THE GREEK WARSHIP.

(Continued from page 156.)

II.

E.

THE evidence considered under *D* makes it, I think, impossible that the accepted theory can be true as regards the larger polyereis of the first three centuries B.C., which clearly were galleys a scaloccio of some sort. If what is put forward under *A* be true, the *reason* why the accepted theory was invented⁷⁷ and has been so largely believed disappears. Nevertheless, there is still room for evidence that will support the accepted theory as to triremes generally, the quadriremes and quinqueremes of the fourth century, and the biremes of the first; and the theory may be true, even if the words *thranite*, *zugite*, and *thalamite* do refer to another arrangement.

For a trireme, said Cartault, the evidence is overwhelming. Unfortunately he omitted to mention what it was, and with the best will in the world I have been unable to discover it. Assmann (1610) relied solely on the monuments. Luebeck however gives Schol. on Aelian's *Tactica*, Schol. on *Frogs* 1074 (see under *A*), Arr. *Anab.* 6, 5, 2 (see under *B*), Pollux 1, 87 (see under *A*), and *Frogs* 1074. Let me add Livy 33, 30, Aesch. *Agam.* 1617, Luc. *Phars.* 3, 529 *seq.*

The Scholion on Aelian⁷⁸ (which I do not consider evidence) would be quite well satisfied by a galley, whether one a *zenzile* or one a *scaloccio*, in which the rows of rowers, taken as parallel to the long axis of the ship, should rise somewhat from the side of the ship toward the long axis. The phrase 'exstructi remigis' of Luc. *Phars.* 3, 530⁷⁹ may well refer to the same thing;

⁷⁷ According to Luebeck, its first modern supporter was Scaliger, relying on Schol. *Frogs*, 1074. But it existed when De Baif wrote in 1536.

⁷⁸ ἡ μόνῃρης καὶ διήρης καὶ ἐφεξῆς κατὰ τοὺς στίχους τοὺς κατὰ τὸ ὕψος ἐπ' ἀλλήλοις. Should anyone think I am unfair to the scholiasts, I would now refer to the chapters entitled 'The explaining of obsolete words' and 'The explaining of matters of fact' in Dr. Rutherford's recent volume *A Chapter in the History of*

Annotation.

⁷⁹

Validaeque triremes

Quasque quater surgens exstructi remigis ordo

Commovet,

Celsior at cunctis Bruti praetoria puppis

Verberibus senis agitur molemque profundo

Invehit et summis longe petit aequora remis.

while the 'summis...remis' of line 537, translated of course as 'thranite' oars, really answers to celsior two lines earlier; Brutus' hexeres was higher than the other ships and its oars were (necessarily) the highest and longest in the fleet. *Agam.* 1617⁸⁰ may only mean that the thalamite squad were, or had once been, somewhat nearer the water than the zugite squad, as is probable enough; unless *νερτέρα* be a mere convention. *Frogs* 1074,⁸¹ taken literally, is of course dead against every version of the accepted theory, except Graser's: it no more suits Assmann than it does Bauer, Fincati, or Weber; moreover that *θαλύμαξ* = *θαλαμίτης* is mere Scholiast's guesswork. It is undoubtedly a bit of slang; Fincati refers to a similar expression in the Venetian dialect, and probably a professor of argot could parallel it in every language.

There remains Livy, 33, 30.⁸² Bauer (p. 462) and Weber have recognised the truth of the old view that the larger polyereis were named from rows of rowers; but the use of ordines remorum (or versus remorum) requires clearing up. It is obvious that, on *any* theory, it was a matter of indifference in a trireme, with one man to one oar, whether one said ordines remorum or ordines remigum. The Romans seem to have inclined to ordines remorum, the Greeks to *στοῖχοι ἐρετῶν*. When the galleys a scaloccio came in, ordines remorum ceased to be correct, but people went on using it; instances of such 'survivals' are common enough in English. This is strongly borne out by a passage in Florus, which has not been cited: 2, 21 (4, 11) Antony's ships at Actium had a senis in novenos *remorum* ordines, Octavian's a binis *remigum* in senos ordines. They were of course built on the same system; it was indifferent which phrase was used.⁸³ Ordines remorum then means only 'rows,' like ordines.

The only two phrases in all this that are of much use to an upholder of the accepted theory are Lucan's exstructi remigis and the Scholion on Aelian. One cannot build a theory on one epithet in a poet, and both phrases are, I think, easily explicable; but in case anyone should suggest that I find it convenient to say that the Scholion on Aelian (whatever it may mean) is not evidence, I would point out that, if I may cite scholia, there is one on Thuc. 7, 40, 5 which almost settles the question.⁸⁴

⁸⁰ οὐ ταῦτα φωνεῖς νερτέρα προσήμενος
κῶπη, κρατούντων τῶν ἐπὶ ζυγῷ δορός;

We have here a reference to a ship in which the zugite was the most important person, and so not a trireme; and as it is too early for a bireme, it bears out section B; it was a *μονήρης δίκροτος*. The importance of the zugite here came from his being the stern oar; see n. 30. Is it not possible however that the contrast is between oarsmen and fighting men, with a play upon *δορός*?

⁸¹ προσπαρεῖν ἐς τὸ στόμα τῇ θαλάμῃ.
Anyone inclined to take this literally should read Jurien de la Gravière's remarks in *La Marine des Anciens*.

⁸² Quam sexdecim versus remorum agebant.
A translation of ἑκκαίδεκέρης in the corresponding passage in Polybius.

⁸³ This may help to explain Lucan's 'senis verberibus' (n. 79) which refers to *one* hexeres only, and should on the accepted theory be sex verberibus, if it were to refer to the beat of the six banks. It means 'with sixfold strokes' 'strokes worked (or made) by six (men) apiece.' Lucan's quadriremes have not four ordines, but a fourfold ordo.

⁸⁴ Thuc. 7, 40, 5 the Syracusans in boats ἐς τοὺς ταρσοὺς ὑποκίπτοντες τῶν πολεμίων νεῶν. Schol. ὑποδύμενοι ὑπὸ τοὺς ταρσοὺς. If the schol. be right, as Bauer supposed, the accepted

Now as to the monuments. Breusing was the first to call for a thorough-going criticism. How badly it was (and is) wanted anyone can see who will refer to the astounding cases of misuse given by Mr. Torr in his preface (p. ix): and these are by no means the only instances.⁸⁵

Omitting coins and Trajan's column, we are supposed to have about 15 representations of biremes, 3 of triremes, and none of larger ships. Of the 'triremes,' only one really matters, the so-called Lenormant relief in the Acropolis Museum at Athens (possibly fourth century).⁸⁶ The 'biremes' fall into two groups, one belonging to the seventh and sixth centuries, the other to Hellenistic and Roman times. The most important of the latter group are the prow from Samothrace, in the Louvre (the only monument we can check by written evidence); the ship from the Temple of Fortune at Praeneste, in the Vatican Museum; and the Palazzo Spada and Ludovisi ships.

I do not count the river boats on Trajan's column. If any one cites them in proof of superposed banks, I may also cite them as proof that the upper oars were rowed over, or through, a fretwork railing, the lower without port-holes; that the rowers used their oars like Canadian canoe paddles,⁸⁷ had

theory is in a bad way, of course. But the schol. must be wrong. The same phrase in Dio Cass. 50, 32, 8 clearly means driving the ship across the oars so as to break them; he adds *καὶ τὰς κώπας συναράσσοντες*; and warships could not go *under*. Cf. Polyb. 16, 4, 10 *ἐμπιπτόντων ἐς τοὺς πασσούς*.

⁸⁵ See Bauer 367 n. 1 on the so-called Malay breme. See also two startling sections of triremes in Kopecky, *Die Attischen Trieren* (1890) plates 21 and 22, which he calls 'sehr beachtenswerthe Abbildungen alter Schiffe,' from Rondelet. 'Die erste (fig. 21) ist der Abdruck einer Medaille' etc. On turning up Rondelet (1820) I found, of course, they were Rondelet's own sections, the most worthless of guesswork; of fig. 21 Rondelet does not even pretend to figure, or refer to, any original, but merely labels it 'after a medal.'

