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Reviews

Weapons of Warre: the armaments of the *Mary Rose* (2 vols)

(*The Archeology of the* Mary Rose*, Volume 3*)

ALEXZANDRA HILDRED (ed.) with many additional Contributors

1006 pp., 777 drawings and photographs; 8 pages of colour plates; 218 tables; DVD with additional images, spreadsheets, databases, recording forms, and three short films

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Although third in the running order of the *Mary Rose* project's 5-part initial publishing schedule, this is the final pair of volumes in the series to be completed. That all have now finally come to fruition is a significant milestone not only for the project, but for nautical archaeology and naval history more generally. Very few shipwreck excavations on this scale have yet been published in anything approaching definitive form. Not that this will be the last word on this long-term and multi-faceted investigation which began more than three decades ago. The Mary Rose Trust has very properly emphasized that much more work, particularly on the study and analysis of the ship and its associated equipment, remains to be done. However *The Archaeology of the Mary Rose*, in spite of shortcomings and gaps in some areas, now provides a foundation upon which future scholars can confidently build, together with the extensive archaeological resource to be housed in the new museum at Portsmouth, expected to open within two years.

But *Weapons of Warre*, which many will consider one of the project's highlights, has covered its own specialized ground so thoroughly that it will probably generate the fewest opportunities for fresh research, though it is ripe for further synthesis and incorporation into the mainstream of Tudor naval history. A vast corpus of material relating to the ship's varied armament is exhaustively presented and described in these two volumes, and the associated analyses are comprehensive, detailed, and perceptive. Alexzandra Hildred's credited status as editor is curious, however, for this is manifestly her book, most of it being written by her or in productive collaboration with other experts. From the early days of the project she has specialized in the ship's weaponry and led its subsequent study all the way to publication. She is the star, and surely should have been billed not as editor but as lead author, albeit one with a large and distinguished supporting cast who are individually credited where appropriate.

The over-arching theme is that these weapons are not just an unparalleled collection of military hardware from a pivotal moment in the evolution of warfare (though they are certainly that), but component parts of an integrated weapons-system. This reflects conscious processes of human minds grappling with the reality of looming strategic threats and adapting technologies spawned by Renaissance inventiveness and energy to create weapons and tactical concepts with which to counter them. Dominant among those minds was the brilliant, overbearing, often prejudiced, and sometimes irrational psyche of Henry VIII himself.

The first volume (Part 1) is devoted to the ship's operational background and her ordnance. The *Mary Rose* was launched in 1510, the first year of Henry's reign, as one of a new breed of carrack-built warships in which artillery constituted a major part of their offensive and defensive capabilities. Much of this was of the small wrought-iron breech-loading variety which had evolved during later medieval times, but modern cast-bronze muzzle-loading heavy ordnance was an obsession of the king's, and he amassed (in the words of the Venetian ambassador) 'cannon enough to conquer hell'. These came first from continental sources but increasingly from England as bronze-founding facilities were established, often under the guidance of imported foreign experts. In 1536 the *Mary Rose* was rebuilt to carry what was then considered to be a state-of-the-art complement of weaponry. By 1540 further additions had been made. A few years later the ship was depicted and her armament listed in the Anthony Roll (dated 1546, the year *after* she went down) (facsimile edition reviewed in *IJNA* 40.2, 454), and this is presumably what was on board when she sank.

Next comes a lengthy examination of the ship's bewildering variety of ordnance. Her core firepower as recorded by Anthony consisted of 15 muzzle-loading guns 'of brass'. Of the ten bronze pieces recovered from her wreck (six during the recent excavation, and four by the Deane brothers in 1836) five post-date 1536, which suggests that the rebuilding and re-arming of the ship in that year had not halted a continuing process of adjustment in the light of experience, technical development, availability, and evolving ideas. The ten bronze muzzle-loaders are described in terms of their physical attributes, dimensions, heraldic embellishment, and inscriptions. All carry the emblems of Henry VIII, seven showing the rose-and-crown device and

three with the royal shield. There is considerable variety in proportions and design, although two, a culverin (find no. 80A0976) and culverin bastard (79A1232), while of different bores (138 and 115 mm respectively), are so similar in appearance and decorative treatment as to suggest they are parts of a matching set.

The remains of six carriages associated with the bronze ordnance were recovered, and their study is of outstanding significance to our understanding of the evolution of naval heavy gunnery at this crucial early period. All are of the four-wheeled 'truck' type, with paired side-cheeks (one supporting the trunnions, and a stepped one behind) rebated into a flat bed to which the axles with their solid truck wheels were bolted. This design presages gunnery practices which would endure, in ever more refined forms, into the Trafalgar era, though the knotty problems of gun-drills and rates of fire, which are matters not so much of equipment but of technique and skill, are wisely avoided in the present work. A start, however, has been made by the casting of an experimental replica of the bronze culverin (81A1423) together with a replica of its carriage. The subsequent firing trials—of which a video record comes as a bonus in the 'interactive technical appendix' on the DVD at the back of Part 2—have provided data which will usefully inform further work. Excellent baseline material has also been acquired through metallurgical analysis of the castings.

Drawings of the bronze guns and associated equipment, as we have come to expect from the *Mary Rose* illustration team, are models of fine archaeological draftsmanship. But perhaps because there are still no widely-agreed archaeological conventions for depicting ordnance, some information is unclear. A rear view is really required when there is decoration around the back of the cascabel (as on three of the pieces), while a section of the bore showing any constriction or taper in the chamber, the curvature of its rear face and the set of the touch-hole, should be given whenever this information has been recorded, as it was on the *Mary Rose* guns with a fibre-optic endoscope, retrieving useful data on the iron wire coils wrapped around the cores during casting. The cannon royal 79A1276, we are told (p.48), has a bore that narrows towards the breech, yet the necessary information as to where the taper begins, and its angle, is not given. This would have provided an indication of the volume of the powder charge, since the ball cannot progress beyond the taper. Opportunity has also been missed to obtain the same information by recording the positions of balls in the loaded pieces. While it is accepted that these might have shifted (as clearly happened in demi-cannon 81A3000, p.60), roundshot extracted from unrecorded positions in the barrels or which 'disintegrated' during the process of removal (of which five instances are apparent) suggest poor liaison between conservators and archaeologists during the project's early stages. An unfortunate transposition between Figures 2.73 and 2.75 on pp.90 and 92 is noted in an *erratum*, though the proof-reading process has failed to spot the spurious scale on p.88, which if correct indicates a culverin less than a metre long.

While the superb preservation and magnificent appearance of the bronze guns have given them iconic status, the huge collection of iron pieces and their associated equipment (though much of it is decayed and fragmentary) is given equally detailed treatment, and rightly so. The Anthony Roll credits the *Mary Rose* with 76 such weapons, as well as 50 handguns. Most were wrought-iron breech-loaders, made of staves, bands, and hoops hammer-welded together. Smith-built guns of similar form have been known since the 14th century, and many scholars have considered them archaic 'second best' survivals when they occur in 16th century contexts. Yet the *Mary Rose* was one of the king's principal warships, recently upgraded to the most modern standards. Hildred and her team meticulously record, describe, and analyse the various types, relating them to the categories recorded by Anthony. The heaviest types, port-pieces with bores ranging from 150 to 200 mm and firing stone shot, were mounted in wooden beds rebated to fit the individual hoop profiles of each gun, which were lashed into them with rope. An extension at the back supported the removable breech chamber, held in place with a wooden forelock. The carriage was supported just forward of its centre of balance on a pair of solid wooden trucks or spoked wheels, while at the rear an elevating post with peg-holes allowed the angle-of-fire to be adjusted. The post, incidentally, means that the piece could not have been allowed a free recoil inboard. A replica port-piece and its carriage have been built for live firing tests, as shown in a film on the disc.

The Anthony Roll also credits the ship with two slings, three demi-slings, and one quarter-sling. These can be identified with a group of iron guns from the wreck of much smaller bores than the port-pieces (65 to *c.*100 mm), firing iron shot. Their carriage designs are similar to those of the port-pieces. Another category is the 'fowler', of which Anthony lists six. Four barrels and several assorted chambers in the *Mary Rose* collection have been tentatively identified as belonging to such guns. Their bores range from 110 to 120 mm, and they appear to have been stone-shotted. A final category of wrought-iron ordnance is the 'base', and Anthony records 30 on the *Mary Rose*. They can be identified as light swivel-guns, of which four fairly complete and eight more fragmentary examples were recovered.

An exceptionally interesting group comprises four small cast-iron muzzle-loaders with wooden stocks and hooks which could be supported over a rail to absorb recoil. These can be identified as the 'hailshot' pieces in Anthony's list, of which the

Mary Rose carried 20, and have horizontally-set rectangular bores filled (as one loaded example shows) with about 30 iron dice weighing, in total, *c.*220 gm. These guns were clearly hand-held anti-personnel pieces.

Munitions and other accessories associated with the ordnance occupy a lengthy and important final chapter in Part 1. Over 2000 individual pieces of shot were recovered—cast-iron roundshot (many with an 'H' mark cast into them), crossbar shot, stone shot (some unfinished, with marking-out lines still visible), and composite roundshot of lead encapsulating an iron core. Lead shot of various calibres is also represented. Three types of wooden canisters were identified, filled with flint beach pebbles or (less charitably) fractured flint. These would have been effective as anti-personnel projectiles, or for bringing down sails and rigging. Next, the evidence of a brass gunner's rule and a number of wooden shot-gauges is considered and quantified. Finally, a wide range of ancillary ordnance equipment is presented, ranging through gunpowder barrels to ladles, rammers, sponges, tampions, wadding, tubs, buckets, sieves, shovels, wedges, powder dispensers (for priming), priming wires, tinder boxes and linstocks (many ornately carved with dragons' heads).

The completeness and complexity of the whole assemblage presented in this work is breathtaking and quite unparalleled. The second volume (Part 2) considers hand-held weapons and, finally, how the large and apparently disparate collection of weaponry recovered from the wreck represents what was at the time an innovative and carefully-thought-through tactical system for fighting the ship. No collection of Tudor personal armament of such scope and comprehensiveness has ever been available to scholars, and a veritable regiment of experts, led by Hildred, has a field day with it. Handguns (including firing experiments with replicas), the remarkable pistol-packing gun-shields, and above all archery (in the investigation of which Robert Hardy has long been a driving force) are all meticulously described, analysed, and frequently tested. Most remarkably some of the many yew longbows recovered were of a condition to allow computer-modelled estimates of their original draw-weights, the highest of which was an incredible 185 lbs. The implications of the performance and effect of such weapons, and the physique and skill of those who wielded them, are fully discussed, and related to the human skeletal evidence investigated by Ann Stirland (in J. Gardiner (ed.), *Before the Mast: Life and Death Aboard the* Mary Rose, Oxford, 2005, reviewed in *IJNA* 35.2 (2006), 341–3). Staffed and edged weapons, along with armour and personal protection, are also fully considered.

In conclusion ch. 11 examines the ship's armament in the round, seeing its superficially hotchpotch mix not as a muddled dichotomy between late-medieval and early-modern thinking, but a skilful bridge which sought to combine the best of both worlds. Thus the modern bronze muzzle-loaders with their powerful ship-smashing capabilities but low rates of fire were interspersed on the main broadsides with stone-shotted breech-loading port-pieces which could be reloaded much more quickly and were effective in inflicting human casualties and confusion at close range. These were supplemented by the smaller-calibre iron fowlers, slings, and bases mounted on the upperworks. Two demi-culverins were placed on the outboard sides of the sterncastle deck, pointing forwards, their carriages adapted to suit this awkward position. This, it is argued, was to provide the ship with a forward-firing capability for the line-abreast tactics inherited from the galley era. More recent excavation in the area of the collapsed bow, briefly touched on in ch.12, has yielded tantalizing evidence of structural adaptation to accommodate forward-firing guns here, a possibility supported by the discovery of a previously unrecognized document (it had been incorrectly dated and so chronologically misplaced in the Hatfield House archive). This reminds us that much of the *Mary Rose*'s archaeology still remains secure in the sea-bed, and even the documents may not yet have been fully explored.

In summary, it appears that the ship could open fire at long range while in the chase or during a line-abreast attack. As the distance closed archers could lay down fast, accurate fire on an enemy's crowded decks, to be augmented at closer range by big-gun broadsides supported by stone and canister shot from the port-pieces and an assortment of missiles from light weapons mounted on the upperworks and in the fighting tops. Finally troops armed with poled and edged weapons, and such exotic weapons as gun-shields (which were probably more frightening than deadly) could finally carry their adversary by boarding.

