the last three syllables of the perfect of ἀνατρέπω (τέτροφεν) underlines the link between 'upsetting' and 'upbringing'.

In short, Andocides is trying to turn the tables on his critics' accusations. In this word play and punning Andocides is emphasizing the fact that Callias, one of his critics, was evil from the very beginning, a severe religious flaw which inextricably bound his role as priest with his outrageous private life. Hipponicus may have reared Callias, but Callias was a holy terror and not worth any sacrifice.

The University of Memphis CHERYL ANNE COX

ON THE CONSTRUCTION OF THE 'SYRACUSIA' (ATHENAEUS V. 207 A–B)

It is perhaps significant that one of the more informative texts on ancient shipbuilding predates the period in which Greco-Roman shipping flourished. It is Homer's description of how Odysseus built a ship (σχεδία) on the island of the nymph Calypso, with which he intended to return to his native island of Ithaca (*Od.* 5.244–57). The text is of exceptional interest because it gives as early as the eighth century B.C. a step-by-step description of the tenon-and-dowel 'shell-first' method typical of Greco-Roman ship-building, which has been so amply confirmed in the last few decades by underwater archaeology in the Mediterranean.

The early date of the Homeric description, well before the period of dominance of Greco-Roman shipping, could indicate a foreign origin of the tenon-and-dowel shipbuilding system. Actually, in Cato's description of a large wooden disk of an oil press which apparently was constructed in this manner (*Agr.* 18.9), it is called by the name of *coagmenta Punicana*, Phoenician joinery,[1] therefore this attribution, whether it is correct or not, should not surprise us.

Because of the general concordance between Homer's description of this method of shipbuilding and the results of nautical archaeology, it is tempting to think that no other method was used. However, in the last few years a historical picture of ancient shipbuilding has emerged which is not a simple one. Not only have wrecks been found which have been built by a method which differed on a number of points from the standard 'shell-first' system, but analyses of ancient texts also show that deviations from it did exist.[2]

Our aim is to discuss here a classical text in which the deviation from the standard 'shell-first' system appears to have been so large that it would seem more correct to regard it as a variation on the 'skeleton-first' principle. Although in some wrecks indications have been found showing that not all ribs were inserted after the entire shell of the hull had been finished, in this instance there are strong indications that, except perhaps for this first few strakes, when strakes were added to the shell during construction of the hull, they were fastened to all of the frames, which had been at least partly pre-erected. The finding has been briefly discussed earlier by one of us;[3] we now present a more complete analysis.

[1] A. W. Sleeswyk, 'Phoenician joints, *coagmenta punicana*', *IJNA* 9.3 (1982), 243–4.

[2] Cf. P. Pomey, 'Plaute et Ovide architectes navals', *MEFR* 85 (1973), 401–9; F. J. A. M. Meijer, 'Ovide, *Heroïdes* 16.112 et la construction navale romaine', *Mnemosyne* 43 (1990), 450–2.

[3] A. W. Sleeswyk, 'Voorwoord', in A. J. Hoving, *Nicolas Witsens Scheepsbouw Konst Open Gestelt* (Franeker, 1994).

The text which concerns us is by the Greek author Athenaeus of the third century A.D. In spite of the magnitude of his extensive work *Deipnosophistae*, not much is known about his life and social position, although it may safely be said that he was fascinated by ships, in particular by the Behemoths of the Hellenistic period, because in his work no less than three of them are described with verve. These are: a war ship (5.203e–204d), a large river boat (5.204d–206d), and a grain freighter with an accommodation for passengers comprising every known luxury of the day (5.206d–209b). The fighting ship was the *tesserakonteres* or 'forty', the largest naval vessel of the classical period in the Mediterranean, the river boat was the *thalamegos* used by Ptolemaic officials for cruises on the Nile. Both had been built for Ptolemy IV Philopator (240–204 B.C.). Finally, the freighter was the *Syracusia*, a huge floating showpiece that the tyrant of Syracuse, Hiero II (265–215 B.C.), caused to be built.

The *Syracusia* must have had a capacity close to or surpassing 2000 tons, judging by the amount of freight described in the text.[4] She must have been an exceptional ship, not only because of the sumptuosity of her accommodation, but even more so because of her dimensions. Unfortunately, these are not mentioned as such in the text, but may be deduced not only from her capacity, but also from Athenaeus' statement that the timbers of sixty quadriremes were used for her construction, which leaves no doubt that she was a true Behemoth of over sixty metres length (a quadrireme was larger than a trireme, which was nearly thirty-six metres long and had a beam of more than five metres). The conclusion is supported by the number of shipwrights employed in her construction: 300 were needed to finish half the ship in six months, excluding supporting personnel (5.206f–207a).