⁸⁶ The two triremes in the Naples Museum, figs. 1676 and 1691 in Baumeister, the first from Pompeii and the other from Puteoli, are, I think, of no great value, as the top oars could hardly reach the water; but the way the oars are laid in threes, one actually upon the other, can be meant for nothing but three oars to a bench all issuing in a sheaf from one opening. The spirited Isis-temple ships, the only ones that give any idea of the general look of an ancient warship, are of no value for the 'problem.' I have not seen any representation of the Ulubad 'bireme'; but according to *B.C.H.* 12, 190 the oars (14 in number) are in groups of two, side

by side. If not a moneres, it would seem to add little to what can be learnt from the Palazzo Spada ship. Two recent discoveries, the ship on a metope of the Treasury of the Sicyonians at Delphi (see Assmann in *Jahrb.* 1905, p. 32), and a graffito on the wall of a tomb near Anfushi bay in Egypt, to which Mr. G. F. Hill kindly referred me (Dr. G. Botti in *Bull. de la Soc. Archéol. d'Alexandrie* (1902) p. 13 seq. and Admiral Blomfield *ib.* p. 37), do not bear on the problem of the oars; though the latter ship (called late Ptolemaic) is interesting as showing a further development of the navis ignifera used by the Rhodians in 190 B.C.

⁸⁷ Every oarsman will sympathise with Arenhold, *Die historische Entwicklung der Schiffstypen* (1891), when he says bluntly that every monument on which the oars 'ganz steil in's Wasser tauchen' is self-condemned. I would like to say the same of every similar reconstruction, and of every monument which shews an oarsman grasping the oar from underneath and with no possibility of getting his feet against anything. Mr. G. C. V. Holmes, *Ancient and Modern Ships* (1900), suggests that the monuments shew that the art of rowing was *not* understood till the Liburnian came in. But some mediaeval pictures also shew the oars at an absurd angle; e.g., C. A. Levi, *Navi Venete*, pls. 28 and 31; and it seems incredible that any people should row for centuries without discovering the proper angle for the oar to make with the water.

one hand *under* the handle, and sat bolt upright at the end of the stroke, and that a bireme had only eight oars aside, and a long list of other absurdities. The oars of the 'trireme,' in particular, are just plastered on anyhow; and it is an open boat. 'The design' says Mr. Torr 'makes little pretensions to accuracy.' It is high time that it vanished from the text books.

And I need hardly say that I do not count dal Pozzo's sketch, interesting as it is; for it is not known from what it is taken.⁸⁸

The prow from Samothrace. Assmann has been much praised for calling this a bireme. But, apart from the question whether the holes seen in the monument are really portholes,⁸⁹ if one assumes, as certainly Assmann does, and I think every one else, that the monument celebrates Demetrius' victory at Salamis, certain consequences seem to follow as matter of history, which must be considered.

In Alexander's lifetime quinqueremes were the highest value in use.⁹⁰ Somewhere between his death and the first Punic war the change of system that introduced the scaloccio galley (see section *D*) must have taken place:⁹¹ and as the higher values undoubtedly took their origin as fighting machines from the time when Antigonus the One-eyed resolved to build a fleet and command the sea (Diod. 19, 58 and 62), we shall not be far wrong in assuming that the change of system originated at the same time (though this is not perhaps very material), both alike being due to the inventive mechanical genius that made Demetrius famous as the Besieger of Cities. Demetrius with the new fleet, including seven heptereis and ten hexereis,⁹² beside smaller values, sailed for Cyprus, and met Ptolemy, who (naturally) had nothing larger than quinqueremes, at Salamis. Demetrius massed his strength, including all his heptereis and hexereis, on his left wing, which he led in person on a hepteres; and the picture given by Diodorus of Demetrius in

⁸⁸ Graser published it (*Arch. Zeit.* 1874 vol. 32, p. 71). It is now in the British Museum (Dept. of Gr. and Rom. Antiq.) It is certainly not a drawing of the Lenormant relief.

⁸⁹ Two slits in the *παρεξείρεσθια*, on which Eins, *Das Rudern bei den Alten* (1896), has based what appears to be an attractive theory of the *διέκπλους*. I have not seen his book. Torr follows Graser in saying the holes are for ropes for an anchor: but if so they should be further forward. If they are not portholes, this hepteres had seven men to an oar, as the monument shews that no oars could be rowed anywhere except through, or resting on, the *παρεξείρεσθια*.

⁹⁰ With a possible reservation in favour of one or more hexereis in Sicily, n. 51.

⁹¹ Polybius has been so abused for saying that the Romans had no experience of building quinqueremes and required a Carthaginian model, that I feel the utmost diffidence in suggesting that the basis of the story is merely

that the Carthaginians had got the new system and the Romans had not. Polybius does *not* say that they copied a stranded quinquereme; he says (1, 20, 15) that they built their whole fleet (*i.e.* quinqueremes and triremes) on the model of a stranded *cataphract*. Ihne's criticism (*Röm. Gesch.* 2, 49), that they had Syracusan models to hand, is beside the point. We, for instance, had many English models to hand in the Napoleonic war; yet I have read that we often copied the lines of French prizes.

⁹² According to Diod. 19, 62, three ennereis and ten dekereis were built. This may be an anticipation; anyhow, they did not go into action. Plutarch gives no details of size. Beloch, *Gr. Gesch.* iii. 1, 159 n. 1, defends Diodorus' account, as against Niese, and says it is the best picture of a sea-fight of the time that we possess. This seems to overlook the battle of Chios just a century later.

action on the stern of his big ship, rejoicing in the battle, with his three armour-bearers fallen round him, is not only entirely in character with all that we know of Demetrius, but is the sort of picture that becomes traditional and gets handed down correctly. He gained a crushing victory, due to his own big ships which he had led in person (his other wing was defeated); and we might know, even if Diodorus had not expressly said so, that Demetrius, being such as he was, could not help sending the biggest ship he had to carry the news to his father. The impression the big ships made in the Hellenistic world was great; Demetrius built bigger and bigger; Lysimachus tried to rival him;⁹³ in mere size the Ptolemies soon went far ahead of all competitors. And in the face of this, how *can* the prow of Samothrace represent anything but Demetrius' hepteres, any more than a monument of Trafalgar could represent any ship but the Victory? And if this prow be a hepteres, the accepted theory goes by the board at once as regards heptereis.

Assmann's selection of a bireme to explain this monument seems most unfortunate. He calls it the 'swift Aviso' sent to carry the news. But Diodorus (20, 53) says a hepteres (τὴν μεγίστην ναῦν) was sent: and one cannot advance by throwing over even Diodorus without good reason and taking to guesswork. If it is to be a bireme, one must begin by showing that it has nothing to do with the battle of Salamis. But the real point is that there is no evidence for the use of biremes at all till far later. I may well have missed some inscriptions; but subject to this, I believe that *διήρης* hardly occurs in Greek at all, and not before Pollux (second century A.D.); biremis is not found in Latin literature before Caesar and Cicero, or referring to an earlier period than theirs⁹⁴; *δίκροτος* has already been dealt with,⁹⁵ and only takes us back to the Mithridatic wars.

There is then no reason for calling the prow of Samothrace a bireme. Its elucidation as such is a good instance of a method which seems to me a wrong one.

The Dipylon 'biremes' have been explained as a first attempt at perspective,⁹⁶ and this may be true; but they may also be due simply to the

⁹³ Lysimachus' great okteres, the *λεοντοφόρος*, is said to have distinguished itself in the sea-fight between Ptolemy Keraunos and Antigonus Gonatas; Memnon 13 = *F. H. G.* 3, 534, τὸ ἐξαιρετικὸν ἔφερεν. The change of system obviously came in before this ship was built, whatever Memnon's description exactly means.

⁹⁴ Livy 24, 40 (nuntiantes, Philippum primum Apolloniam tentasse, lembis biremibus centum viginti flumine adverso subvectum) is an apparent instance to the contrary. But we know all about these lembi, which Philip had built on the Illyrian model (Polyb. 5, 109) and which fought so well at the battle of Chios; and they were certainly not biremes (n. 60). The explanation is flumine adverso; they were

going up stream and to get more power the oars had been double-banked for the occasion. Double-bank, 'to provide . . . with two rowers for each oar'; see Murray's *Dict. s.v.* I wish to thank my friend Mr. Colin Campbell for calling my attention to this word, which he tells me is still in use, and which aptly explains this puzzling passage. As to Pliny 7, 56, see Appendix.

⁹⁵ See n. 40.