This is an important and informative publication, magnificently produced. It is not just a triumph of nautical archaeology, which after all is only the process by which these outstanding results were achieved; but, much more significantly, it adds immeasurably to the sum of knowledge we possess about the evolution of warfare in general at a crucial stage of its development. At the same time it has demonstrated that archaeology is a rich source of primary information for historians, who now know more new things about Tudor naval tactics than documentary sources alone could ever have provided. For this period and topic archaeology and history are (or should be) equal and interactive partners, and *Weapons of Warre* has loosed off a salvo so powerful that any who disagree with this now self-evident truth are likely to sink without trace.

COLIN MARTIN
University of St Andrews, Scotland

The Global Origins and Development of Seafaring

(*McDonald Institute Monograph*)

ATHOLL ANDERSON, JAMES H. BARRETT and KATHERINE V. BOYLE (eds)

330 pp.114 b&w figures. 21 tables

McDonald Institute for Archaeological Research, University of Cambridge, Downing Street, Cambridge CB2 3ER, UK, 2010, £44 (hbk), ISBN 978-1902937526

The 22 papers contained within the volume originated from a conference held at the McDonald Institute for Archaeological Research, University of Cambridge, in 2007. The broad purpose of this was to explore key themes in maritime prehistory from the perspective of seafaring, an activity felt by the organisers and editors to be routinely taken for granted in archaeological writing. Explicitly they wanted to use the conference, and hence also the volume, to 'bring an understanding of its [seafaring's] origins, development, qualities and influence into the centre of discourse about maritime archaeology' (p.xiii). They argue that the development of boats and the behavioural practices associated with them holds the key to understanding larger issues such as maritime exploration, migration, trade and colonialism. These are substantial aims, as would befit an ambitious conference and book.

Anderson's initial chapter attempts to set out an agenda for action, in which he takes a broad generalising approach to pick out patterns and processes in seafaring, underwritten by detailed archaeological investigation. This imperative is driven by his contention that 'the first long-term history of global seafaring that is more than a chronicle of boat technology remains to be written' (p.3). It is fortunate, however, that the volume also contains just such a chronicle in McGrail's chapter (8), which draws on a lifetime of work and makes an essential companion to Anderson's own short sketch of a global history of seafaring. Both chapters are mutually supportive and offer an epic vision of how such global histories could be written. Anderson suggests that seafaring history falls into two related but different phases: in the Pleistocene in general, and in some other regions throughout prehistory, seafaring was localised, small-scale and depended on natural drift or human propulsion, while from about the mid-Holocene in the Old World the adoption of wind-power changed seafaring dramatically. Memorably Anderson calls it 'the domestication of the sea' (p.7, also figs 1.1, 1.3, 1.6), deliberately adapting a loaded term to remind us that although he is arguing for global seafaring to be a subject of research in its own right, the developments therein are simply part of a wider set of cultural, and also geographical, processes which impacted upon people who responded to them in diverse ways in different places.

The papers have an extraordinary temporal range, dealing with issues as diverse as the dispersal route for anatomically-modern humans out of Africa, for which it is suggested that there is no requirement for the construction of seaworthy boats or to envisage the possession of any navigational skills (Bailey, ch. 3), to the social imperatives that resulted in the Viking diaspora beginning with violent young men setting off in search of bride-wealth (Barrett, ch. 23). The volume is arranged in four main sections, which are related to the questions that the authors were asked to consider: when and in what circumstances did seafaring begin?; how is seafaring understood from the perspective of maritime technology?; what were the circumstances and incentives of seafaring development through the Holocene?; and how were relationships between sailing and society constituted?

The problem of grouping the papers according to these questions, however, is that it is not entirely conducive to the declared intention of allowing the development of a history, or indeed histories, of seafaring. The papers concern a limited number of geographical areas during roughly the same periods, yet they are widely distributed though the volume. Consequently, it is arguable whether it would have been better to place Crumlin-Pedersen's excellent summary of the origins of Atlantic and Baltic seafaring (ch. 9) alongside Cunliffe's chapter (21) on seafaring on the Atlantic seaboard, Dugmore *et al*. (ch. 17) on the exploration and settlement of the North Atlantic islands and Barrett's ch. 23 on the Viking diaspora. Such a reorientation would have enabled the creation of a small sub-section of the volume dedicated to seafaring in the North Atlantic and Scandinavia, from which a regional seafaring history could be derived; perhaps a summary paper after the case-studies could have been added. While this more-regional approach would not be looking at the origins and development of seafaring at a global scale *per se*, such a reorientation would have allowed the volume to forward a number of localised detailed and data-driven seafaring histories.

It is the papers which deal with the Old World of the Mediterranean that can be used to create the most coherent regional narrative, with the data slipping easily into Anderson's two-phase model for seafaring history. Seafaring becomes archaeologically observable during the Mesolithic, particularly in the cold snap at the end of the last Ice Age, the Lower Dryas (*c*.10,800–9600 cal. BC), when seagoing foragers voyaged to islands with seasonal resources or sources of obsidian (cf. Ammerman, ch. 7 and Farr, ch. 14). These 'rather timid argonauts' (p.85) undertook crossings of the open sea of *c*.100 km or less in logboats (McGrail, ch. 8), or perhaps reed-boats (cf. Farr, ch. 14: 183–4). The Neolithic period brings island colonisation and the development of trading networks, with their obvious implications for skilled seafaring combining technical knowledge, including the use of the

sail, and complex social organisation (cf. Farr, ch. 14, Carter, ch. 15, Broodbank, ch. 20).

It should also be noted that this increasing mastery of the maritime environment also allowed island abandonment as much as the colonisation of islands for non-agricultural reasons (Dawson, ch. 16). Also notable here are several case-studies from the Pacific-region included in the volume, such as the development of the Tongan thalassocracy (Clark, ch. 18) and the comparative perspective that it gives to the development of maritime power in the Mediterranean. Also Habu's study of the development of cultural complexity in north-east Asia (ch. 12) offers an interesting comparative study of how changes in subsistence, settlement and society in Japan are related to developments in seafaring technology. This also reiterates a trope within the volume that sees changes in vessel construction occurring in relation to other changes taking place within a society as a whole: in Japan, for example, the shift from canoes to semi-composite boats during the Yayoi and Kofun periods was an aspect of the emergence of cultural complexity and the integration of the archipelago into the East Asia economic and political spheres.

The relatively straightforward developmental narrative from Mesolithic canoes to Neolithic sailing craft in the Mediterranean, however, should not be taken to suggest that there is widespread agreement over all details: the debate over the origin of the sail is a case in point. For the sake of his argument, Anderson favours the Mediterranean-west Asia region as the single location where sailing began and from which it diffused (p.9, fig. 1.6). Within this wider region, Carter (ch. 15) narrows the potential origin down to the Persian Gulf, where a painted ceramic disk showing a boat with a two-footed mast, and barnacle-encrusted fragments of reed-impressed bitumen, once part of the outer coating of a reed-bundle boat, have been found. These are proposed as both the world's oldest fragments of a seagoing boat and also the oldest evidence for a mast and sail (p.192). Broodbank, however, argues that the decoration of the sherd with the ship resulted from a secondary and undated reworking. Instead he argues that even if the sail was used in the Persian Gulf in the late-6th-to-5th millennium BC, the emergence of sailing craft in the south-east Mediterranean was an independent development, with indisputable evidence for sails on the Nile by the late-4th millennium (ch. 20: 254–5). Finally, McGrail casts doubt on the diffusionist arguments for the global spread of sailing from a single origin, and argues for other centres of sail innovation, notably South America (ch. 8: 103).

The same pattern of a generally-established outline with contested details is, perhaps, even more apparent in the interpretation of the earliest origins of seafaring in the Indo-Pacific region. In his overview Anderson traces the earliest clear evidence for seafaring from >800,000 BP, although he suggests that it is open to conjecture whether the longer (up to 120 km) passages that were undertaken were accidental or intentional (ch. 1: 5). Nevertheless, the seafarers in this region were extraordinarily precocious when compared to their much later Mediterranean brethren. For Anderson, in the western Pacific, this is due to its large number of inter-visible islands, high water temperatures and the availability of large-diameter bamboos from which to construct floats and rafts (cf. McGrail, ch. 8: 104 on the effects of hypothermia in colder waters). Such rafts can be seaworthy and carry quite large human groups and their supplies; for example, a green bamboo raft of $8 \times 2.4 \times 0.4$ m could carry 20–40 adults with children and supplies, which would reduce the problems associated with colony establishment and survival (ch. 1: 6).

The scholarly debates within the Indo-Pacific region come more into focus as we move from a high-level overview to the archaeological details. The volume contains two papers dealing with the colonisation of Sahul (Pleistocene Australia-New Guinea), which are illustrative of the problems of dealing with deep prehistory in a region characterised by a sheer lack of archaeological evidence. For O'Conner (ch. 4), the absence of evidence for early deliberate species translocations and the movement of non-perishable exotic goods suggests that purposeful voyages of colonisation, and return journeys, did not occur throughout Island Southeast Asia until *c*.20,000 and 16,000 years BP respectively. This would further suggest that there was little technological maritime specialisation involved in the colonisation of the islands on the way to Sahul.

This can be contrasted with ch. 5, by O'Connell *et al*., which presents a model, using concepts from behavioural ecology, that argues for deliberate seafaring and colonisation. This was the result of the high cost of coastal subsistence propelling the colonisation of resource-rich islands by seafarers with ocean-going canoes capable of carrying sizeable cargoes. Such a scenario accords with Irwin (ch. 10) who suggests that Pacific seascapes become navigationally more demanding with successive episodes of colonisation, and would have required capable canoes with competent crews who steered them using regular wind-systems and navigated by stars and sea-signs. Yet the problem for such interpretations is the absence of such technologically-advanced vessels at the time of European contact with Australia. O'Connell dismisses such concerns with the argument that technological progress is not inevitable and that regressions can happen. In Australia this was due to the fact that ocean-going canoes were no longer required by the inhabitants, who chose instead to follow more terrestrially-based life-ways, with the result of a simplification of vessel technologies (pp.64–6, also cf. the model proposed by Fitzhugh *et al*., ch. 6). Elsewhere in the Indo-Pacific region the presence of Austronesian speakers on Madagascar, as well as evidence of their presence in India, Japan, the Persian Gulf and in North,

Central and South America, would indicate the continuation of maritime technologies (Blench, ch. 19). Consequently, the continuation or abandonment of large ocean-going canoes was a matter of local social, cultural and economic imperatives.

Overall, what the volume highlights most clearly is that the reason a detailed history of the global origins and development of seafaring is yet to be written is the provisional nature of many of our interpretations in the face of a lack of sufficient archaeological evidence. What is likely, however, is that given the great variability of coastal adaptions by different societies through time and space, the story of the evolution of seafaring will not simply reduce to a few global or universal generalisations (Erlandson, ch. 2), but will be rich, deeply textured and built up from an understanding that seafaring was constructed at a human level (cf. Westerdahl, ch. 22), by activities on small and intimate scales (Barrett and Anderson, ch. 24). With its numerous case-studies and models, this volume represents a significant step along the way to that first detailed history, with the papers providing interesting comparative material, different perspectives and much to reflect on. These are undoubtedly the greatest strengths of the volume and amply justify the wide spatial and temporal spread of the papers: it is a stimulating book that will repay close scrutiny and contemplation.

DAMIAN ROBINSON
Oxford Centre for Maritime Archaeology, England

Alexandria and the North-Western Delta

(*OCMA Monograph 5*)

DAMIAN ROBINSON and ANDREW WILSON (eds)

xviii + 282pp., 133 colour and 69 b&w illustrations, 8 tables

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The Oxford Centre for Maritime Archaeology (OCMA), founded in 2003, is a partnership between Oxford University's School of Archaeology and the Institut Européen d'Archéologie Sous-Marine, with funding from the Hilti Foundation. Its aim is to research the underwater sites of Alexandria and the Canopic coast and to assess their importance within a cultural and trade context. This monograph comprises the proceedings of two OCMA conferences; the first, 'City and Harbour: the archaeology of ancient Alexandria', was held in Oxford in December 2004 and the second, 'The Trade and Topography of Egypt's North-Western Delta: 8th century BCE to 8th century CE', in Berlin in 2006. This single volume however is organised not in two parts for the two conferences, but thematically.

