.
S.17a See also 5.83.2 for Aeginetan superiority at sea (shortly thereafter contradicted by 5.86.2). Aegina, Athens, Salamis: Map S.
S.17b Miletus: Map S, BY.

S.17c The Samians are mentioned on four occasions; 3.44.2, 3.122.2, 5.117, 6.14.3.
S.18a Phoenicia: Map S, locator.
S.18b The Phoenicians are mentioned in this capacity at 3.19.2–3, 5.109.3, 6.6, 6.28.1, 6.31.1, 6.33.
S.18c Phoenician circumnavigation of Africa: 4.42; also, perhaps 2.102.2, 4.43.
S.18d Abydos: Map S, AY.

1.143.2 (although Persian troops served on ships as marines), and the Amazons (4.110.1–2).

S.19a Hellespont: Map S, AY.
S.19b Egypt: Map S, locator. Papyrus was normally used in place of paper in the ancient Mediterranean, but in this case it was used to create some of the immense cables which were used to hold Xerxes' boat bridges in place (7.25.1, 7.34, 7.36.3).
S.19c It is likely, however, that they hired Phoenician vessels there (4.42).
S.20a The Lydians under Croesus (1.27); the Persians at

Merchants and Colonists

§21. Herodotus' enumeration of fleets only occasionally makes reference to the supply ships that accompanied and outnumbered the warships. In contrast to the sleek lines of the oared ships designed for speed, cargo ships[a] were built for capacity, and thus their profiles were rounded and full. Merchant traffic through the Hellespont was particularly important, for the fertile fields of the Greek colonies in the Black Sea provided vital resources of grain to their homelands. Thus, control of these straits was strategically important for both sides. But Dionysius' acts of piracy against Carthaginian and Tyrrhenian[b] merchant shipping in Sicily illustrate that dangers beset merchant shipping throughout the Mediterranean (6.17). It is perhaps because of such dangers that oared warships are regularly associated with colonization movements.[c]

"Other" Watercraft

§22. It is only when he discusses foreign watercraft, such as the Armenian boats or the baris of the Nile, that Herodotus provides details. In both instances, archaeological, iconographic, and/or ethnographic evidence corroborates his descriptions. Round, skin-covered boats (Arabic: *kufah*) were sailed down the lower Euphrates into the early twentieth century, and just as in Herodotus' account (1.149), they were broken up at the end of the journey, their skins carried back upstream and refitted for another trip downstream. Herodotus also accurately describes the construction of Nile riverboats;[a] the use of short lengths of acacia wood and a construction technique reliant upon beams at deck level for the hull were foreign to Greek shipbuilding. His descriptions of the mechanics of towing the Nile boats upstream and keeping them on course downstream also ring true.

Nicolle Hirschfeld
Assistant Professor
Department of Classical Studies
Trinity University
San Antonio, TX

S.21a   Greek merchant ship: *holkas,* Phoenician: *gaulos.*
S.21b   Carthage, Tyrrhenia (Etruria): Map S, locator.
S.21c   Warships associated with colonization: triaconters, 4.148.3; penteconters, 1.163.1, 4.153, 4.156.2; triremes, 5.47.1.
S.22a   C. Haldane and C. W. Shelmerdine. "Herodotus 2.96.1–2 Again." *Classical Quarterly* 40 (1990), 535–539, with references.