⁹⁶ Pernice, *Geometrische Vase mit Schiffdarstellung* (*Jahrb.* 1900, p. 92), on the ship published by the late Dr. A. S. Murray, *J.H.S.* 1899 (vol. 19), 198. I gather that in 1900 Pernice no longer held the view he had taken in 1892 as to the fragments of dipylon-ships,

desire of a very crude artist to show two sets of oars because he *knew* that a ship had a set on each side.⁹⁷ It is difficult to see how any one ever took such a ship as that in *J.H.S.* 1899, Pl. VIII., for a bireme of two superposed banks; for even an artist of the Dipylon period may be supposed to have known that oars should be able to reach the water and not stop short in mid-air. And if, as Pernice, Helbig, and von Wilamowitz have supposed, these Dipylon ships are Athenian, how came Athens to return for a couple of centuries to the more humble ships of a single bank? A question often asked and never answered. Assmann avoids it by calling the Dipylon ships Phœnician.

There are three Assyrian reliefs from the palace of Sennacherib, one in the British Museum, and two figured but not brought home by Layard, of which one has no ram. These shew oars in two rows, at no great interval of height, arranged in a zigzag thus, the lower oars in the intervals of the upper ones. The same thing is shewn on two ships on an Athenian B.-F. vase of about 500 B.C. (*B.M. Vases*, B. 436), and possibly in the ship on an Etruscan B.-F. vase (*B.M. Vases*, B. 60), though this latter is of little value for the arrangement of the oars. None of these ships can be biremes, which are unknown to every writer before Cæsar. The silence of Thucydides, who gives a sort of history of shipbuilding, is most material.

The Praenestine 'bireme.' According to Assmann, this relief belongs to the time of Augustus; according to Torr, to about 50 A.D. It shews two superposed banks with a very small interval between them; perhaps it would be more correct to say it shews the arrangement The higher bank issues from the outside of, the lower from the under part of, the *παρεξίπρηστα*. The distance between the banks is too small for the accepted theory, to which it gives no support; but if it is in fact a bireme, then it may support Bauer's theory for *biremes of the early empire*. Whether it really is a bireme seems to me, I confess, very doubtful. Biremes were undoubtedly light and swift; but, allowing that in this relief, if to scale, the oars would be longer and the men smaller, it remains anything but a light or speedy-looking ship; compare it with the Isis-temple ships, for instance. Then it carries a *turris*. We do not know that a bireme never carried a tower, certainly; but we do not know that it did; I think the smallest ship referred to with a *turris* is Eudamus' quadrireme at Side (Livy 37, 24), and after all one can only argue from the facts that are known.

Figs. 5 and 6 in his article in *Ath. Mitth.* 17. Assmann claims to have refuted Pernice, (*Arch. Anz.* 1901, p. 98); and his point, that the Dipylon chariots shew one horse *beyond* and not *over* the other, is a fair one. But he does not (apparently) deal with the three things that seem conclusive, viz. :—(1) the supposed upper deck has no supports; (2) the supposed upper oars are cut off short on reaching the (supposed lower) deck, *i.e.*, fall on the other side of it; and (3) the steersman is lower than the supposed

upper rowers.

⁹⁷ It is well known that almost all beginners will try to draw, not what they see, but what they know to be there. A case exactly in point appears to me to be the idea of some savages, that a drawing in profile represents half a man only. This would meet Assmann's point about the chariots. It is easy to shew the further horse *beyond* the other, but very difficult thus to shew the further oarsmen.

The Palazzo Spada and Ludovisi reliefs.⁹⁸ These are Roman copies of the same Hellenistic original, of unknown date. The arrangement resembles that in Fig. 2, *ante*, and the original may have been a bireme; but it may just as well have had several men to an oar. And the two copies do not agree. If it was a bireme, then Luebeck's definition in Pauly-Wissowa is wrong, for its oars form one line in the water and not two.

Now as to the 'bireme' question generally. If the holes in the prow of Samothrace are portholes, and supposing that the Praenestine ship is not a biremis at all, but a large admiral-ship, as is possible—note the laurel-wreath—we get a breit-polyeres system in which two oars appear at unequal levels, a hepteres, *e.g.*, being rowed by three and four men to the oars respectively; again as at Venice.⁹⁹ This seems to me quite possible, and would explain the fact that every monument that we possess which shews or appears to shew any form of superposition (except the two ships at Naples, Trajan's column, and the Dipylon vases) never shews anything but two rows arranged thus; and we may perhaps imagine, founding ourselves on the Assyrian reliefs and the black-figure vases mentioned before, that such an arrangement of two rows has nothing whatever to do either with banks or ordines or the terms ending in -*ηρης*, but is merely an arrangement of old standing in the Eastern Mediterranean, applicable in many forms. As we possess very many references to triremes, quadriremes, and quinqueremes, and (omitting inscriptions of the Empire) very few indeed to biremes, to call nearly every monument a bireme is a historical absurdity. I would suggest that from early times there were two arrangements; in one the oars issued from the ship in a straight, in the other in a zigzag, line; from the former was developed the trireme; the latter, perhaps in abeyance in the 5th and 4th centuries, was again utilised, perhaps with modifications, for some of the larger polyereis of Hellenistic and Roman times. This seems at any rate worth consideration.¹⁰⁰ We have to explain Demetrius' hekkaidekeres somehow and two oars of eight men apiece would be more feasible than one of sixteen¹⁰¹. As to what the zigzag arrangement precisely means, I have no theory; what is and is not mechanically possible in the way of alternation must be left to others to say. I merely note the lines on which it would

⁹⁸ Schreiber, *die Hellenistische Reliefbilder*, Pls. 10 and 23^a respectively. See the two together in Dar.-Sagl. s. v. *navis*.

⁹⁹ For such a hepteres at Venice, Fincati, p. 196. It does not however appear if the oars in the Venetian ship were at unequal levels.

¹⁰⁰ Though I do not accept Bauer's hypothesis of the larger polyereis, I thoroughly agree with his conclusion; '[Meiner Hypothese zufolge] ist es unmöglich, den Typus eines Schiffes nach der Zahl der auf einer Darstellung sichtbaren Ruderreihen zu bestimmen' (p. 463).

¹⁰¹ Nothing larger than a dekeres is known to have gone into action; nor does it appear

that in mediaeval times more than ten men to an oar were ever known. It is possible that the performance of Demetrius' hekkaidekeres, which so pleased Plutarch's authority, (*Dem.* 43 τὸ τάχος καὶ τὸ ἔργον ἀξιοθεατότερον τοῦ μεγέθους), was only a 'contractor's trial' with a picked crew and very favourable conditions. Yet Philadelphos' extraordinary fleet (*Ath.* 203d) cannot have been merely for shew; though the account may be exaggerated, as Beloch supposes. Livy's translation of ἑκκαίδεκῆρης (n. 82) seems to dispose of the otherwise attractive view that the higher terms were arbitrary and merely denoted so much extra tonnage.

FIG. 3.—THE (SO-CALLED) LENORMANT RELIEF.
 Reproduced by the kind permission of Mr. Torr from the plate in his 'Ancient Ships.' The lettering is mine.

appear that the 'bireme' problem must be solved, if due regard be paid to the evidence; and I rather think that the bireme is the key to the whole matter. For instance, I know of no evidence that the oars of any ship ever formed two distinct lines in the water, let alone more than two.^{101a}

There remains the so-called Lenormant relief, (Fig. 3), which has (unfortunately) caught the popular imagination as the one remaining representation of a trireme, largely owing no doubt to the inaccurate representations originally published. As soon as accurate plates were available, the idea that Y and Z were the oars of the two lower banks was seen to be untenable in its original form, which took both Y and Z across the timber EE and made AA the portholes of the lowest bank ZZ.¹⁰² Assmann accordingly, while still calling Y and Z the 'zugite' and 'thalamite' oars, has to place their ports below or under EE, (there is no sign of such ports in the relief itself), and to treat the design in effect as an abnormal trireme, with a very long 'thranite' bank and two stunted lower banks of almost equal length; and this explanation has been largely accepted.

If we take the relief as it now is, and if it is to be a trireme, no explanation but Assmann's is possible, as I think will appear from the subjoined letter¹⁰³ from Mr. R. Carr Bosanquet, who, in reply to some questions of mine, kindly examined the original for me, not knowing for what purpose I required it done. As to the matter of paint, or low relief, now lost, this is of course a double-edged weapon; and I submit that it is indisputable, either that we must take the relief as we find it, or that we must say that it is too worn to draw any deductions from, one way or the other. The *raised* lumps AA cannot of course be portholes, as Assmann saw.