The first half, 'Alexandria and the North-Western Delta', consists of ten papers, most of which report the results of fieldwork both on land and under water: articles on Alexandria include ch. 4, 'Early Human Activity (pre-332 BC) in Alexandria, Egypt: new findings in sediment cores from the Eastern Harbour', ch. 5, 'The Development and Operation of the Portus Magnus in Alexandria: an overview', ch. 6, 'Discovering Alexandria: archaeological update on the finds from Kom el-Dikka', and ch. 10, 'Destructive Earthquakes in Alexandria and Aboukir Bay'. The newly-found submerged sites of Heracleion-Thonis and Canopus (now about 4 miles off the modern coast of Egypt) are examined in ch. 1, 'Geophysical Survey in the Submerged Canopic Region', and ch. 2, 'Naukratis, Heracleion-Thonis and Alexandria—remarks on the presence and trade activities of Greeks in the North-Western Delta from the 7th century BC to the end of the 4th century BC'.

The second half of the volume, entitled 'Studies in the material culture of the North-Western Delta and submerged settlements in Aboukir Bay', concentrates on specific objects that have been discovered during the recent research reported on in the first half: ch. 12 on pottery from Heracleion-Thonis, chs 13, 14 and 15 on the Naos of the Decades, chs 16, 17 and 18 on statues, ch.19 on metals and ch. 20 on early Byzantine jewellery, while the remaining chapters consider broader cultural aspects of the area.

The introduction by the editors is eloquent, clear and hugely informative. The articles, mostly in English, are well edited and there is a uniformity not always found in conference papers. Each has its own bibliography and many of the articles are excellently illustrated with photos, diagrams or maps. Unfortunately it is not possible to review everything so it has been necessary to select those papers that particularly caught the reviewer's eye. The first of these is F. Goddio, 'Geophysical Survey in the Submerged Canopic Region' (ch. 1). This was an enormous survey covering an area of 110 km^2 using marine magnetometers, bathymetric survey, and side-scan sonar. The resulting anomalies were further examined with more intensive magnetometry, sub-bottom profiling, coring and visual survey as well as excavation where necessary. This combined approach led to the successful discovery of parts of the port of Heracleion-Thonis; possibly the large canal leading to Canopus; an Egyptian-style temple in the precinct of which were found massive statues of a Ptolemaic king and queen and of the fertility god Hapi and an enormous *stele* recording a decree of Ptolemy VIII.

A particularly interesting feature is that the archaeological structures are orientated in the same direction as the magnetic gradient lines and geological faults, and in fact it was the faults and not the building remains that were initially detected by the magnetometer. These faults, which show up as areas of high magnetic disturbance, are the result of land

liquefaction, from either earthquakes or *tsunami*s (see below). The section of the Canopic Canal that was discovered not only held numerous ancient anchors and some shipwrecks, as one would expect, but also many artefacts that are either cult instruments or had some ritual purpose. They seem to confirm what is already known from the *stele* of the Decree of Canopus, that a statue of Osiris was brought annually from the main temple in Heracleion to the sanctuary in Canopus on a ceremonial barge. Thus, even from this preliminary fieldwork, Heracleion-Thonis needs to be considered as an important pre-Hellenistic Greek site which probably reached its zenith during the Ptolemaic dynasty.

J-D. Stanley and E. Landau's article, 'Early Human Activity (pre-332 BC) in Alexandria, Egypt: new findings in sediment cores from the Eastern Harbour' (ch. 4) demonstrates the presence of humans from 1000 BC even on Pharos Island before the construction of the Heptastadion. Coring is a rapid, non-destructive and relatively cheap form of exploration which has given good results in this case over a wide area. D. Fabre and F. Goddio's paper, 'The Development and Operation of the Portus Magnus in Alexandria: an overview' (ch. 5), concentrates on showing how a naturally enclosed bay was transformed into a well-organised port, divided into a series of harbours for protection from swells and currents. The different zones included an emporium, royal ports, military ports and shipyards, 'a large commercial port developed in a good commercial location' at the junction of the Nile and a maritime navigation route.

A. Nur's 'Destructive Earthquakes in Alexandria and Aboukir Bay' (ch. 10), is a fascinating article that considers the seismological and geological evidence for three fault systems that run close to the North-West Delta. It shows how Alexandria and the cities in Aboukir Bay may have been destroyed by earthquakes and the ensuing *tsunami*s. These may possibly also relate to the subsidence seen in the region as a result of their subsequent liquefaction and slumping. The largest earthquakes to affect Alexandria were in AD 365 and 1303, both with epicentres in Crete.

C. Grataloup demonstrates in her paper, 'Occupation and Trade at Heracleion-Thonis: the evidence from the pottery' (ch. 12), how pottery can provide chronological information about key periods of activity. Different areas of excavation show different assemblages—some purely Eastern Mediterranean, some entirely local—with the main phases of activity between the Saïtic and Ptolemaic periods. The earliest area to be inhabited seems to be the northern section nearer the sea, spreading southwards later. On a different note, three chapters are devoted to the Naos of the Decades, a complicated astrological monument, parts of which were originally found over two centuries ago. The discovery of several missing fragments in Aboukir Bay has led to its near complete restoration. This has led to much debate about the meaning of its finer details, although its essence remains unchanged.

An enormous amount of metalware has been discovered and Z. Robinson's 'Living with Metal in Hellenistic Egypt: new finds from Heracleion-Thonis' (ch. 19), shows again how important a tightly controlled stratigraphic discovery is. So much has been found, from worked vessels, lamps and musical instruments to unworked ingots, that Robinson concentrates solely on bronzes and precious metals. About 70 ladles were discovered, the largest known find, many with the form of a duck's head, and probably made on site. They were excavated from the area around the temple complex, and along with a comparative analysis of their capacities, Robinson has interpreted their use for ritual purposes, suggesting that the larger ladles (100–120 ml) may have been used for wine or water, the smaller ones (under 30 ml) for more precious fluids. There were fragments of at least nine *sistra* (musical instruments used for ritual purposes and shaken in processions), while many other objects reveal the sorts of daily activities that took place in Heracleion-Thonis.

Much of this preliminary fieldwork is very exciting, especially the discovery of the submerged city of Heracleion-Thonis. The underwater research so far carried out in Alexandria and Aboukir Bay and presented in this volume is invaluable and has greatly added to our understanding of the North-Western Delta. As with any conference, not every paper will be of interest to everybody, and there may be some articles in this volume which are too generally historical for those who are purely maritime-archaeologically minded. Having said that, the topics presented here form a cohesive picture of the region that demonstrates the significance of Alexandria and its surrounding area in terms of commerce and culture. Future proceedings from more recent conferences are awaited with anticipation.

JULIA STRAUSS
Bloomsbury, London

Ship Iconography in Mosaics: an aid to understanding ancient ships and their construction

(*BAR International Series S2202*)

ZARAZA FRIEDMAN

xiv + 213 pp., 316 illustrations (many in colour)

Archaeopress for BAR, 276 Banbury Road, Oxford OX2 7ED, UK, 2011, £53 (sbk), ISBN 978-1407307589

This is a revised and extended publication of a doctoral thesis, and so comprises a selective discussion of Greek, Roman and Byzantine mosaics, introduced and concluded in terms of four topics. Of the four topics, the most interesting is posed by the question, 'Can [the

depictions of ships in mosaics] be considered as relevant sources of information of ancient ships, types, rigging or steering gear?', to which the author eventually answers: 'The [ships] researched in this monograph ... are conclusive and important sources of pictographic information for ancient shipwrecks found during occasional excavations and surveys'. Nonetheless, the author also remarks on the limited competence of the mosaicists, the influence of the architectural setting of the mosaic, and the likelihood that mosaicists often followed patterns or other sources rather than observation from the life—all factors which one might think had greatly reduced the value of the information.

On the key question, Friedman notes that the most realistic ship-mosaics are made with polychrome *tesserae*, as at Palestrina; even where such mosaics were not studio-made *emblemata*, they must have been laid using detailed drawings made on the basal mortar, and these were likely to have been copied from designs brought to the sites by the mosaicist. The implication is that there was probably only a distant relationship between the 'real' ships shown and the final mosaic representation. Friedman recognises this also in the case of the sectile panels from Cenchreae—'The artist probably followed a very detailed drawing of the vessel that may have been sketched by an artist who was familiar with ships and harbours'. It seems to your reviewer that this issue is not thoroughly discussed, though it is ultimately the nub of Friedman's thesis; instead, she is drawn aside into a consideration of perspective. She is impressed by ancient artists' use of perspective, but allows this to influence her assessment of their reliability in matters of detail, such as rigging, or steering-gear.

The relevance of 'pattern-books' is clear in the author's discussion of mosaics from Antioch and Leptis Magna. Here she plausibly identifies two boats as logboats, and feels obliged to see both representations as derived from Nilotic (Alexandrian) scenes, while remarking on ancient references to the supply of timber at Antioch. Her discussion has not been worked through: a pity, since it could reflect on the central question.

That ship iconography is often not straightforward appears from the question of the transom, or square, bow. This handy feature of ferries and other small boats seems to have been fairly widespread in ancient Egypt, and it also appears in a boat labelled *horeia* in the Althiburus mosaic (Tunisia) and in an African-style mosaic at Piazza Armerina. At fig. 3.5.22, Friedman illustrates a Pompeian painting, not previously known to your reviewer, which she describes as 'Nilotic' and which she captions 'Boat with transom stern'; comparison with other examples in the book, however, strongly suggests that the transom is in fact at the *bow*. Friedman also includes plans of the transom-ended harbour-boats from Roman Toulon (some 7–9 m long) and of Napoli C, at least 13 m long, identified by Friedman as 'one of the rare ancient ships to be found with a transom prow'.

Now, supposing that these marine finds of full-size vessels are in some sense barges or harbour-craft, one might expect Friedman to compare two mosaic candidates for the same type: however, she fails to cross-reference the first, a square-prowed Nile barge in the Palestrina mosaic (which seems to be genuine, though the mosaic has been repaired at this place), and she gives only a limited cross-reference for the second. This is a vessel in the Cenchreae sectile panels which she calls 'Sailing Ship I—Harbor II': her close-up illustration (fig. 3.5.16) shows that this low-freeboard vessel does indeed have a raking bow which could have been a transom, but for some reason Friedman identifies the *other* end as the bow, even though steering-oars and a cabin definitely show that to be the stern. My guess is that, in the case of Cenchreae, the author has misread her notes when writing-up—venial, of course, a fault to which we are all prone—and that, in general, she has failed to review and cross-reference all the separate references to the transom-bow question in the different parts of the book—something which could have been corrected given a more leisurely pace of publication.

Friedman's discussion and illustration of the Palestrina mosaic are good, and should be read by students of ancient shipping. Her section on Piazza Armerina is less thorough—in particular as she skates over the marked schematic and decorative spirit of many of the watercraft representations, and pays little attention to how much influence on the subject-matter might derive from Alexandria. Her discussion of the black-and-white mosaics at Ostia's Piazzale delle Corporazioni is also disappointing. In this reviewer's opinion, she reads too much into the sketchy silhouettes of the ships which have. in any case, often been unreliably repaired.

As for her conclusions, Friedman's view in brief is that the Palestrina mosaic is a good source of information for Nile watercraft, but that most of the other examples involve uncertainties of observation and interpretation. Despite her claim, it seems that mosaics do not provide a graphic supplementation of sails, rigging, superstructure or decoration to the hulls found under water or in silted harbours. Of course, no antiquities are ever totally lacking in interest, and Friedman's journey around the Mediterranean in search of ship iconography makes a lively and intriguing story. Her descriptions and illustrations are useful, and she is generally well-informed about ancient shipping as a whole. One must counsel that, as well as her often opaque English, her spelling of Greek and Latin terms is frequently so ignorant or careless as to be misleading. The book is well presented, but desperately needs thorough reading and correcting by an English-speaker with a knowledge of basic Greek and Latin grammar. Perhaps a second edition?

A. J. PARKER
University of Bristol, England

Archäologie der Brücken: Vorgeschichte, Antike, Mittelalter, Neuzeit

(*Archaeology of Bridges: Prehistory, Antiquity, Middle Ages, Modern Era*)

MARCUS PREIL (ed.)