The main interest of Athenaeus' text resides in two fragments of the description of the method of construction. Again, the text is not as explicit as one might wish, but it does contain indications that the hull was not built according to the standard 'shell-first' method. We thus formulate our finding with some reticence, as the first and most important text fragment is very short and preceded by a lacuna. The latter follows after Athenaeus' explanation that building part of the hull prior to launching required six months. In our interpretation, the first sentence after the lacuna concludes the description of the method of construction of the first building phase.

That remaining sentence is interesting enough. Athenaeus (5.207a) states that *καὶ ταῖς ἐκ μολίβου ποιηθείσαις κεραμίσιν ἀεὶ καθ' ὃ ναυπηγηθείη μέρος περιελαμβάνετο* which, translated literally, reads: '...and each time that part ⟨of the ship⟩ was completed, it was always covered by tiling made of lead.' The words *καθ' ὃ ναυπηγηθείη μέρος* in this text are crucial. They state unambiguously that each time that part of the shell had been completed, it included its being covered by lead sheathing, a procedure which differed fundamentally from normal shipbuilding practice.

The latter consisted of finishing first at least the entire part of the shell which was to be protected by lead sheathing tiles were fixed to the wooden shell by short nails of bronze or copper. In this case all treenails and all of the large metal nails joining the frames to the shell were already in place prior to mounting any piece of the protective sheathing.

[4] The text says (5.209a): 'The vessel was loaded with 60,000 measures of grain (*σίτου... μυριάδας ἕξ*), 10,000 jars of Sicilian salt fish (*ταρίχων δὲ Σικελικῶν κεράμια μύρια*), 20,000 talents of wood (*ἐρίων τάλαντα δισμύρια*), and other freight amounting to 20,000 talents (*ἕτερα δὲ φορτία δισμύρια*)'. The problem what tonnage this load represented has been discussed authoratively by L. Casson, *Ships and Seamanship in the Ancient World* (Princeton, 1972²), 185–6; he arrives at a total of 1940 tons, a conservative estimate.

The procedure in building the *Syracusia* was different in that here the stage of fastening the shell to the frames preceded that of mounting the protective lead sheathing only by a few strakes. The first process was finished only shortly before the second on the hull; they took place nearly simultaneously instead of consecutively. Each time the lead tiling had been mounted on a part—a few strakes—of the hull, that part of the hull had reached the final stage of its construction, as Athenaeus' text explicitly states.

It is easily understood why the ribs and the planking had to be fastened to each other prior to the mounting of the sheathing in any case: if the frames would have to be inserted after the sheathing had been mounted, the fastening treenails would have had to penetrate the lead plating, which would have largely negated the protection against *teredo navalis* for which the lead sheathing was provided. An important reason for the particular mode of construction of the *Syracusia* may well have been that it obviated the difficulty of access underneath the wide wooden hull if the latter had been completed first.

The second text fragment is seen to confirm the building sequence deduced from the first. Athenaeus (5.207b): *ὡς δὲ καὶ τὰ λοιπὰ μέρη τῆς νεῶς ἐν ἄλλοις ἓξ μησὶ κατεσκευάσθη καὶ τοῖς χαλκοῖς ἥλοις πᾶσα περιελήφθη, ὧν οἱ πολλοὶ δεκάμνοοι ἦσαν, οἱ δ' ἄλλοι τούτων ἡμιόλιοι–διὰ τρυπάνων δ' ἦσαν οὗτοι ἡρμοσμένοι τοὺς σταμῖνας συνέχοντες· μολυβδίναις δὲ Κεραμίσιν ἐπεστεγνοῦντο πρὸς τὸ ξύλον, ὑποτιθεμένων ὀθονίων μετὰ πίττης*, which we translate as: 'The remaining parts of the ship were finished in another six months. It was fixed entirely with bronze rivets, most of them weighing ten pounds, while the rest were half as large again. These were fitted in their place by means of augers, and they held the futtocks together. Fixed to the timbers was a sheathing of leaden tiles, under which was canvas covered with pitch.'

All of this would have seemed familiar and perfectly clear to a nineteenth-century builder of wooden ships. If these ships were sheathed, the protective metal would have been copper rather than lead (coppering was introduced in the 1760's in the British and French navies), but the tiles were still customarily mounted over tar-impregnated cloth covering the hull.[5] In large ships the frames were often built of paired long and short floors and paired overlapping futtocks.[6] These pre-erected frames were thus built up of relatively short timbers solidly joined to each other. The rivets joining pairs of futtocks were indeed the largest and heaviest which were used in building the hull.