Granted, however, that, if this relief is to be a trireme, Assmann's explanation is, on the facts before us, the only possible one, it is not easy to take it seriously. Why are we entitled to invent portholes, when the relief

^{101a} One of Weber's points is the single line in the water.

¹⁰² Even as late as 1896 Eins is said to have taken Y, and Haack (whose paper I have also not seen) Y and Z, across EE. Since this went to press, I see that the older view is still taken by Torr in *Dar.-Sagl*, and by Mr. E. Conybeare, *Triremes*, 1904.

¹⁰³ 'No sign of Y and Z crossing over the transverse pieces. The surface is much weathered and perished, and they may have done so in very low relief, now lost—or even in paint; no doubt the thing was made far more intelligible by the colouring (of which naturally no trace remains, but it must have been there). AAA are rounded knobs projecting vertically above the transverse strip E, but with their faces in the same plane as the face of E.' . . .

'I think Torr's drawing (which I have examined since looking at the stone) exaggerates the disturbed surface of the water; there is a raised lump where X meets the water in the case of oarsmen 1, 3, 4. No such lump in the case of Y and Z; but this must not be pressed.' All these points come out clearly on a cast in the Inner Temple Library, which also shows another point referred to by Mr. Carr Bosanquet, and not appearing in Fig. 3, viz., that X seems to pass over F in the case of oarsmen 3, 6, and 8, as well as 1. The raised lump in the water round X, as compared with the smoothness where Y and Z meet it, is most distinct in this cast. The figure in Baumeister, reproduced by Luebeck, is from a cast in Berlin, but is (admittedly) much touched up and 'completed.'

does not shew them, and when there is no evidence, monumental or otherwise, for portholes¹⁰⁴ low down on the ship's side in a polyeres? How, if we are to invent them, can they be placed 10 inches, or even a foot,¹⁰⁵ above the normal waterline, where the least sea would prevent the oarsmen from clearing the water, and where a slight roll, or some change in the waterline,¹⁰⁶ would send them under water altogether? And how, if we do place them there, could the oars be got in and out quickly in the face of the enemy, as was done?¹⁰⁷ And why, if this be an Athenian trireme, has it no *παρεξειρεσία*, which is well attested by Thucydides for the fifth century and Polyænus for the fourth? And why are Y and Z to be distinguished from the precisely similar streak (not lettered) running parallel to the upper part of Y, which cannot by any possibility be an oar?

Neither are we justified in supposing this to be an abnormal trireme. There probably *was* another type, the trihemiolia;¹⁰⁸ but short of elucidating this relief as a trihemiolia, should anyone care to, we are bound to suppose that triremes, at one and the same time, were all of one type as regards the arrangement of the oars.¹⁰⁹ Fifth century: Thuc. 2, 93; Brasidas led over the Isthmus crews from the fleet of the allies, furnished by a number of different states; they all brought their oars, confident that these would fit the Megarian triremes at Nisaea; and they did. Fourth century: for Athens alone the lists are conclusive. For Athens and Sparta, excerpta Polyæni 40, 2, Iphicrates deceives the Laconisers of Chios by sailing in *κόσμφ Λακωνικῶ*: had there been a difference in oarage he could not have hidden

¹⁰⁴ Even Mr. Torr's storehouse of quotations fails here. Herod. 5, 33 (which I shall come to presently) is certainly not such evidence. Pollux' *τήματα* is quite satisfied by openings in the *παρεξειρεσία*; and none other appear on the Praenestine and Palazzo Spada ships, and perhaps I may add on the prow of Samothrace. (The portholes *are* however low on the Delphi ship, which is a moneres; but the gunwale is low also). *θαλαμία* is not connected with thalamite, technically, and does not mean the thalamite ports, but any port (Ar. *Ach.* 553) or any opening (Ar. *Peace*, 1232).

¹⁰⁵ Torr, p. 45, who takes AAA as the thalamite portholes, about one foot above the water, but points out the difficulty of squeezing in the rowers.

¹⁰⁶ See section D (*d*), and n. 75.

¹⁰⁷ Polyæn. 5, 22, 2. Note that the oars were not merely drawn inboard, but taken right out. The same manœuvre in Polyæn. 1, 47, 1; 3, 11, 3; excerpta Polyæni 57, 9. This is obviously dead against the portholes being covered with leather bags, the only alleged support for which is the Praenestine ship. There is no proof that the Athenian *ἄσκάματα*

were such; the only passage is Zonaras, who shews his ignorance by saying that the *ἄσκάματα* were fastened to the oars, the Athenian lists shewing that they were fastened to the trireme. Pollux 1, 88 τὸ πρὸς αὐτῷ τῷ σκαλμῷ δέρμα ἄσκαμα is more likely to be correct. But I suppose that the notion that the most intelligent people in the world first 'honeycombed' the sides of their triremes with holes larger than a man's head, and then covered the holes with leather bags to keep out the water, will die very hard. Why some of the text book writers believe that the oars were put out from the inside, blades first, instead of having the handles passed in from outside, is to me a puzzle. It also seems to me to be a grave question whether oars could be rowed at all through the *sides* of a boat as light as a trireme without pulling her to pieces in a short time.

¹⁰⁸ See n. 11.

¹⁰⁹ I do not mean more than 'at the same time.' We cannot for instance prove that the arrangement of the fourth century was that of the first. See however under *F*. Some writers assume a new arrangement of oars to explain each monument.

it, but must have betrayed himself at once. So exc. Pol. 58, 3. And as a general maxim of warfare, the same in exc. Pol. 57, 1. We *do* hear of considerable differences between the models of different states, both as to triremes and quinqueremes, but always in one respect only, weight or stoutness; a difference of oarage is never hinted at.

But the real objection to Assmann's view is, that it demands (judging by eye) an upper bank of oars that shall be more than twice the length of the two lower banks. Such a ship is impossible; for if one thing be more certain than another, it is that oars of different lengths, where the difference bears more than a certain proportion to the length, cannot be rowed together, by one man to an oar, so as to be of any real use or turn out an efficient ship. That they might be rowed together in a certain way for a short time I do not deny; but the huge increase in the ratio of dead weight to power would at once put an end to all idea of speed or efficiency.¹¹⁰

The Lenormant relief is, in fact, a moneres, and a simple one, as Bauer has always said; ¹¹¹ and Y and Z are part of the hull.

F.

I trust I have now made probable the five propositions with which I started. The deductions from them—remembering that we have to do with reasonable probabilities only and not certainties—are, first, that a quinquereme of the last three centuries B.C. was a comparatively light galley of five men to an oar; secondly, that the ships from hexereis to dekereis may have been similar galleys of so many men to an oar, or may have been some other form of scaloccio galley, *e.g.*, one rowing two sets of oars in the arrangement ''; and thirdly, that Roman biremes may well have been nothing but double-banked monereis, perhaps modified a little; this last however is mere opinion.

It is however pretty clear on the evidence that the accepted theory

¹¹⁰ I am bound to refer to this controversy, on which so much has been written in Germany, and which has produced the greatest gem of the whole trireme-literature, the theory that the 'thalamites' may have taken 4 strokes and the 'zugites' 2 to the 'thranites' 1, *because* a pianist can play in three-time with one hand and four-time with the other. Given more than a certain proportionate difference in length, it is matter of mathematical demonstration, as well as practical knowledge, that the oars cannot be rowed together by one man to each oar so that each oar should do its best and each man pull his weight, *i.e.*, his own and his share of the ship's; and therefore each added bank after the first means a relative loss in power, owing to the

disproportionate increase in dead weight. Schmidt here *almost* takes up the position that, if practical oarsmanship forbids his deductions, so much the worse for practical oarsmanship: the 'thranites' had '*erheblich* längere Riemen. . . . Um diesen Schluss kommen wir nun einmal nicht herum, wir mögen uns drehen und wenden, wie wir wollen. Die namhaft *verschieden langen* Riemen, also auch *alle ihre Konsequenzen*, sind feststehende Thatsache' (p. 17; italics mine). Once more, whatever thranite means, there is no evidence of any sort that the thranite oars were *much* longer than the others.

¹¹¹ Bauer remained of the same opinion after examining the original; see his review of Schmidt in *Neue Phil. Rundschau*, 1900 p. 301.

cannot apply to any of the above; but the question of the trireme, Greek and Roman, and of the quadriremes and quinqueremes of the fourth century, is still open.