327 pp., 324 illustrations mostly colour

Verlag Friedrich Pustet, Regensburg, Germany D-93008, for Bayerische Gesellschaft für Unterwasserarchäologie e.V., 2011, €49.90 (hbk), ISBN 978-3791723310

Bridges of the World: an illustrated history

TIM and ANNE LOCKE

224 pp., colour illustrations

AA Publishing, Fanum House, Basingstoke RG21 4EA, UK, 2008, out of print but available secondhand (hbk), ISBN 978-0749559113

A wide variety of aspects of human endeavour and invention which have developed over many millennia have become the objects of specialized research and exploration over recent centuries, such as fortifications, castles, churches, tombs, ships and factories. The essential physical link between human communities was initially provided by roads and tracks, but these cannot function effectively unless they have the means to cross the obstacles created by water in the form of rivers and swamps and gorges and defiles. Human skills developed over many centuries have moved towards the evolution of effective bridges and trackways of all kinds. It is therefore somewhat surprising perhaps that the study of these essential means of transmitting people, goods, and ideas has never become a sub-discipline of archaeology and history.

It is the hope, therefore, that the recent commendable initiative of the Bavarian Society for Underwater Archaeology, with the support of the Bavarian State Monuments and Sites Protection Service, will see this situation rectified. The Conference on the Archaeology of Bridges that took place in Regensburg in November 2009, the first ever to have been organized, brought together experts in various aspects of this subject and the proceedings of this innovative conference have recently been published, with commendable rapidity and in a sumptuously printed and illustrated volume.

Of the 54 papers in the volume, 32 are in German and 22 in English, each with a summary in the other language. They range in geographic terms over 15 European countries, together with Turkey, Iran, and Iraq, and chronologically from the Late Neolithic to the early-modern period. Their authors come from a variety of fields of study—archaeology, history, architecture, engineering, science, and even numismatics. There is, perhaps inevitably, some concentration on bridge-building in the Roman period by the greatest engineers of the ancient world, and on the medieval period when techniques and ideas, many from the Islamic world, had been adopted widely in Europe. Developments in prehistory, notably the sophistication of trackways for crossing boggy land, and simple but effective bridges to traverse water obstacles and features such as defiles and small valleys, are perhaps under-represented. One omission is that of the simple but sturdy clapper bridges, most probably of medieval origin, which are to be found on Dartmoor and elsewhere in Britain.

The Roman achievements, in building both bridges and monumental aqueducts such as the Pont du Gard in France and the sophisticated structure at Aspendos (Turkey) with its pressure-relieving siphons, are deservedly saluted, as are the bridges over the Rhine and the Tiber and elsewhere. A number of outstanding medieval projects for bridging major rivers in central and eastern Europe have been examined and are the subjects of admirable reports, several dealing with underwater exploration and recording of submerged remains, producing exceptional results that have made possible the re-evaluation of the medieval achievements.

There are no more than three papers that might be considered to be overviews of bridges in individual countries, namely in Hispania (Roman Spain), Dacia (latter-day Romania), and Ireland. It is to be hoped that further studies will be prepared and published which will permit a wider overview and analysis of bridge design and use in Europe and its neighbours, to provide guidelines for future comparative studies and research programmes.

Another promising area for future research is that of the development of prospecting, excavation, and analytical techniques, areas that are barely touched on in the present volume, apart from an interesting paper on 'Palaeohydrology, climate change, and bridges'. A number of potentially fruitful areas of activity suggest themselves in reading the papers in the present volume, but the decisions need to be taken and the priorities identified after consultation and evaluation by those currently working in the field.

The importance of bridges in human history has already been outlined in what on first sight appears to be no more than a 'coffee-table book', *Bridges of the World: An Illustrated History*, based on a survey prepared for ICOMOS and UNESCO by distinguished industrial historian Eric DeLony as a guide to the identification of bridges for inclusion on the World Heritage List. Over 60 bridges are included in this handsome volume, ranging in time from the Roman period (the Pont du Gard and the Alcantara bridge) and 6th-century China (the Zhaozhou bridge in Hubei province) through to modern masterpieces such as the Sydney Harbour Bridge and the Millau Viaduct in

southern France. DeLoney's comprehensive report serves as the introduction to the illustrated survey, and supplies the overall historical framework.

Taken together, these two admirable publications constitute an informed and extensive outline of a new and very significant field of research.

HENRY CLEERE
Institute of Archaeology, University College London

Roman Warships

MICHAEL PITASSI

191pp., 25 colour plates, 92 b&w figs, 29 plans

Boydell Press, PO Box 9, Woodbridge, Suffolk IP12 3DF, UK, 2011, £50/$90 (hbk), ISBN 978-1843836100

Roman Warships by Michael Pitassi serves as a companion volume to *The Navies of Rome*, published by the same author and press in 2009 (see review in *IJNA* 40.2). In this new work, Pitassi charts 'the development and evolution' of Roman warships, 'interpreting the surviving evidence to reconstruct the ships as drawings and models' and to explain how they worked and were used. The book is well illustrated with photographs, line-drawings, and plans, mostly by the author.

The book is divided into two parts, with the first part ('Interpretation') presenting the evidence on which the second part ('The Ships') is based. Pitassi explains that evidence derived from literature, iconography, and archaeology is not always self-evident and thus requires a degree of interpretation. He thereupon reviews the standard explanations for various rowing systems and the nomenclature of various ship classes, like 'ones', 'twos,' 'threes', 'fours', and so forth. He then explains how ship iconography is frequently difficult to interpret, the ships being shortened, and their details stylized, left out or simply misunderstood by the artists who depicted them. He explains that our attempts to visualize ancient warships must follow, as much as possible, the depictions that survive, and also respect 'the geometry of the human body' while maximizing the efficient use of both the oarsman and his oar (p.21). He concludes his interpretative section by describing the various kinds of fittings attested by the evidence, from the ram to boarding-bridges, figureheads, towers, artillery, rigging, pumps, anchors, hatches and ventilation courses, rudders, deck-fittings, awnings, gangways, ships' boats, and foredeck structures.

The second part of the book includes five separate chapters on ships from various periods of Roman history from the 8th century BC to the 5th century AD. A listing of Pitassi's designs conveys a sense of the topics covered: Etruscan-style monoreme of 20 and 30 oars; Greek-style penteconter; Etruscan and Greek biremes; Roman triremes of various periods; the *hexeres* (Pitassi: *sexteres*); quinqueremes of various periods; the quadrireme; *liburnae* of various periods and types; the *pristis*, *celox*, scout-ships, small craft, military transport, Rhone patrol-boat, warships of the *Classis Britannica*, *scapha exploratoria*, *lusoria*, and a late Roman warship.

The true measure of a book that deals with a somewhat technical subject depends on the breadth of the author's research, his ability to clarify complex topics, and above all, his careful attention to detail and accuracy. Unfortunately *Roman Warships* comes up short in some of these areas. While the author's prose is clear enough, the book is not written to help its reader delve further into the subject. I refer here to the footnotes which include no page numbers for any of the secondary sources. This applies not only to the written evidence but also to the visual sources, which are just as important for a work like this. Pitassi needs to give more information about the artefacts he chooses to illustrate (such as accepted name, location, museum number, approximate date of manufacture, etc.) and point the interested reader to published photographs of items he mentions but does not illustrate. When he chooses to present line-drawings, he particularly needs to cite a reference to a published photograph. Although Pitassi is a fine artist, he frequently edits details from the original image to highlight features he wishes the reader to observe. In so doing, he allows the reader to wonder whether something important has been omitted.

As mentioned above, the nature of such a book requires the author to present the evidence clearly and accurately. In this regard, *Roman Warships* displays some unfortunate problems. First of all, Pitassi uses some idiosyncratic terms which undermine his authority. For example, his use of 'conter' to signify a ship-type and 'reme' to signify a level or bank of oarsmen (p.18 and elsewhere for both terms) is inappropriate. Both are fabricated words, existing in neither English, Greek, or Latin with the sense he imparts to them. Their repeated use as technical terms is worrisome. Other terms used throughout the book are simply wrong. For example, *reme* does not mean oar in Latin—it is *remus*—and *ordine* does not mean rank or file—it is *ordo* (p.18). The term '*supparum*' (see index and fig. 30) should actually be '*siparum*' (topsail). '*Sexteres*' occurs nowhere in Latin; Latin speakers used the Greek term '*hexeres*' for this class. A '*liburna*' is not the same craft as a '*lembus*' (p.178) and '*quadrieres*' is not a correct name at all (it should be '*quadriremis*' or '*tetreres*'). '*Liburnis exploratoriae*' (p.179 under '*speculatoria*') should be '*liburnae exploratoria*' and I am not sure why '*scaphae*' (hull or boat) appears in its plural form in one list (p.179) and in its singular form '*scapha*' in another (p.180). And finally, at least one English term is idiosyncratic to the point of being confusing. Pitassi uses 'freeboard' to indicate the distance from the waterline to the first oarports, instead of to the upper deck. I do not wish to appear picky, but these examples represent a fraction of the total.

When incorrect or confusing terms are interspersed with other errors in fact, the total effect is unsettling. In the span of seven pages (pp.20–27) the reader is misinformed that 'eights' were introduced following 'twenties' and 'trounced them' in battle (the 'extraordinary eight' of Lysimachus was built well before the 'twenty' of Ptolemy II—these vessels never met in battle); that a warship depicted by an image showing 22 oars a side would be termed a 'twenty-two-er' (most consider that the source for this image was a penteconter—a 'fifty-oared galley'—with 6 oars edited out by the artist; if such a vessel *did* exist it presumably would have been termed a 'forty-four-oared galley'); that the three levels of oarsmen on a 'three' were called 'thranites,' 'zygetes' and 'thalamites' (correct forms = *thranitai*, *zygioi* and *thalamioi*); and finally, that the deck of a Roman quinquereme was 10 feet above the waterline. This last misstatement requires some explanation. Pitassi's note 26 (p.35) incorrectly refers the reader to Morrison's *Athenian Trireme* (Cambridge, 2000), quoting Orosius 6.19. Although Morrison does not quote Orosius in his *Athenian Trireme*, he does quote him in *Greek and Roman Oared Warships 399–30 BC* (Oxford, 1997) (pp.163–4), but there relates the 10-foot dimension to Antony's 'nines' and 'tens,' not to his 'fives'. Such errors, sprinkled throughout the text, call into question the author's general reliability and undermine the authority of the book.

This said, I found Pitassi's proposed reconstructions interesting, although some are impacted to varying degrees by errors of fact. For example, I feel that his reconstructions for 'fours,' 'fives,' and 'sixes' are too long and beamy (something that he admits for his 'six'; see p.100). 'Sixes' are described by numerous sources as capable of some speed and manoeuvrability, which demands a smaller vessel than described by Pitassi (pp.90–95). I have already alluded to his mistaken belief that 'fives' stood 10 feet above the water at their main deck, a fact that contributes to the oversized dimensions of his 'five.' And Pitassi's 'fours' are based partly on unreliable crew numbers (Rhodian inscriptions do not provide 'hard evidence' for the size of a 'four's oar-crew, as Pitassi maintains on p.105; see *Greek and Roman Oared Warships* p.349 and Casson's *Ships and Seamanship in the Ancient World* p.306 (n.28) and faulty suppositions derived by J. S. Morrison from a small graffito. Despite these problems, Pitassi displays a refreshing ability to admit alternative designs when faced with ambiguous or conflicting evidence—the result, perhaps, of his making models as well as plans.

In conclusion, I would recommend this book to ancient-ship modellers who are interested to see how one man grappled with the ancient evidence related to different kinds of Roman warships and auxiliary craft. Although *Roman Warships* is not a 'how to' book for modellers, Pitassi clearly explains the reasons behind his design choices, his plans are clear, and his models are nicely illustrated in colour plates. Because so few books exist on this subject in English, I suspect that some will read the book out of curiosity. Indeed, *Roman Warships* presents some interesting ideas about Roman naval craft. As an accurate guide to the subject, however, introducing reliable terminology, presenting the evidence in all its complexity and providing helpful footnotes enabling further investigation, *Roman Warships* is unfortunately disappointing.

WILLIAM M. MURRAY
University of South Florida, USA

Rome's Imperial Economy. Twelve Essays

W. V. HARRIS

384 pp., 3 maps, colour cover

Oxford University Press, Great Clarendon Street, Oxford OX2 6DP, UK, 2011, £80.00 (hbk), ISBN 978-0199595167

William Harris, Professor of History at Columbia University, here presents 11 of his previously published papers, together with one new one and some minor updating and reviewing. The book is nicely printed and bound, and your reviewer has found no misprints or errors in it: perhaps this could help justify the eye-watering cost, even to libraries, for what is mostly second-hand material. At the very least, and in marked contrast to many recent publications, the author accurately quotes ancient references in the original and gives his own translations—though one might expect no less from a graduate of Oxford's leading classics college.