Although this passage in Athenaeus' text suggests that the frames in the *Syracusia* were probably similar in construction, it does not follow that they were, as the frames in many of such nineteenth-century wooden ships, built up already in their entirety and that they formed part of a finished skeleton prior to the planking of the hull. It seems more likely, because it would have been closer to the 'shell-first' method predominant at the time, that the composite frames progressed timber by timber just in advance of the planking of the ship, just as the planking advanced the mounting of the lead sheathing by a few strakes. As regards the planking, it would not have made any difference whether or not the frames were completed before.

Actually, a process much resembling a step-by-step 'skeleton-first' method is depicted in the 'Album de Colbert' (1670), where it is shown that the third futtocks went up only when about half of the hull of an eighty-gun ship had received its planking. In the *Syracusia* the step-by-step method would have formed a counterpart to the variation on the 'shell-first' building method which was employed in building

[5] J. Boudriot and H. Berti, *Les Frégates de 12. La Belle Poule*, 1765 (Paris, 1986).
[6] B. Greenhill and S. Manning, *The Evolution of the Wooden Ship* (London, 1988).

the contemporary Punic ship of Marsala. From carpenters' marks painted on the hull of the *Navis Punica* it could be deduced that the assembly of the hull planking and the insertion of the framework progressed together, but with the second process being always a step behind the first;[7] in the *Syracusia* the order would have been the other way around.

The question may be asked whether the building method of the *Syracusia* may legitimately be regarded as an early example of 'skeleton-first' construction. The answer depends on the criteria used. If it is regarded as essential for this type of construction that the floors were joined securely to the keel, one simply would not know. It would have been possible in the building process which we deduce from Athenaeus' text, that the first strakes next to the keel were mounted prior to the insertion of floors, after which the lead sheathing was mounted, but the text does not furnish any information on it. The criterion of floors fastened to the keel is used by archaeologists in order to establish what building method had been used in the construction of the hull, but it may attribute wrongly a 'shell-first' characteristic to a ship of which only the first few strakes were mounted prior to the frames.

Regarding the ancient wrecks in the Mediterranean found so far, none of them exhibits the characteristics of the 'skeleton-first' method, but it is true too, that none of them was of the size of the *Syracusia*. The largest wreck which is presently known, that of *La Madrague de Giens* (first half 1st c. B.C.), is that of a ship which was forty metres long and had a capacity of *c.* 400 tons. That ship was constructed by the 'shell-first' system, but with an admixture of 'skeleton-first' elements.[8] An example of pure 'shell-first' construction is encountered in the *Kyrenia* ship (fourth century B.C.), where the joinery between the strakes provided a homogeneous shell into which all frames were inserted later.

In the ship of *La Bourse de Marseille* (late second-early third century A.D.) several floor timbers had been fastened to the keel and apparently a few frames had been pre-erected prior to the construction of the shell; these frames may have been used as moulding frames during construction. This mixed construction method has been characterized as a 'construction alternée'.[9]

But even if the floors in the *Syracusia* had been mounted only after the first few strakes and even if the erection of the built-up paired frames would have been only a little in advance of the building of the shell, in our opinion the building method deduced from Athenaeus' text ought to be regarded as characteristically 'skeleton-first', because the shape of the hull would have been determined entirely by the frames and not by the strakes.

It would not have been surprising that in the construction of a large ship such as the *Syracusia* the 'skeleton-first' method would have prevailed, because the solidly joined built-up frames resulted in an exceptionally strong hull. It may be that the *Syracusia* was the prototype of the later Roman grain freighters in this respect; if a wreck of one of these be found, this question may receive its answer.

University of Amsterdam FIK MEIJER
University of Groningen ANDRÉ WEGENER SLEESWYK

[7] H. Frost, 'Lilybaeum-Marsala—The Punic ship: final excavation report', in *Atti della Academia Nazionale dei Lincei; Notizia degli Scavi di Antiquitá* 30 (1976), 228–70.

[8] P. Pomey, 'Shell conception and skeleton process in ancient mediterranean shipbuilding', in Chr. Westerdahl (ed.), *Crossroads in Ancient shipbuilding* (Oxford, 1994), 125–30.

[9] J.-M. Gassend and J.-P. Cuomo, 'La construction alternée des navires antiques et l'épave de la Bourse de Marseille', *Revue Archéologique de Narbonnaise* 15 (1982), 163–72; cf. Pomey, *Crossroads* (1994), 126.