Herod. 7, 36: Xerxes' bridge over the Hellespönt was laid on triremes and pentekontors. They were therefore of approximately equal height; and this seems to me very strong against the accepted theory, as regards Phoenician and Ionian triremes of 480 B.C.

Assuming the similar low elevation of an Athenian trireme, which is also a necessary consequence of its shallow draught, there remain only two theories, those of Bauer and Fincati respectively. To adopt Bauer's, one has to say, first, that the Praenestine ship is a bireme, and, secondly, that one can argue from a Roman bireme of the time of Octavian to a Greek trireme of the time of Pericles. Both these views are feasible enough, and I think therefore that Bauer's theory must remain a possible one. But for my part I do feel a great difficulty in arguing from a given monument to a ship of four centuries earlier. It is a question of individual opinion, no doubt; a rowing galley has only limited possibilities of development, and the great pace at which ancient fleets were built, indubitable even if exaggerated in detail, may well point to stereotyped models; but if I am right as to biremes not being in use till the first century B.C., I do not feel that they can have much bearing on the Athenian trireme. If this should be correct, the direct evidence for Bauer's view of the Athenian trireme has gone. Moreover I do not think Bauer claims that his view will explain the fourth century quadriremes and quinqueremes, which must be explained; and it may be that Fincati's will.¹¹²

Was a trireme then in the nature of a zenzile galley, with three men on a bench?

Galen, *de usu part.* 1, 24. Why are the fingers of different lengths and the middle one the longest? In order that when they close round an object the ends may come equal. So in triremes¹¹³ the ends of the oars all fall even (*i.e.*, make one line in the water) though the oars are not of equal length; for there too (*i.e.*, in the trireme as well as the hand) the μέσαι are made the longest (note that he refers to the *oars* and not only to the inboard portions) *for the same reason*. These last words can only mean 'in order that the ends of the oars may form one straight line like the ends of the fingers.' Now if any oars were the longest, considered as a group, it was the thranite oars,

¹¹² Fincati seems clear that no zenzile galleys larger than triremes were in use at Venice; but it is generally asserted, on Pantera's authority, that quinqueremes a zenzile were used. In Pantera's time the zenzile galley was only a memory. A thing might however be feasible with the shorter Athenian oars that was not so with the Venetian. How many difficulties would be avoided if one could only agree with Beloch (*Gr. Gesch.* 2, 470) that the

Athenian lists do not really prove that the oars of a trireme were used for a quadrireme.

¹¹³ καθάπερ οἶμαι κὰν ταῖς τριήρεσι τὰ πέρατα τῶν κωπῶν εἰς ἴσον ἐξικνεῖται, καίτοι γ' οὐκ ἴσων ἀπάντων ὄντων. καὶ γὰρ οὖν κακεῖ τὰς μέσας μεγίστας ἀπεργάζονται διὰ τὴν αὐτὴν αἰτίαν.—πέρατα cannot of course refer to the *handles*, which did not, and could not, come εἰς ἴσον on any conceivable theory, except Graser's.

and not those amidships (zugite). μέσαι then is not zugite (probably if he had meant zugite he would have said zugite); and the μέσαι had¹¹⁴ to be longest so as to get all the ends level. μέσαι then are the oars of the horizontal row or ordo nearest to the middle line of the ship drawn from stem to stern, and the trireme known to Galen was a breit-polyeres, probably in the nature of a zenzile galley;¹¹⁵ for the oars, if the ordines were distinguished by their position relative to the long axis of the ship, must have been all on a level, or thereabouts.

Now arises the question, is Galen an independent authority or is he using or referring to Aristotle (*Mech.* 4)?¹¹⁶ First, let us assume that he is using Aristotle.

As the text stands, Aristotle begins by saying (1) that the μεσόνεοι do most work; (2) that the fulcrum of the oar-lever is the thole. (2) is of course wrong in fact; if then (1) was right in fact, the μεσόνεοι must in fact have had the longest oars; and, if the passage is to agree with Galen, as explained above, the μεσόνεοι must also have had more oar inboard than the others, and so Aristotle says: ἐν μέσῃ δὲ τῇ νηὶ πλείστον τῆς κώπης ἐντὸς ἐστίν. So far all is plain sailing. Then come the following words, explaining μέσῃ; καὶ γὰρ ἡ ναὺς ταύτη εὐρυτάτη ἐστίν, ὥστε πλείον ἐπ' ἀμφοτέρα ἐνδέχεσθαι μέρος τῆς κώπης ἐκατέρου τοίχου ἐντὸς εἶναι τῆς νεώς, i.e., μέσῃ means amidships, and the whole passage, as a source for Galen, becomes nonsense. The rest of the chapter (allowing for the mistake as to the fulcrum) is excellent sense and suits Galen very well. If then Galen was using this chapter, he was using a text in which the words καὶ γὰρ ἡ ναὺς, etc., did not occur, and I may therefore strike out these words as a gloss. But perhaps these words do suit Galen, and it is only my explanation of Galen that is wrong? This, I think, is forbidden by Galen's words, διὰ τὴν αὐτὴν αἰτίαν.

Suppose now that Galen was not using or referring to Aristotle. He is then an independent authority; but one must attempt to construe the more important Aristotle on the basis of the words καὶ γὰρ ἡ ναὺς, etc., forming part of the text. The passage refers to the inboard length of the oars ἐν μέσῃ τῇ νηὶ. νηὶ here is either confined to a moneres or not. If it is, as is often assumed, then the passage construes well enough, but has no bearing whatever on the accepted theory, or my theory, or any other theory. But if νηὶ refers to, or includes, a trireme (as it obviously must), then, (if the words καὶ γὰρ ἡ ναὺς, etc., be included) μέσῃ means amidships, μεσόνεοι mean what I call zugites, and my zugites do more work than my thranites: and as this

¹¹⁴ This (the word αἰτία) is conclusive against μέσαι here meaning amidships, whatever theory we adopt as to the trireme; for the oars amidships would not have to be the longest to make the ends come level; indeed if they were the longest the ends would not come level. It seems equally conclusive against Conybeare's view that μέσαι means the middle of three superposed banks.

¹¹⁵ The explanation is substantially Fincati's, though he does not apply it to Galen. He says they had two zenzile triremes at Venice, in one of which the oars formed one even line in the water. To the same effect is Aristot. *de part. anim.* 4, 10—the handle of the κώπη μεσόνεως traverses a greater space.

¹¹⁶ The chapter is too long to cite in a note.

will not do, the passage must be taken to shew that the term 'zugites' means a row or ordo, and not a squad; this is of course against me.¹¹⁷ Assuming then for a moment that it *does* shew that the zugites were an ordo (and it does not matter now whether we take the accepted theory, or Bauer's, or Fincati's, they all agreeing that the zugites were an ordo), we land in a very grave difficulty over the *παρεξαιρεσία*. This must of course have formed a straight line parallel (more or less) to the long axis of the ship, and not a curved line following the ship's side, one object being to give the oars all along approximately equal leverage throughout each ordo;¹¹⁸ and if so, the oars amidships of any ordo could not be longer inboard (*i.e.*, from the *σκαλμός*) than the others of the same ordo in any ship, such as a trireme, which carried a *παρεξαιρεσία*, the *σκαλμοί* being of course in the *παρεξαιρεσία*. If then this is well founded, *μέσση* cannot mean amidships, and therefore *μεσόνεοι* must have the same meaning as in Galen,^{118a} and I may omit the words *καὶ γὰρ ἡ ναῦς*, etc., as a gloss added by some one who was ignorant of the *παρεξαιρεσία* and was thinking of a ship with a curved side. If this be done, Aristotle means what Galen means. I do not then myself think that Aristotle is against me: but I hope I have stated the difficulty fairly.

I need only refer to two other passages. Polyæn. 3, 11, 7; Chabrias, training some new men, took out the triremes' oars, and placing on the beach great logs (*ξύλα μακρά*), so that the men sat one by one (*ὥστε ἐφ' ἓνα καθήσθαι*), thus taught them. I think the natural meaning is that in the trireme they did not sit *ἐφ' ἓνα* (else why be at pains to mention that they so sat on the beach?), but *ἐπὶ* some other number, *i.e.*, *ἐπὶ τρεῖς*, three on a bench; but I cannot press this. Herod. 5, 33. If a trireme was a zenzile galley, with the three oars issuing side by side from one opening, we can explain what Skylax' head was put through. The idea of a porthole for one oar larger than a man's head is not only unlikely in itself,^{118b} but flatly contradicted by every published monument known to me that shews portholes: and Herodotus does *not* speak of the man's head as being near the water, as many seem to assume.