Harris's chapter on 'Trade 70–192 AD' (from the *Cambridge Ancient History*, written in 1990) is succinct and readable: references to shipwrecks are confined to detailed illustration of a point, but draw on individual sites. A tailpiece refers to the author's jointly-edited volume on technical improvements in Roman shipbuilding, which has now been published, and which one hopes will be reviewed in this *Journal*. A section on 'Updating' (in the Introduction to the present volume) gives a properly measured view of ancient shipwrecks in general, and of the Roman use of river-transport.

On certain topics, Harris is uncertain, or uncommitted. He is unsure of the profitability of water-transport in general, and holds back from arguing on the basis of underwater evidence: the appearance of ships' pumps in the archaeological record, for instance, shows that 'we are certainly not faced with technical inertia in this sector'. He also observes that relatively large ships were indeed known, but draws no overall conclusion. Harris has come close to archaeology at times, principally in his work on *instrumentum domesticum* ('the inscribed economy') and, in particular, in his study of Roman lamps bearing a maker's mark. On these, he remains tentative about the significance of shipwreck finds,

while recognising that 'some lamps were certainly exported over long distances'. On other categories of wreck-find, notably vessel-glass, he refrains from drawing conclusions, while acknowledging the importance of recent discoveries.

Good use of shipwreck information is made in 'The Roman Economy in the Late Republic, 133–31 BC' (from the *Cambridge Economic History*, published in 2007, but written some years previously). Here a Table of 23 selected sites illustrates the variety of cargoes in the 100-year period under review: these wrecks are called on to demonstrate 'the metallization of the Roman economy'. Even the often-contentious general statistic of Roman wrecks (for which your reviewer stands guilty in the end) is properly used: 'the remains of some 220 wrecks of Mediterranean merchant ships ... are known from our period ... whereas many earlier and later one-hundred-year periods have produced hardly any'. The shipwrecks are also cited, along with remarks of the ancient geographer Strabo, to demonstrate that Roman trade included 'inexpensive goods that could easily have been substituted for locally in most places ... the implication is that transport was efficient, that part of the economy at least was organized on the basis of trade, and that an entrepreneurial spirit was widespread'. Having argued this sort of point for years, your reviewer welcomes this sober judgement from a historian.

This is a humane and generous book, broad in its toleration of scholars' errors and prejudices, and subtle in its insights into ancient Roman life and thought. There are over 1300 references in the bibliography, a huge weight of information for the author to remember and evaluate: even so, every reader will, no doubt, like this reviewer, think of another publication, not listed, which could have illuminated some point at issue. As always, there remains a paradox, a conflict between the over-arching vision of the historian and the obsession with detail of the field archaeologist. In the end, one has to question, given the loss of the memoirs of Roman rulers and officials, and thus of the possibility of knowing their reasoning and intentions, whether an evidence-based economic history will ever be possible. Meanwhile, William Harris's collected papers give a good idea of how far we have got.

A. J. PARKER
University of Bristol, England

Les Romains et Le Commerce

ANDRÉ TCHERNIA

439 pp., 7 figures

Centre Jean Bérard, via M. D'Auria Editore, Calata Trinita Maggiore 52, Naples 80134, Italy, 2011, €30 (sbk), ISBN: 978-2918887065

This well-written and -produced book is in two parts. The first part, five chapters running to over 170 pages, plus many pages of references (over 800 for the whole volume) and fairly comprehensive indexes, is intended as an introduction to the second; the latter is made up of 12 papers, all previously published (but some in arcane conference proceedings), here reprinted together with extensive update-notes. In fact, the first part is a colourful, readable book in its own right, and is by far (in this reviewer's opinion) the best study yet of how underwater finds fit into our picture of the ancient world. The five chapters are entitled 'Owners and traders', 'Traders' fortunes', 'The issue of the market', 'The role of the state' and 'Progress with what is lacking'. Note that the phrase 'The (Roman) Economy' does not appear: the concept is, indeed, discussed, but in a radical and exciting manner. This is thus pretty much a new book, and it is a fine piece of work, full of vivid insights, rational arguments and up-to-date information. It is a pleasure to handle, and almost completely free from typesetting errors (for the pedant, I note a small one in the caption to fig. 2): at the cover-price of €30, it has to be a bargain. What a pity that it has not been translated into English, the language which now (for better or worse) has become the international language of scholarship.

The cover-blurb correctly identifies the author as a pioneer of undersea archaeology, and features a beautiful photo of him in action (in the 1970s) at the site of La Madrague de Giens. André Tchernia may be best known to readers as a co-director of that hugely significant research excavation, but, as the present volume shows, his acute intelligence and wide learning have given him unrivalled authority as the inspirer and leader of research projects in history, epigraphy and technology.

The gist of the book is that trade was an important feature of ancient Roman life, but it was governed more by social than by purely economic practices. This is argued, not from theory or anachronistic analogy, but from a close study of the evidence. And what a variety there is! Tchernia cites ancient writers of every genre—papyri, Pompeian tablets, funerary and honorific inscriptions, graffiti in the Eastern Desert, finds of coins and pottery in India, the supply of the Roman army on the frontiers, amphora labels, stamps and seals, Monte Testaccio in Rome, sculptures from Trier and dedications to Nehalennia. Some shipwrecks (such as Dramont A, or Port-Vendres II) are discussed in detail; others are summarised in general, but with an important rider—'Wrecks must, if they are to take on a true economic meaning, either be set in a series, or be compared with coherent discoveries in land digs'.

Of the seven figures, one maps coin-hoards and pottery in India, two show the quantified distribution of South Spanish and Istrian amphora stamps, and the other four are histograms of Mediterranean shipwreck sites by date. In the last case, Tchernia subtly recasts the graphs, correcting and improving your reviewer's diagrams on the basis of considered information, while recognising the utility of Wilson's recently published

reworking of generalised data. Furthermore, Tchernia goes on to deliver a more focused analysis: he remarks that the most solid and clear feature of the graph is due to the collapse of Italian wine exports to Gaul in the later-1st century BC, for political reasons; the massive consumption in Gaul before this date was due to the social function, the redistribution, of wine in Gallic *oppida*. He thus integrates, to take just one instance, a specific class of shipwreck information with archaeological and historical comparisons to lift the discussion to a dynamic level.

Inference from shipwrecks lies at the very heart of the book's final conclusions. On the last page of Part I, Tchernia alludes to a specific class of wreck-site when he writes, 'The Baetican merchants who had split in five or ten a single vessel to carry their goods, did they, a moment after landing, separate into warlike rivalry?'. In other words, social considerations must modify any estimate of market forces, and shipwreck archaeology is the springboard for that concluding argument. Two pages earlier, Tchernia reveals some of the ways in which shipwreck archaeology and social history can mesh when he stresses the importance of 'private trade'—what archaeologists call the secondary (or 'piggyback') cargo, or what the Roman historian Sallust called *supervacuanea onera*, 'disposable supplements'. From such margins, traders might make their fortunes, but it was not market forces which led them to squeeze 'disposable' pottery or trinkets on board.

An excellent book: no one should write about Roman remains from under water without reading it.

A. J. PARKER
University of Bristol, England

Exploratio Danubiae. Ein rekonstruiertes spätantikes Flusskriegsschiff auf den Spuren Kaiser Julian Apostatas

(*A Reconstructed Riverine Warship of Late Antiquity, in Search of Julian the Apostate*)

FLORIAN HIMMLER, HEINRICH KONEN and JOSEF LÖFFL

124 pp., 138 illustrations, tables, DVD

Frank & Timme GmbH, Wittelsbacherstraße 27a, 10707 Berlin, 2009, €29.80 (hbk), ISBN 978-3865962270

Almost as fascinating as discovering and studying ancient wrecked vessels is the process of reconstructing and building them at full size and testing the reconstructed craft in realistic conditions. This is an account of a reconstructed voyage down the Danube by a reconstructed Roman patrol boat in the 21st century. Men like Thor Heyerdahl and Tim Severin, and ship copies such as *Tigris* or *Olympias*, are well-known even to those with little knowledge of ancient shipbuilding or reconstructions or how to navigate them when built. Nonetheless there is great popular appeal for these activities and their pioneers.

There are two approaches to tackling such projects: one is to rely mainly on contemporary literary and visual references, as with *Olympias*; the other is to base the construct on actual surviving and dated wrecks, as in the case of *Kyrenia II* (*c.*300 BC). Three reconstructions of the 'Bremen Cog' of *c.*1380 AD have been built and tested in Germany. They are now tourist attractions as well as being viewed as objects conforming to the rigorous standards of experimental archaeology. Films have been made of their voyages, and reports and books written. A number of compromises have, however, been made, for instance over tools used; 'originals' or replicas of these have been replaced by electric power-tools and engines installed for health-and-safety reasons, so that the data derived from the 'cog' experiments are somewhat invalidated.

A new research experiment in Germany has avoided most of the pitfalls. The vessel design and construction is based on actual Roman ship survivals and retrievals, and ship-handling and function on a number of classical documents and writers, including Tacitus, Pliny, Hyginos and Vegetius. The Danube reconstruction, *Regina*, and her voyage, was an academic project of Regensburg University students and scholars. Regensburg derives its name from Roman *Castra Regina*, hence the ship's name.

Her design and construction was based on five substantial Roman river-galleys found in and around the military harbour at Mainz on the Rhine in 1981–2 and subsequently excavated and copies put on display. (A sixth smaller 22-m vessel called 'the ghost' as it was etched in a concrete wall was found later). The five are sleek, shallow-draught, undecked rowing galleys *c.*30 m long, used for river and border patrols in the 4th century AD, which could carry a mast. They are classified as of *lusoria* type, which derived from the Nile where the vessels acted as cargo-carriers. By the 3rd century Roman forces had seen the possibilities of this type of vessel for patrolling the Rhine and other rivers within the Roman provinces and they were being built locally. Construction was of oak, combining Mediterranean planking methods with Celtic shipbuilding features, which produced a cheap, easy-to-build craft well suited to its border policing tasks. It was also easy to handle and crews required little training provided they had stamina and were fit to row and sail, and put up with the primitive conditions aboard ship.

The Regensburg team set out to prove all this and then to navigate their ship down-river to Budapest and back. The book under review describes the building, preparation and voyage of *Regina*, and incorporates comments and a log of the passage, establishing the scientific status of the experiment. There are unfortunately no plans of the vessel. It is observed that the book title 'The Exploration of the Danube' is rather misleading, since it was not the Danube but the ship which sailed on it that was being explored. Trials were

made with both square and lateen sails, though there is only documentary evidence of sailing. No actual sails were found on the wrecks, so they had to be specially designed from rather sketchy pictorial sources.

Much of the book is taken up with enquiries into the background of these operations and the vessels that carried them out. Parker (*Ancient Shipwrecks of the Mediterranean and the Roman Provinces*, 1992) discusses the construction of the five Mainz relics and has some earlier bibliographic references; but by far the most comprehensive treatment comes from Bockius's monumental work *Die Spätrömischen Schiffwracks aus Mainz* (2006) with its 32 drawings, 80 plates and 9 large plans. The Regensburg project drew heavily on this. The authors all took part in the *exploratio*. An appendix reports on *Regina's* speed, both sailing and under oars, and finds it averaged about two knots per hour. There is a useful chronology from the reign of Diocletian (254–305 AD) to the beginning of the era of the Goths in Italy (493) that provides historical orientation. The 45-minute film on DVD is invaluable in presenting a vivid visual record of the experimental tour.

It is only a pity that the publication contains no plans of the ship reconstruction. And what is *Regina's* destiny now?

ARVID GÖTTLICHER
Bremervörde, Germany

Tree-rings, Kings, and Old World Archaeology and Environment: papers presented in honor of Peter Ian Kuniholm

STURT W. MANNING and MARY JAYE BRUCE (eds)

336 pp., 87 figures including colour, 34 tables

Oxbow Books, 10 Hythe Bridge Street, Oxford, OX1 2EW, UK, 2009, £60 (hbk), ISBN 978-1842173862

The interdisciplinary nature of archaeology is one of the most stimulating, and challenging, aspects of the field, as the papers in *Tree-rings, Kings and Old World Archaeology and Environment* remind us. This volume, which gathers papers from a 2006 conference on the impact of dendrochronology in the ancient world, honours Peter Ian Kuniholm, who made, and continues to make, significant contributions to the field. In addition to looking at the impact of events such as a volcanic eruption, or a period of aridity or chilling, tree-rings help us to approach questions of greater interest which relate to understanding interconnections between cultures in contact, the impacts of climate change, as well as focusing on exactly when an event—whether shipwreck or eruption or fire in a city—occurred.