The evidence then, for what it is worth, though terribly scanty and unsatisfactory, does lend colour to the idea that, as regards triremes, Fincati is, in the main outlines, right:¹¹⁹ and we come round once more to the

¹¹⁷ The argument under *B, C, D,* and *E* is independent of the meaning of 'zugite.'

¹¹⁸ This was the object of the *telaro* in the mediaeval galley, and of the first importance, as Jurien de la Gravière points out. It gave the boat, seen from above, the look of a parallelogram with two projecting ends; see the frontispiece and pl. 7 in Furtenbach, also the rearmost trireme in Fig. 1, *ante*. If I am right, then the *παρεξαιρεσία* itself, though possibly inclining (as from stern to bow) somewhat

toward the long axis of the ship, must have been somewhat broader at the bow end than amidships; and this agrees well with Thuc. 4, 12, where Brasidas falls wounded and swooning on to the *παρεξαιρεσία* and does not roll off.

^{118a} I take *μεσόνεοι* to be a technical term; something like *vogue-avante*.

^{118b} Even Assmann now doubts it; *Jarhb.* 1905, p. 89.

¹¹⁹ Fincati could at least claim that his boat would go: according to a writer in the

conclusion to which we have been tending throughout this paper, that the course of development in the Aegean was very similar to that which took place later in the Adriatic.¹²⁰ Differences in detail, of course, there must have been; ¹²¹ but the conclusion as a whole does not seem to be in conflict with common sense.

One thing however seems to me to be abundantly clear: no evidence has yet been put forward that compels, or even seriously invites, us to believe in the accepted theory: and it is to be remembered that the burden of proof is on those who uphold that theory.

W. W. TARN.

APPENDIX.

I have received from Mr. Cecil Torr a number of critical notes on both parts of the above article, and by the courtesy of Mr. Torr and of the editors of this Journal it has been arranged that the substance of them shall be here published, with my replies. Mr. Torr's remarks are given verbatim as far as possible, in inverted commas.

- p. 139. If the rowers were in three divisions, 'how did they get their names? I conceive that the thalamites sat in the thalamos, or hold; the zugites sat on the zuga, or beams, which formed the upper limit of the hold; and the thranites sat on thrani, or thranyes, which were seats above the beams.'—There is I think no evidence for these thrani; and as to thranites, I should adopt Prof. Ridgeway's suggestion (*Class. Rev.* 1895, p. 166), and derive the term from *θρήνυς*, the elevated step or platform at the stern on which stood the helmsman. As to thalamites, when an open boat first began to be partly decked, there would be a thalamos or cabin in the *βους*; hence the name. In Timaeos ap. Ath. 2, 37d *θάλαμοι* are the cabins of a merchant ship; and I know of no passage where the word simply means 'hold.' Pollux 1, 87 says that the *ἔδαφος τῆς νεώς* was called *κύτος καὶ γάστρα καὶ ἀμφιμήτρον*, and that in the part where the thalamites sat it was also called *θάλαμος*.

Academy, 1883 p. 219, it attained the great speed of 9 miles an hour, *i.e.*, nearly three-quarters of the pace of an average University crew from Putney to Mortlake. Unfortunately I have never seen any details of what the boat exactly was.

¹²⁰ So far as we have gone, there has been nothing to lead one to distinguish the Roman trireme from the Greek. It is however just possible that in Polyb. 1, 20, 15, we have a reference to a trireme a scaloccio; the Romans, he says, built their whole fleet (quinqueremes and triremes) to a Carthaginian model; and if, as suggested in this paper, the quinqueremes had 5 men to an oar, these Roman triremes may have had 3. This would only accord still further with what happened at Venice, where

triremes on both systems are said to have been built. But even were this so, the scaloccio trireme (if I am right as to Galen's meaning) was not the one that survived in the Aegean. At Venice, the galleys a scaloccio killed the trireme a zenzile.

¹²¹ The length of the oars, for instance. It might be attractive guesswork that the bench rose a little from the ship's side inboard and that the oars had separate portholes very close together; this would much resemble Bauer's theory, I think, and might be a useful subject for experiment. It has been suggested by Mr. Cook, whose citation of the *τρίσκαλοι* *vases* of Aesch. *Pers.*, 679, for the zenzile trireme is most happy, as a reference to Fig. 2 (*ante*) will shew.

- pp. 140, 141. Polyæn. 5, 43 and 3, 11, 14; Polyb. 16, 3. 'The Athenian triremes had sixty-two oars in the thranite (or highest) bank, fifty-four oars in the zugite (or middle) bank, and fifty-four in the thalamite (or lowest) bank. Consequently, the thranite bank of oars was longer than either the zugite or the thalamite bank. And this would naturally be the case, for all three banks would start from abaft the catheads, and the thranite (or highest) bank could extend further back toward the stern than the other two banks, owing to the sharpness of the run in ancient ships.' The three passages in question refer 'to the part of the stern to which the thranite bank extended.'—The numbers 62, 54, and 54, are the highest of various numbers given for triremes by the Athenian lists; but it does not follow that all these oars were in use at once. However, if Mr. Torr could shew that Calliades' ship was an Athenian trireme, and that a trireme had three superposed banks, his explanation might do for Polyæn. 5, 43. It cannot apply to the *trihemiolia* in Polyb. 16, 3, which was rammed *κατὰ μέσον τὸ κύτος*; and Polyæn. 3, 11, 14 depends on the meaning of *παρεξαιρεσία*; see post.
- p. 140. 'In rendering Polyæn. 5, 43, the word *πηδάλιον* is taken three times to mean "steerage" and once to mean "stern." It really means "steering-oar." The phrase *τὸ πηδάλιον ἔσχαζε* is translated "kept using his steerage." It means "kept lifting his steering-oar out of the water," i.e. ceasing to use it for steering.'—'Stern' does not occur in my rendering of Polyænus, but in my own account of what happened, and is not meant for a translation of *πηδάλιον*. There is no instance, I think, of *σχάζω* meaning 'to lift.' It means 'to cut'; and when it is used in the phrase *κώπην σχάζειν*, 'to stop rowing,' the meaning is that the oar is (naturally) dropped flat on the water, so that the edge of the blade cuts through the surface; this was known to the Scholiast on *Clouds* 107 *σχάσαι γὰρ δεῖ καὶ ὥσπερ διαστῆλαι καὶ διασχίσαι τὸ ὕδωρ τὴν κώπην*, though he is mistaken in adding *ἐρέσσουσιν*. From this meaning again are derived two others (*ἀπὸ μεταφορᾶς τῶν ἐρεσσόντων*); simply 'to stop,' and simply 'to drop' (Xen. *Kyn.* 3, 5). *ἔσχαζε τὸ πηδάλιον* is then 'he kept dropping his steering-oar into the water,' i.e. making use of it; and this is the only rendering of the passage that makes sense, for Calliades must have turned his own ship now to one side and now to the other in order to avoid the enemy *καθ' ὁπότερον ἂν ἐμβάλλειν μέλλοι*. No doubt it was a technical term.
- p. 141. Note 10. "The new steering-oars were through the *παρεξαιρεσία*: therefore, the old ones were not." This does not follow. Polyænus says *διὰ τῆς παρεξαιρεσίας κατὰ τὰς θρανίτιδας κώπας*. He is specifying a point in the *παρεξαιρεσία* further forward than the position of the old steering-oars, namely, the point to which the thranite oars extended. Then as to *παρεξαιρεσία* in *Peripl. Pont. Eux.* 2, "the reference must be to a *higher* point, not a *different* point," i.e. from *κατὰ τὰς κώπας*. Of course, it is a *higher* point, because the ships were higher out of water at the ends (*παρεξαιρεσία*) than in the middle (*κατὰ τὰς κώπας*). But, unless it is a different point, the passage is meaningless. Then, Thucydides vii. 34 is made to mean exactly the reverse of what it does mean. The ships met the others bow to bow (*ἀντίρροποι*) and were damaged in the parts next the bow (*παρεξαιρεσία*). It is unfair to Thucydides to make him say that the ships met bow to bow and thereby damaged themselves amidships. "But the absolutely decisive passage is Polyænus, iii. 11, 13. Chabrias stretches skins over the *παρεξαιρεσία* of *each side* of the ship and nails them to the deck above, thus making a *φράγμα* which prevented the waves washing in and the oarsmen looking out." If the sea had been abeam, he would only have put the skins along the windward side of the ship. As he put them *on each side* of the ship, it must have been a head sea or a following sea; and, as one of his objects was to prevent the rowers seeing the approaching waves, it must have been a following sea, for the rowers faced aft. In fact, there was a following sea in which his ship was likely to be pooped, and he protected her at the stern (*παρεξαιρεσία*).—I think there is no passage in which *παρεξαιρεσία* must mean

stern or bow, and cannot mean an outrigger or some analogous structure. I grant that *Peripl. Pont. Eux.* 3 can be taken either way; and that Polyæn. 3, 11, 14 is not quite conclusive; though if *παρεξαιρεσία* be the stern, why is it mentioned at all? And how is *διά* to be construed? Did Chabrias cut a hole in the timbers of the poop? (*Anc. Ships* fig. 36 illustrates how he put out his new steering-oars, I think.) Thuc. 7, 34 states that no Athenian ship sank, but seven became *ἄπλοι, ἀναρράγεισαι τὰς παρεξαιρεσίας*. It is incredible that none sank if their bows were torn open. Two triremes ramming bow to bow would rarely meet stempost to stempost with accuracy; the stems would slide each past the other, and carry away the forepart of the opponents' outrigger, which extended most of the ship's length. (I said nothing about 'amidships.') This was why the Syracusans strengthened their *ἐπρωτίδες*, i.e. the forward ends of the outriggers. Cf. the distinction between *ἀναρρήξαι τὴν παρεξαιρεσίαν* and *ἀναρρήξαι τὴν πρῶραν* in Pollux 1, 124. Polyæn. 3, 11, 13 is decisive that the *παρεξαιρεσία* was something extending along each side of the ship so far as the rowers extended. Chabrias stretched skins *ὑπὲρ τὴν παρεξαιρεσίαν ἐκατέρου τοίχου* (which in silver Greek can only, I submit, mean the *παρεξαιρεσία* of each side of the ship), and nailing them to the deck above made a *φράγμα πρὸς τὰς παρεξαιρεσίας* (plural), which (among other things) prevented the men getting wet and prevented them seeing the waves, *οὐχ ὁρῶντες διὰ τὴν τοῦ φράγματος πρόσθεσιν*. No arrangement on the stern could possibly have this effect, apart from the reference to cataphracts in *φράγμα*; and Chabrias could not possibly have carried out his idea *at sea*, with a crew so nervous that he was afraid of their upsetting the boat. The old interpretation of *παρεξαιρεσία* as stern or bow is in fact a guess of the scholiast on Thucydides from the look of the word, τὸ παρὲξ τῆς εἰρεσίας.

Mr. Torr then refers to Dr. Assmann's view of the *παρεξαιρεσία*, which I have adopted, as being based on a misinterpretation of the prow of Samothrace, the projections on which (as in *Ancient Ships*) he calls cat-heads, comparing a coin of Cios (*Anc. Ships* fig. 23).—I have nothing to add to what I have said on this monument. But if one can prove the outrigger from the texts, it lends much support to Dr. Assmann's view that what the monument shews is an outrigger.

pp. 142, 143. 'I am not concerned with evidence of class (2). But Pollux 1, 87, shews by his mention of *θάλαμος, ζυγία, and κατάστρωμα* that he supposed the banks of rowers to be superposed.'—The most that can be claimed for Pollux is, that he can be read to suit either theory, like many other passages. But he does not refer to triremes only; he is speaking generally; and for three centuries the standard warship had been the quinquereme. As to there being three classes *only*, Mr. Torr says 'The men in the highest bank of the tesserakonteres were called thranites, as was to be expected; but nothing whatever is known about the names for the men in the other banks in the tesserakonteres, or any other ships of higher rank than triremes.'—One cannot *disprove* this; but we have no right to confine Pollux 1, 87 and 119 to triremes, and most recent writers have taken the simple view, that in all ships there were only three classes. It is a pity that the text of Polyb. 26, 7, 10 is corrupt.

pp. 143, 144. 'The forms "*τετρακίπορος* and so forth" may not occur, but their equivalents do. Aelius Aristides, *Rhodiaca* p. 341 *δικρότους καὶ τρικρότους καὶ εἰς ἑπτὰ καὶ εἰς ἑννέα στοίχους*.'—*ἑπτὰ στοίχους* is septem ordines, which we know (from Livy and Eutropius) would be the translation of *ἐπτήρης*; it is not *ἑπτακίπορος*. In the second century A.D. *δίκποροι* were probably biremes; and *τρικρότους* is used here for 'triremes' because the writer has just used *τρήρεις* for 'warships.' A professional rhetorician like Aristides could not write *τρήρεις ὑπήρχεν ἰδεῖν, δῆρεις καὶ τρήρεις καὶ εἰς ἑπτήρεις καὶ ἑννήρεις*, which is what he means; he has done all he can to vary the *sound*, that is all.

pp. 144, 145. App. *Mith.* 12. 'There is nothing there to shew that the term *δίκπορος*

excludes hemiolia. I conceive that *δίκροτος* includes hemiolia as well as the true bireme and the bireme of the Liburnian type. Appian's statement is that the pirates gave up using myoparones, and took to using *δίκροτοι* of other sorts besides the hemioliai, and also triremes.' Then follows the explanation of hemiolia as a two banked ship given in *Ancient Ships*, for which there is no evidence.—As this is important, I quote Appian (Mendelssohn). *πειρατὰς . . . οἱ τὸ μὲν πρῶτον δλίγοις σκάφεσι καὶ μικροῖς οἶα λησταὶ περιπλέοντες ἐλύπουν, ὥς δὲ ὁ πόλεμος ἐμῆκύνετο, πλέονες ἐγίγνοντο καὶ ναυαὶ μεγάλας ἐπέπλεον. . . ἀντὶ τῆς γῆς ἐκαρποῦντο τὴν θάλασσαν, μυοπάρωσι πρῶτον καὶ ἡμιολίαις, εἶτα δίκροτοις καὶ τριήρεσι κατὰ μέρος περιπλέοντες.* To the man who wrote this, *ἡμιολία* and *δίκροτος* are mutually exclusive terms; and Mr. Torr's explanation is forbidden by the Greek.

pp. 144, 145. Arr. *Anab.* 6, 5, 2. 'The context shews that these *δίκροτοι* were hemioliai. By making the statement refer to triakontors, instead of hemioliai, the author has to shew that *κάτω* does not mean lower; and he does not seem to me to shew it.'—Once it is established from Appian that the hemiolia is not *δίκροτος*, the meaning of *κάτω* follows with almost mathematical precision.

p. 146. Mr. Torr claims *διήρης* and *δίκροτος* in Pollux 1, 82 as synonyms. It is not very important; but no doubt by the second century A.D. they were practically synonyms.

p. 150. App. *b.c.* 4, 85. 'Some ships got into the whirlpool at Scylla, and the crews were upset, not being used to it. It seems forcing the translation to say that the men were knocked off their legs rather than off their seats.'—I submit that *οὔτε ἐστῶτες βεβαίως* cannot possibly refer to sitting.

p. 154. 'Oros. 6, 19 is quoted as if he were contrasting Antony's dekereis with other dekereis, whereas he is contrasting them with the ships in Octavian's fleet which were all smaller than dekereis.'—Very possibly this is right; but it does not affect the other evidence for the size of Antony's ships. They must have resembled galleasses.

Note 80. 'See *Anc. Ships* p. 57, n. 131' which states that *ζυγόν* in *Agam.* 1618 is some bench at the stern.

p. 205. 'Florus ii. 21 (iv. 11) uses *remortum* and *remigum* indifferently, because there was one man to one oar.'

p. 206. 'The Trajan column trireme cannot be ignored. It is not true that the oars "are just plastered on anyhow." They are clearly intended to be arranged in *quincuncem* . . . which is the natural developement of the zigzag . . . that you mention in the biremes.'—But what the monument *shews* is not a quincunx at all, but . . . ; and is not that 'anyhow'?

p. 207. The prow of Samothrace. 'Your argument for the hepteres, which you develop at so much length, does not seem to have very much foundation. How can one assume that it has anything to do with Demetrius' victory at Salamis? And why should Nike be travelling about on one of Demetrius' ships rather than her own? Her ship was a familiar thing before that date; see *Revue Arch.* 26 (1895) p. 161.'—Mr. Torr's article in the *Revue Arch.* gives two figures of Nike, one on, and one hovering over, the prow of a ship; but there is nothing to suggest that the ship is Nike's own ship. Is there any other evidence? As to the Nike of Samothrace, Demetrius' well-known coins shew that she was set up to commemorate some victory of his by sea, and we know of no other but Salamis; had there been any other of importance, Plutarch would hardly have passed it over.