The painstaking process of developing a reference collection, a laboratory, and a network of archaeologists aware of the process of dendrochronology is only indirectly dealt with in this volume. The foreword by Colin Renfrew, however, the extensive bibliography of Kuniholm's work, and Jim Muhly's encyclopaedic review of Kuniholm's career, all emphasize again and again the combination of the single-minded pursuit of wood-samples (from shipwrecks to mosque renovations and destruction layers of Hellenistic palaces) with a broad-spectrum approach to archaeology, climate science, forestry, and all the aspects of quantitative dating. Peter Kuniholm trained hundreds of us to be alert to the opportunities presented by a fragment of wood, to help build a definitive chronology that could be anchored in time through archaeology and science. His contributions are truly beyond calculation.

This volume of papers reflects his impact. In addition to presenting a historical perspective on the development and expansion of dendrochronology, the first section considers new applications of dendrochronology from Poland and northern Germany to Italy and eastern Europe, and an oak chronology for Istanbul and environs which spans over 900 years. The focus of the volume, however, is that dendrochronology, in its overarching approach, is about more than absolute dates. It touches on the integration of climate change with 'ecological hieroglyphs', as Schweingruber calls tree-rings, and reveals potential environmental factors contributing to the well-attested cultural shifts in the ancient Aegean and eastern Mediterranean world. Muhly (p.10) notes that, 'The more we work the more complicated things become', an understatement with respect to the debate about familiar topics (when did the volcano on Santorini destroy Thera? What are the criteria for establishing an absolute chronology for the Aegean?).

In addition to regional contributions, the more detailed analysis of trees dated by dendrochronology and analysed by neutron activation analysis (NAA) lays the groundwork for understanding the scientific basis for interpretative frameworks which heavily weight dendrochronological data. Dean calls attention to the significant threats posed to the discipline in an age of budget reductions, when the labs and collections of researchers who work on their own, and single facilities devoted to chronometric dating, are at risk. The risk is increasing and no solution is evident, making the establishment of additional chronologies across species and regions even more important.

Dendrochronology can play a central role in establishing absolute dates for some sites, but others are frustratingly elusive, with inadequate wood samples and tree species. Jeremy Rutter proposes a supporting approach for evaluating quantitative change over time through big-picture data analyses of pottery-shapes, patterns and motifs, to which French and Shelton would add clay sourcing to confirm cultural connections when tree-rings are scarce.

Summers likewise excavates at a site of unusual importance to the Iron Age, but lacking preserved

wood samples, and chronicles the breakdown of cultured society through changes in style and architecture. Voigt offers a cautionary example of a project extending over a vast space and time at Gordion, focusing on the role of the archaeologist in deciding what data to accept and which to discard, sometimes resulting in significant errors. Muller-Karpe returns to the realm of dendro-archaeology with an evaluation of relationships between urban society and the environment as the Hittite empire rose and declined, reflected in its control of water supplies and its inability to control increasing aridity.

Of particular interest to readers of this journal will be the re-dating of the Uluburun shipwreck, and the extensive discussion of the archaeological and quantitative basis for shifting the date from *c*.1306 BC to 'about 1320 ± 15 BC', tying together the Amarna culture in Egypt, the end of LHIII, and the Cypriot material represented on this site. The discussion of its dating also touches on the thorny issue of when the volcano on Santorini erupted, a topic of continued disagreement between traditional archaeological correlations of historic events, iconography, and pottery types and quantitative measurements of radiocarbon and other physical markers of time.

Weiner's paper and subsequent discussion and response maintain that Manning, and Friedrich *et al.* incompletely comprehend the data from the archaeological perspective, and invokes a special perspective achieved through applying a conventional archaeological approach to the question. Weiner dismisses evidence from ice cores, radiocarbon dates which support a high chronology, and analyses of the remains of olive trees buried in the same volcanic ash that smothered the town. For their part, Manning *et al*. and Friedrich *et al*. counter Weiner's traditionalist approach through demonstrating a robust radiocarbon sequence on tightly controlled samples, while recognizing Weiner's contribution in identifying weaknesses and areas where additional data can contribute to higher-quality resolution of the date. Weiner replies by calling them optimistic and maintaining his reductionist approach, with a fitting closing comment, 'Time will tell'.

Thanks to the efforts of Peter Ian Kuniholm and his colleagues, students, and wide network of contacts, time will tell. This volume provides timely and critical information about dendrochronology and dendro-archaeology. An index would have been appreciated for cross-referencing some sites, but the arrangement of papers (and their comprehensive titles) compensates somewhat for its absence. This volume makes a vital contribution to scientific approaches to archaeology, to dendrochronology, and to the integration of quantitative and qualitative approaches.

CHERYL WARD
Coastal Carolina University, USA

A Late 11th Century Ship-Handling Site on Falster: Fribrødre Å

JAN SKAMBY MADSEN and LUTZ KLASSEN, with contributions by Charlie Christensen, Morten Fischer Mortensen and Lars Krantz Larsen

487 pp., many illustrations including colour, tables, maps

Jutland Archaeological Society, Aarhus, via Aarhus University Press, 177 Langelandsgade, Aarhus N, DK-8200, Denmark, 2010, €53.95 (hbk), ISBN 978-8788415599

The site of Fribrødre Å was found by a farmer strengthening a river-bank. It was excavated between 1982 and 1993 by a team from Roskilde, led by Jan Skamby Madsen, who also wrote several preliminary papers. The site is situated by a small stream which reaches the sea near the city of Stubbekøbing. The stream must have been navigable by large vessels during the 11th century. Unlike most sites, this is not a wrecked vessel or vessels, but, as the title states, a ship-handling site. A large number of fragments, all damaged, from many vessels, have been discarded here. J. S. Madsen describes the excavation campaigns, followed by a chapter by C. Christensen and M. F. Mortensen, who trace the development of the river-valley over a long time-span. A large part of the volume (386 pp.) consists of Klassen's analysis of the finds, followed by a full catalogue. The final chapter treats the Baltic Ware pottery found.

I will concentrate my review on the ship finds. Klassen makes some use of previous work on similar finds of separate ship fragments, McGrail's 1993 publication of the *Medieval Boat and Ship Timbers from Dublin*, and the present reviewer's *Boat Finds from Bryggen* (1985), but his analyses are more detailed. He divides the material into knees, floor-timbers, strakes, rigging equipment and so on. There is also a group of 'non-maritime' artefacts. Using parallel material from Skuldelev and Hedeby, the evidence is sorted by ship-type, small and large warships (longships), small, medium and large cargo-ships, and one small boat. One characteristic floor-timber and one strake must be from Slav vessels from the southern Baltic shore; fragments of two vessels may be from western Norway, while the remainder seem to be locally built.

'Few of the numerous vessels seem to have been built more than 100 kilometres—or more than a one day's sailing in good weather—away from the Fribrødre Å site'. The background for the statement is a very detailed analysis of the wood in the treenails used as fastenings. Treenails as plank-fastenings have been seen as proof of Slav shipbuilding, but Klassen convincingly argues for their use in south-east Denmark, with willow as the material instead of the pine used by the Slav boatbuilders. However, there were Slav

settlers on Lolland, Falster and Møn, so the ships may well have been the work of Slav shipbuilders working in Denmark, building ships of Norse shape but with treenail fastenings. Another possibility is Norse shipbuilders adopting Slav fastening methods.

But Fribrødre Å is not a place where ships were built, it is a pure 'repair yard'. The beaches are too small for shipbuilding. The use of many kinds of wood other than oak speaks of hasty, and sometimes sloppy repairs. The conclusion is that the site was used for repairing many ships on several occasions, using materials available locally. An absolute minimum of 22 ships can be documented, but many more seems probable. All dates fall in the 11th century, and, with the help of written sources, the author suggests that the site can be connected to a campaign in the years 1090–1093 when, with help from the Danish king, the Slav noble Heinrich tried to retake his father Gottschalk's Obotride kingdom. The work is a fine example of how dedicated and detailed analysis of fragmentary archaeological material can produce important results, both archaeologically and as a historical hypothesis.

I have very few comments on the negative side. On p.14 'floor-boards' should evidently be 'floor-timbers'. In Norse, and in more recent Norwegian boatbuilding, decorative mouldings are scraped or planed along the edges of strakes and frames. A few of the Fribrødre Å fragments have mouldings. They are mentioned, but not illustrated, in an otherwise very well illustrated book. On p.227, a nearly-complete swivel is described as a possible rigging detail. According to the author: 'the exact use of the swivels still remains unknown, but was most likely connected with the rigging of boats and ships'. Good parallels found in the Oseberg ship clearly show that they are parts of a halter used to tether animals. Most maps and site-plans seem to be printed with north at the top, but a 'north arrow' could well have been included. The book is well produced.

ARNE EMIL CHRISTENSEN
Oslo, Norway

Seán McGrail writes: this volume is in English, and has been published by the Jutland Archaeological Society in association with Mosegaard Museum and the Viking Ship Museum, Roskilde, with financial support from Bikubenfonden. In Part 1 Jan Skamby Madsen describes and discusses the discovery and excavation of the site, its geomorphological setting and its dating. Part 2, on palaeo-ecological investigations, is by Charlie Christensen and Morten Fischer Mortensen. Part 3, in which boat and ship timbers are described and interpreted by Lutz Klassen, extends to more than 80% of the book. The fourth part, by Lars Krantz Larsen, deals with the Baltic Ware pottery. Each part has its own list of references. The volume is extremely well produced but there is no index.

The site, Fribrødre Å, lies in the northern part of the Baltic island of Falster, on the southern shores of the Gronsund Strait which separates Falster from the islands of Møn and Sjaelland. In 1981 a farmer found ship timbers in a former bed of the River Fribrødre. During each autumn between 1982 and 1993 the site was excavated under the direction of J. S. Madsen, and hundreds of individual ship timbers were located, recorded and lifted. These worn and damaged timbers had been discarded individually after removal from the parent vessels. The main period of use of this site is estimated to have been AD 1050–1100 (pp.292, 358).

In his post-excavation research, Klassen first identified the function of each individual timber—knees, keels, stems, planking, floors, crossbeams and other framing timbers: there were also rope fragments and toggles. He then sought answers to three main questions. How many vessels were represented by these timbers? What building tradition did the parent ships belong to? What was the functional type (warship or cargo ship) of these vessels?

Klassen's way of tackling these questions (pp.65–7) was based on the methods this reviewer used when investigating medieval boat and ship timbers excavated in Dublin between 1962 and 1981 (*Medieval Boat and Ship Timbers from Dublin*, 1993; see reviews by A. E. Christensen, *IJNA* 23: 162–3, and E. V. Wright, *Mariner's Mirror* 80: 484–5). These methods had themselves been derived from Christensen's pioneering research on the Bergen ship timbers (*Boat Finds from Bryggen*, 1985). The key assumption of this Dublin method was that, within a particular shipbuilding tradition, the size of each timber in a vessel is related to the size of that parent vessel—that is, 'ships' have more massive timbers and thicker planking than 'boats'. Using Skuldelev 1–6, Hedeby 1 and 3 and Fotovik 1 as models, Klassen has extended the Dublin method by devising a way of differentiating warships' timbers from those fitted in cargo vessels. Moreover, he has evolved (p.65, Table 1) a method of identifying which of the parent cargo vessels were 'small' (10–14 m overall length), 'medium' (14–20 m) or 'large' (greater than 20 m); and a way of differentiating timbers from small warships (10–20 m) from those from larger ones (over 20 m).

Unlike the Dublin site at Wood Quay, where dismantled parts of ships and boats had been re-used to stabilise a domestic site, to act as walkways and as 'fill', the activity at Fribrødre was the repair of ships and boats (p.302). Another significant difference between these two sites is that, in the former, most information about parent vessels came from four large groups of planking still fastened together. In contrast, the planks which survived at Fribrødre were in poor condition, short in length, and not fastened together, so little information about the parent vessels could be obtained from them. Klassen found, however, that the knees from Fribrødre were most informative: of the 58

excavated, nine were deduced to have come from cargo vessels and 17 from warships. Furthermore, some of these timbers had features in common, suggesting that they came from the same vessel. From such information Klassen deduced that evidence for at least 22 parent vessels had been excavated (pp.353–4). There had been seven (possibly eight) cargo ships (two large, two medium and three small), and between seven and 11 warships. When other timber types were also analysed, it was reckoned that a total of 33 timbers came from between ten and 30 warships (of which a minimum of four were small, and six large); 16 other timbers came from between seven and 14 cargo vessels (of which a minimum of three were small, two medium and two large).

Although it proved impossible to use the scanty plank remains to answer questions about the type and size of parent vessels, Klassen was able to use them to answer the second question he had posed: the building tradition behind the parent ships. The great majority of the plank fragments had been fastened together by small treenails. The overwhelming evidence for fastening planks by treenails, and the fact that the placename Fribrødre was of Slav origin, led Klassen to infer that the parent vessels of the great majority of the timbers had been built by Slavs on the islands of Lolland, Falster and possibly Møn (pp.213, 361). He suggests that an alternative, but less likely, explanation is that the vessels had been built by Scandinavians who had adopted Slav techniques. The discussion of the provenance of the parent vessels is not entirely convincing—it seems to this reviewer that more research is needed here.

Despite such misgivings, this is an important and most welcome volume which will be of great interest to all who have worked, or in the future may work, with individual boat and ship timbers rather than more-complete boat and ship structures. Since publication of the Dublin timbers in 1993 this reviewer has been wondering whether the methods he used there would be criticised. Now it appears that at least one maritime archaeologist has found them to be useful. I—and probably Lutz Klassen—look forward to the publication of other views on these matters.

SEÁN McGRAIL
University of Southampton, England

Vikings in America

GRAEME DAVIS

xiv + 208 pp., 8 pp colour plates, 6 maps

Birlinn Ltd, West Newington House, 10 Newington Road, Edinburgh EH9 1QS, 2009, £14.99 (sbk), ISBN 978-1841587011

This author 'doth protest too much, methinks'. According to the back cover, 'It was the Vikings, not Christopher Columbus, who made the first European discovery of America; it was the Vikings, not the Pilgrim Fathers, who were the first European settlers in America. And it was probably the Vikings who first used the name 'America'. This is all good stuff, but the author's determination to prove his point leads him to over-emphasis and repetition.

Davis is a lecturer in English Linguistics who appears to know little about archaeology, and even less about early boats. He introduces the classic Viking longship as a technological advance, in moving from skeleton-first to the more flexible plank-first construction. He claims (p.16) that clinker planking 'became the basis of all shipbuilding until iron hulls were developed'. And his description includes confusing explanations such as 'The mast, the flooring and the rowing benches were likewise all fastened directly to the keel rather than to the hull, allowing the hull far greater flexibility'. A glance at the several publications in English from the Viking Ship Museum, Roskilde, would have sorted out such misunderstandings.

The author argues his general case very clearly, following the expansion of Viking exploration and settlement through Greenland and onwards, 1000 miles south to the east coast of America, 1000 miles west to Hudson Bay and 1000 miles north into the High Arctic. These chapters are entitled 'Stepping Stones to America' (2), 'The Greenland Base' (3), 'Vikings to Vinland' (4), 'Viking Exploration in the High Arctic' (5), 'Viking Hudson Bay' (6), and 'Vikings and Inuit' (7). In ch. 4 Davis argues that careful reading of the Icelandic sagas shows that they record 'six distinct voyages to America' (p.68). The earliest was by Bjarni Herjolfsson in 985, but it was accidental. According to the saga he did not land, but that seems unlikely, and may be to do with the claims made by the second voyager, Leif Eriksson, who bought Bjarni's ship, and possibly with it any associated land rights. Thorvald, Leif's brother, led the third expedition, which involved the first recorded encounter between Vikings and native Americans. Thorvald was killed, and could be the first European to have died in America. As the native Americans are thought to have moved east from Siberia, and the ancestors of the Vikings to have moved west from Asia, it could be claimed that in *c.*1000 AD 'east met west in America, a remarkable meeting which signified that the human race had circled the globe' (p.71). The chapter ends with a discussion of the authenticity of the 'Vinland Map'.

The penultimate chapter, 'Memories of Vikings in America', is less convincing, building supposition upon supposition, and in the case of the secretive nature of the Vatican archive, bordering on conspiracy theory. 'Legacy of the Vikings in America' discusses a variety of 'ways in which the Vikings in America have stamped their mark on the world'. One

example is the 'Newport Tower', on Rhode Island, a circular dry-stone tower, with no close parallels in either America or Europe. It dates back to at least 1665, when it was described as a windmill. It has been suggested that it might be a Viking relic, but few are convinced, and attempts at scientific dating have produced an earliest date of 1410, though this has been challenged. Davis saves for near the end his section on 'The Vikings named America!'. He argues that the common Viking name for areas on the edge of their territory was 'merki' or 'outback' (in English it appears as 'Mercia' and 'march' meaning border). By the 15th century metathesis could have changed it to 'merik', which Romance languages would naturally convert to 'Amerika'.

However, this volume cries out for some further indication of the author's sources. Appendix 1, 'A Note on Methodology', claims that 'The style of this book is a continuous narrative free from a heavy critical apparatus. Researchers will readily find corroboration for factual material in major libraries or online … There is little here that is original or primary research …'. There is a general bibliography divided by theme, a handful of endnotes per chapter, and an index. Few of the endnotes contain bibliographic material. The note on Viking ships in ch. 2 says 'The two major sources of information for Viking ships are the two Viking ship museums' at Roskilde and Oslo. But what about those who would like to read a reliable and well-illustrated book? The style and usefulness of the endnotes can be illustrated by another example. The index has four entries under 'coracle'. The third time the word appears in the text a note explains: 'The large coracle which was used for sea voyages is sometimes called a *currach*, with the name *coracle* reserved for the single-person boats used on rivers and lakes. However *currach* does not have wide currency, and I have used *coracle* throughout' (p.192). Why misuse a technical term, rather than use the general description 'skin boat'? And why not attach this note to the first use of 'coracle' (the voyage of St Brendan) rather than the third, by which time this reviewer was already annoyed.

There are six maps at the beginning, very useful except that no. 5 is upside-down. At the centre of the volume is a block of black-and-white plates of varying quality and not referred to in the text. They have brief captions, but no indication of source or copyright. There are also some lapses in copy-editing. Porterage (p.115) should be 'portage', and 'greywrack' on the following page 'greywacke'.

There is much in this book to stimulate thought and interest, but also much to annoy or frustrate. Davis may well be right in his claims, but I found myself less inclined to believe him because of the way he presented his arguments.

PAULA MARTIN
Institute of Archaeology, University College London

Norman Naval Operations in the Mediterranean

(*Warfare in History Series*)

CHARLES D. STANTON

338 pages, 14 b&w illustrations, 14 maps

Boydell & Brewer Ltd, PO Box 9, Woodbridge, Suffolk IP12 1SY, UK, 2011, £55 (hbk), ISBN 978-1843836247

Charles D. Stanton is not a name familiar to most students of maritime history: the back-cover blurb of this book reports that he comes from an unconventional background, as a mature student who completed a PhD at the University of Cambridge after a career as a naval officer and pilot. As a CV shared with at least one archaeologist of note this is an excellent background for a book on this subject, dealing as it does with inshore coastal and amphibious operations. The book is—in the present circumstances of publishing—reasonable enough value at £55 hardback, and Boydell have maintained high-quality production throughout. More (colour) illustrations would have been welcome, but the maps and diagrams are excellent (a consequence of the author's previous career, perhaps). For those interested in this particular topic the book will be essential reading and serves the purpose admirably; for all others, it is good but not perhaps sufficiently remarkable to justify a major diversion.

For maritime archaeologists, the major sections of note are the Introduction, discussing (briefly) galley logistics (pp.1–8) and Appendix 1, 'The Fleet: ships, sailors, shipyards and strategies' (pp.225–72). The latter in particular is a useful review of the varied available data for the Norman fleet, albeit at times taking a stance that some might disagree with. For instance, Stanton asserts (pp.225–6) that 'the Normans had long since forgotten the seafaring ways of their Viking forebears. Thus, they would have availed themselves of whatever maritime technology was prevalent in the Mediterranean at the time of their arrival, adapting it to their needs as the circumstances dictated'. Your reviewer disputes this interpretation and suggests that it was this opportunistic Norman approach to technology which is the key. That is, their willingness to adopt and adapt existing regional seafaring technologies rather than try to force the use of familiar technologies in a new environment demonstrates not their *lack* of familiarity with seafaring but rather the opposite. Given how active the Normans and their varied relations, clients and enemies were around the seas and coasts of both southern and northern Europe at this time, they could hardly have failed to be aware of the technologies best suited for different circumstances, and successfully used these to their own ends on many different occasions. After all, the next group

successfully to undertake amphibious assaults in both southern and northern Europe did so nearly 800 years later: the Allies during the WW2 invasions of Sicily and then Normandy.

Such disputes aside, Appendix 1 contains a lot of useful archaeological, historical and art-historical data brought nicely together—discussing in turn the different types of galleys and also horse-transports used; their procurement; the presence and nature of shipyards (especially interesting given the lack of comparable data from this period for such facilities in north-west Europe); the recruitment and organisation of sailors; and finally the development of maritime strategy and tactics. It would have been good to see a more detailed consideration of the archaeological data, but that is clearly not the author's main interest, and must await the attentions of a future scholar.

Most of this book offers traditional (and intensely referenced) naval history, examining the nature of first Muslim and later Norman military (thus naval) control, primarily of Sicily, albeit within the wider context of naval operations in this area, especially various conflicts between the Byzantine empire and the Normans in the 11th century, and those first against Greece, later in North Africa, in the 12th century. Covering the period *c*.827–1194 AD, the book splits into four sections: 'The Conquest' (827–1101); 'The Apogee' (1101–1154); 'The Eclipse' (1154–1194) and 'The Impact'. This last is likely to be of most interest to *IJNA* readers, beyond the Introduction and Appendix 1.

The author does his best to place such varied developments in a broad context: as he states in the acknowledgements: 'the one overarching concept that I have gleaned … is that the Mediterranean Sea is a stage upon which no act occurs in isolation' (p.ix). Having said that, what we have here is a personal labour of love on a subject that is clearly the author's passion. This book is written with enthusiasm but also a lack of compromise familiar to many PhD candidates and their supervisors. After the short introduction the book leaps immediately into the detail of the Muslim conquest of Sicily in the 9th century AD. Students, therefore, should begin in easier and more engaging waters—the works of Susan Rose stand out—and only after that time move into Stanton's work if sufficiently intrigued. The book, however, contains excellent detail about the different personalities involved in the control of the Norman empire at this time in traditional 'top-down' history style. Archaeologists interested in the lives of galley crews in this period, for example, need to look elsewhere. But Section 4 does provide much useful food for thought. It focuses on four themes: first, the eastward expansion of West Italian sea-power; second, the revitalization of western commerce in the Mediterranean; third, altered trading patterns of Muslim commerce, and fourth the resurgence of Sicilian sea-power under the Holy Roman Emperor Frederick II (1154–1250). To this reviewer's mind what these discussions highlight above all is the need for a reassessment of the archaeological evidence of shipwreck-sites and coastal settlements around the central Mediterranean in this period, which were last surveyed by Parker back in 1992 (*Ancient Shipwrecks of the Mediterranean and the Roman Provinces*). With books such as Stanton's providing a solid documentary background, together with Parker's existing database joined to 20 more years of research, there has to be an engaging new story to be told about the maritime archaeology of this area.

JOE FLATMAN
Institute of Archaeology, University College London

Shipping the Medieval Military: English maritime logistics in the fourteenth century

(*Warfare in History Series*)

CRAIG L. LAMBERT

256 pp., colour cover, b&w frontispiece, 14 tables

Boydell & Brewer Ltd., PO Box 9, Woodbridge, Suffolk IP12 1SY, UK, 2011, £50.00 (hbk), ISBN 978-1843836544

Craig Lambert is a research assistant at the Department of History, University of Hull, which has a distinguished history of maritime historical research, and this book appears to stem from his MA and PhD studies there. This is a fine piece of scholarship in that mould—solid documentary research matched by sound writing. The book shows considerable effort spent in its production and editing, with little of the painful language so common to first books which have their origins in academic theses. For all its weight of learning and large number of impeccably-cited references, this is a relatively easy book to read, using engaging language to keep flowing a text full of intriguing details. It will appeal to all those interested in maritime history, especially in the field of naval logistics, as well as scholars of the medieval world.