Note 94. 'I conceive that these lembi were narrow enough to have the oars sculled in pairs.'—No doubt biremis *can* mean a sculling boat; but had Philip two complete fleets of lembi? Or did he put sculling boats into line against the Rhodian quinqueremes at Chios?

- p. 209. The Dipylon ship *J.H.S.* 1899, Pl. 8. 'I doubt if it is a bireme. I am in favour of its being a ship of a single bank with *περίνεα* oars rowed from the *κατάστρωμα*.' —I by no means exclude the idea that (say) a state ship might have been thus rowed; I believe there is a case at Venice, and possibly Antigonos' *τρίπυρρος* was something of the kind. But in the case of this Dipylon ship the explanation does not seem to meet any of the three difficulties given in n. 96.
- p. 209. As to biremes being unknown to every writer before Caesar. 'Damastes (apud Plin. vii. 56 (57), 207) attributes the invention of biremes to the Erythraeans; and Damastes was a contemporary of Herodotus. Also in the catalogue of the ships *Il.* 2, 509, 510, there is a pretty clear allusion to biremes.'—The allusion in the *Iliad* is merely to ships with 120 men each. As to Pliny. It is not a case of Damastes *apud* Plinium, but of an assertion of Pliny's own, even supposing Damastes of Sigeum to be meant; and Pliny's list is quite untrustworthy. 'Biremem Damastes Erythraeos fecisse: triremem Thucydides Aminoclem Corinthium (our Thucydides says nothing of the sort, see 1, 13, 2; it is Pliny's own interpretation of him); quinquerem Mnesigiton Salaminios (directly contradicted by the circumstantial account in Diodorus); ab ea (hexeres) ad decemremem Mnesigiton Alexandrum Magnum (almost certainly untrue, see note 51). In the face of this kind of thing, Pliny's statement as to Damastes is of very slight value. No doubt a bireme was experimented with before a trireme; my point is that it never came into use *at all* in early times, while Mr. Torr thinks it did, and was driven out by the trireme. Then why no reference to it?
- p. 209. 'If Sennacherib's ships are not biremes, what are they?'—I do not know. But if the pentekontor was really not invented till 704 B.C., they cannot be *long* ships at all. I think they are *round* ships (see figs. 10 and 11 in *Anc. Ships*) beginning to be adapted for fighting; two have rams, one has none.

Mr. Torr does not comment on the difficulty I have felt and expressed over the bireme question generally.

'Lenormant relief. I have no doubt at all about the accuracy of what you call the older view. "The *raised* lumps A A cannot of course be portholes." They presumably are portholes with *ἀσκόματα*. "And Y and Z are part of the hull." Similar reasoning would make X part of the hull; which it certainly is not. Why should not Y and Z cross E E (the lower waling piece) just as much as X crosses D D and E E (the two waling pieces) and F F (the gunwale)? If the relief disproves one, it disproves the other.

'I presume you admit that X are oars rowed against tholes on the gunwale F F, and that D D and E E are the waling pieces. Then one gets the ports (with *ἀσκόματα*) of the third bank just where one expects to find them, namely between the two waling pieces and vertically below the tholes of the first bank. One would expect to find the ports of the second bank between the upper waling piece and the gunwale. The difficulty of course is that the oars of the second bank (Y) seem to go right up to the lower side of the gunwale. Now there is a double set of supports under the gunwale, one running down to the upper waling piece and the other running down to the lower waling piece. One explanation is that the sculptor was rather careless, and continued the oars (Y) as far as the gunwale in the same way as these supports. Another explanation is that these supports imply that the gunwale projected a little way over the side of the ship, and thus hid the portholes.

'I think my diagram, D. and S., fig. 5275, helps one to understand this relief.' —I submit that this is reconstruction, not explanation; precisely as fig. 5275 in Dar.-Sagl. is. The monument shews that X crosses D D, E E, and F F, and does not shew that Y and Z cross E E: that is the point. One cannot reconstruct a relief on the footing that it has to shew three banks, and then use it as evidence that there *were* three banks.

Note 107. 'Polyaen. 5, 22, 2 is not conclusive that the oars could be got out quickly. Diotimos would begin getting his oars out as soon as the enemy saw his hulls, say five miles off. The stratagem would answer only so long as his ships were hull down. But the passage seems to me to shew that the oars could not have been passed in from the outside, as you suggest. Pollux, I think, is wrong; the thing that he mentions was called *τροπός* or *τροπωτήρ* and *κωπητήρ*, not *ἄσκωμα*.—Diotimos must have let the enemy come close up, or he could have got back to harbour; but I have omitted the words 'is conclusive' from the note. But the *practical* difficulty of getting out the oars at all, whether from inside or otherwise, in a trireme arranged on the accepted theory is to my mind prohibitive. Whether Pollux here be right or wrong (I think he is right), there is no real evidence for the current view of the *ἄσκωμα*. Its use was to lessen friction.

n. 107. 'The latter part of this note seems to rest on a misconception. The portholes did not serve as rowlocks. The oars were rowed against tholes.'—By all means. My difficulty, *i.e.* the strain on the ship's timbers, remains (she was very lightly built); and I should like an expert opinion. I am thinking of the way a racing eight strains in spite of every precaution.

p. 215. Herod 7, 36. 'Probably the bridge had longer supports where the supports rested on pentekontors than where they rested on triremes.'—Perhaps. The bridge was laid on great cables. No doubt it may be possible to get round the question of *height* as regards a trireme; it is with the quinquereme that it becomes so formidable.

p. 215. Galen. Mr. Torr is inclined to think that he is referring to one *tier* of the trireme's oars only and also to the aspect of the oars inside the ship. The word *αἶρια* I think forbids this, as I have shewn (n. 114). It also assumes that there *were* tiers, which is rather the point at issue.

p. 216. As to Aristotle. I do not reproduce Mr. Torr's criticism because (given his premisses) everyone will agree. If there was no such thing as an outrigger, and if Galen is not using Aristotle, (these are his premisses), then *μεσόνεοι* are the men amid-ships, and Aristotle is against my view under A. But if either of these premisses be false, my argument holds. Anyhow Mr. Torr does not claim that Aristotle supports the theory of superposed banks, for he says 'Aristotle is stating a general proposition, *i.e.* he refers to any tier of oars (it does not matter whether the ship had one or more).'

p. 217. Polyaen. 3, 11, 7 ἐφ' ἑνα. 'I take this to mean that each pair of rowers (port and starboard) sat on the same piece of timber, instead of sitting on separate seats. Cf. Leo, *Tactica* 8 and Ap. Rhod. 1, 395, 396 quoted in *Anc. Ships*, notes 46 and 110.'—Neither of these passages refers to triremes, and I doubt if the above explains ἐφ' ἑνα; but I have said that I cannot press the passage.

Finally, Mr. Torr considers it hazardous to say that something which existed in the mediaeval type existed in the ancient type unless one can shew that it existed also in the intermediate or Byzantine type. But I claim neither continuity of tradition nor identity; only analogy.

Mr. Torr sums up as follows :—

'As to your propositions.

A. I do not see that you have any evidence at all for the assertion, "thranites astern, zugites amidships, thalamites in the bows." Your evidence is only that the thranites were furthest astern. And there is quite another explanation of that, namely, that the thranite bank, which had sixty-two oars, reached further aft than the zugite and thalamite banks, which had only fifty-four.

B. To establish this translation of the terms *τρικפורος*, etc., you would have to show that *δίκפורος* and *ἡμιολία* are mutually exclusive in App. *Mith.* 92, and that *κάτω* does not mean *lower* in Arr. *Anab.* vi. 5, 2.

C. Of course, there is a danger in generalizing from a limited number of instances; but, I think, people were aware of that already.

D. I cannot find anything in your paper to support D (1), and hardly anything in support of D (2). Of course, D (2) is really a question for a naval architect; and I fancy he would decline to express an opinion without more *data* than can be given him.

E. This is supposed to be dealt with in Part II., but I do not see that you have really tackled the question.'

W. W. TARN.