Those looking for a detailed consideration of archaeological evidence for medieval ship technology, however, should search elsewhere. There are only passing references to archaeological material, and scarcely more to iconographic data. This is a pity, since the book could have been usefully and attractively illustrated with some of the fine manuscript illuminations of naval transport, and especially inshore fleet operations, which survive from this period (examples can be seen in the reviewer's own *Ships and Shipping in Medieval Manuscripts*, 2009). But illustrations would have increased the cost of this book, and it already weighs in at £50 for just over 250 pages.

In terms of archaeological comparison, meanwhile, the most useful section is Appendix 1, which lists the

ports which supplied ships to the fleets, highlighting once again the urgent need for a reconsideration of the archaeological data available from such locations, especially that collected since the advent of 'polluter pays' archaeology policies in England and Wales under *Planning Policy Guidance 16: Archaeology and Planning* (1992) and latterly its replacement *Planning Policy Statement 5: Planning for the Historic Environment* (2010).

Appendix 2 is similarly relevant, providing the author's methodology for the reconstruction of contemporary merchant fleets. This highlights the scale of shipping in use in the 14th century. Together, these two appendices demonstrate how little we know from archaeology about the scale and extent of high-medieval shipping in English waters (especially in comparison with other nations), and, thus, how much useful research might be undertaken, using both old data from published excavations and new information (especially that derived from remote sensing on land and sea). As Lambert writes 'the number of ships that participated throughout the campaigns … was immense, and it is difficult to avoid the conclusion that the English merchant fleet in the 14th century was larger than has been previously appreciated. When we consider the involvement of thousands of mariners with the demands for supplies, and the system that ensured their collection … it can be stated fairly and conclusively that England's population felt the effects of total war' (p.208).

Shipping the Medieval Military is split into four main chapters, framed by a brief introduction and conclusion. The introduction is primarily a speedy consideration of previous scholarship in this field (with several pages containing footnotes longer than their supporting text), and then a *précis* of the main chapters. The conclusion is an even briefer, two-and-a-half page summary of the main themes of the book. Chapter 1, 'Raising a Fleet', is sub-divided into four sections; 'sources of shipping', 'requisition orders', the 'process of requisition' and 'the return passage'. Particular consideration is given to these activities during the reign of Edward III in the 1330s and 1340s, including events leading up to the battle of Crecy in 1346. This is complemented by ch. 2, 'The Supply of Armies and Garrisons by Sea, 1320–1360', which considers the wider issue of long-term logistics, especially the victualling of these fleets, which from an archaeological perspective is some of the most interesting discussion of this book, with questions of the types and quantities of materials involved.

The question of naval logistics is not something which archaeology has explored very much, but as McErlean, McConkey and Forsythe (*Strangford Lough: An Archaeological Survey of the Maritime Cultural Landscape*, 2002) highlighted in their chapters on the role of the linked monasteries of Greyabbey in Northern Ireland and Holm Cultram in Cumbria in providing preserved fish for successive English campaigns in Scotland in this period, there is great potential here. Indeed, the particular questions of supply to these Scottish wars in the 1320s and 1330s, and then the 1340s to 1360s, are discussed in detail in the middle part of ch. 2 to good effect. Later sections of this chapter consider the rather different logistical concerns of the conflicts in France in the 1320s to 1340s. A particular (but, oddly, not subtitled) section at the end of this chapter (pp.93–100) discusses the transport of horses by sea, drawing in particular on previous studies by Pryor and others of this most specialized of all types of naval logistics.

Chapter 3 concerns 'The Transportation of English Armies to France, 1324–1360', and goes into extensive detail, in particular regarding the payroll and financing of these fleets. As an archaeologist the reviewer recognises that these sections and their sources are extremely important but confesses to having struggled at times to embrace such documentary detail. Chapter 4, 'Maritime Resources and the King's War', where Lambert brings together all his work in detailed analysis, is the real conclusion of the book, the short formal conclusion notwithstanding. After a scene-setting introduction he discusses developments in fleet organisation (pp.158–71), port resources (pp.172–83), shipmaster service and mariners (pp.184–96) and finally crew size and manning (pp.196–206).

Those in agreement with the reviewer that there is a need comprehensively to reconsider the archaeological evidence for English medieval ports will find much food for thought in the section on port resources, especially when considered alongside other recent publications which shed further light on this issue, such as Rose's excellent *The Wine Trade in Medieval Europe 1000–1500* (2011). Similarly, those interested in the particular issue of the crewing of vessels—perhaps in relation to experimental archaeology using replica or reconstructed vessels—will find much of relevance in the section on crew-size and manning.

JOE FLATMAN
Institute of Archaeology, University College London

Edward III and the War at Sea: the English Navy 1327–77

(*Warfare in History series 15*)

GRAHAM CUSHWAY

xii + 265pp., 2 appendices, bibliography and index, 5 colour illustrations, 4 maps

Boydell Press, PO Box 9, Woodbridge, Suffolk IP12 3DF, UK, 2011, £60/$99 (hbk), ISBN 978-1843836216

In this book Graham Cushway supplies a very useful and highly detailed account of maritime activity, ranging from logistical support, and victualling, to participation in war fleets, undertaken at the behest of the

Crown in the period from the accession of Edward II to the death of Edward III. This period of 70 years was one of almost continuous warfare, mostly against the old enemies of England—on the one hand, Scotland, and on the other, France. Some of the most renowned medieval land battles, Bannockburn, Crecy and Poitiers, are included in this period as well as the first phase of the Hundred Years War. It is, therefore, not surprising that there is a great deal of ground to cover.

To establish the context of the various campaigns and engagements discussed, Cushway has also found it necessary to include what amounts to a summary of political relations between the English crown and its opponents in these years. The result is at times a somewhat dense narrative which is inevitably not easy reading for those without some previous knowledge of the period. Nevertheless the account of the use of ships by the Crown is careful and well researched, making abundantly clear the extent to which an English monarch in these years needed the support of the maritime community. Chapters cover events from the very earliest years of Edward III's reign to his death, with due attention paid to the war with Scotland as well as that with France. The major naval battles of the reign, Sluys (1340), Winchelsea, or *les Espagnols sur mer*, to give it its contemporary title (1350), and La Rochelle (1372) each receive a separate chapter.

The accounts of these battles are often stirring and give a good idea of the armaments and tactics used in the rare sea fights of the period. They also, however, rely on the writings of chroniclers which have not been subjected to much in the way of criticism or evaluation. In the case of Sluys for example, Cushway includes without comment the story of English ladies being killed in the course of the battle. This probably owes more to the imagination of the master teller of chivalrous tales, Froissart, than to actuality, since this incident has left no trace in English sources. Froissart's account of the battle of Winchelsea may be more reliable, since there is good evidence that it came from a participant, but, again, it is embellished by a degree of speculation. This lack of criticism of contemporary sources applies also to the illustrations of Sluys and La Rochelle included in the book. These are based on a 15th-century illuminated version of Froissart's *Chronicle* prepared for a noble patron, and cannot be used as evidence for either ship types or battle tactics relating to a period at least a century earlier. Other sources can confirm the use of missiles thrown down from top castles and the press of armed men on the decks shown in these images, but that is all.

As well as the largely narrative chapters which make up the bulk of the book, Cushway also includes some material on the organisation and administration of royal fleets. Much of this is valuable, as are the appendices which include a listing of all those known to have held the position of Admiral during this period, and the listing of what are called 'royal ships used by Edward III'. This reaches a total of 99 vessels although, of course, not all were serving the King simultaneously. It is also the case that only a minority of these ships were ever owned by the King directly; it was a peculiarity of royal practice at this time that ships were considered among a monarch's personal possessions not as 'Crown' property to be handed on to a successor. All aspects of their maintenance were thus paid for by the King with details in royal accounts. More space in the book could have been devoted to these topics, and would have added to the understanding of what constituted the English navy of the 14th century. It would also have been valuable to devote more space to the ships themselves, their design and what is known about their handling qualities. This is all passed over very briefly and can be misleading. Mention is made of the lack of dry docks in private (that is, non-royal) shipyards at this period, when in fact dry docks are not found in English shipyards until the 16th century.

The final pages of the book make some striking claims for the importance of Edward III in the realm of war at sea. He is described as using his 'military genius' to develop a system 'whereby merchant shipping of the realm ... could be harnessed ... to sustain his remarkable military ambitions'. Cushway has certainly provided many instances of the use of merchant shipping in the service of the Crown. He states in the introduction that he has deliberately devoted most space to what happened. In the process of doing this, however, much of the necessary understanding of contemporary developments in the nature of the state and its administration, in the conduct of warfare, and more particularly in ships and ship-handling, has been somewhat overlooked. Cushway devotes a whole chapter to the Battle of Winchelsea but does not fully appreciate Edward's daring in attacking an enemy fleet under full sail on the open sea rather than in the confined waters of an estuary or very near to the shore where virtually all earlier sea battles had taken place. To some extent the ships themselves are almost absent guests at the feast of narrative provided.

There is also an aspect of the book as a whole which may be more the responsibility of the publishers than the author. It is often the case that reviewers welcome footnotes in preference to the endnotes now more commonly found in academic books. Here, however, the notes are inserted only at the end of a paragraph no matter how many sources have been referred to in the preceding text. This makes tracing any particular reference, particularly any to a paraphrase of a document or a chronicle, a tedious and time-consuming task; this, to some extent, negates the purpose of having notes at all. Apart from this, the book is well-produced with a full index and some useful sketch maps. Despite some imbalances in the material covered it is a volume which will be very useful to those working in this period.

SUSAN ROSE
Highgate, London

Deutsches Schiffahrtsarchiv 33 (2010)

(English and French summaries)

LARS U. SCHOLL with ERIK HOOPS (eds)

Deutsches Schiffahrtsmuseum, Hans-Scharoun Platz 1, Bremerhaven, D-27568, via Oceanus verlag, Thien-kamp 93, Wiefelstede D-26215, Germany, 2011, €23.50 (hbk), ISBN 978-3869270333

The German Maritime Museum Yearbook 33 is a well-presented publication comprising eight sections, which reflect a variety of themes. The first five sections consist of one article each. 'From the collections of the German Maritime Museum' is the first section, with Ellmers's article on 18th-century scenes of herring fishing which decorated Dutch faience plates—two examples of which were acquired by the German Maritime Museum in 2008. Ellmers's significant study traces the production process from the etching to the finished plate, while he also provides examples of wall-tiles (pp.15, 26). The article presents scenes that unfold all aspects of herring fishery: the herring *buss* preparation, equipment and sail, the making and repair of herring nets, the packing of the herring into barrels, the making of red herrings, marketing the finished product and finally its consumption.

From these delicate scenes in blue watercolour, the editors proceed to a different and earlier 'Source material', the medieval limestone petroglyphs from the church of Bobbin on the Island of Rügen, discussed by Steusloff. The scenes are dated to 1400 AD when the church was built, and depict late-medieval cogs with a possible building surrounded by palisades. This new material certainly adds to the corpus of known medieval maritime scenes. Likewise, new evidence is presented in the following section, 'Maritime archaeology', with a paper by Auer and Belasus on 'The British Brig *Water Nymph*', reporting underwater excavation of a typical 19th-century merchant vessel off the Island of Darss, Western Pomerania (see *IJNA* 37.1 (2008), 130–41).

The next section, 'Social history of navigation', consists of a single article by C. Westerdahl on 'Ancient Sea Marks—a social history from a North European perspective', a refreshing and much-needed approach to an often-neglected element of the maritime cultural landscape (if this is defined as a network of routes and harbours). Unlike much previous research, Westerdahl contextually examines sea-marks as material and immaterial dynamic features of both the natural and social landscape. His survey and linguistic analysis of place-names provide a significant corollary to his archaeological and historical work, as a means of identifying and providing a wider context for sites with possible associations with sea-marks, supported by a detailed study of the landscape.

As a navigational aid, a sea-mark can be defined as 'an artificial or natural object of easily recognisable shape or colour or both, situated in a position where it may be identified on a chart or related to a known navigational instruction' or experience (p.72). Whatever the function of ancient sea-marks—'to warn sailors and fishermen of shoals and banks near the coast', or to 'show them their location' (p.72), or perhaps also with ritual properties—the system or pattern of ancient sea-marks is considered by Westerdahl both as a 'continuum and as reflection of changes in society' (p.74).

The author sees built, natural, and verbal or cognitive sea-marks as dynamic elements of the landscape which have been 'transformed from immaterial to material and back again' (p.133). They have been completely removed or moved to a different location, they have been re-erected or repaired, or even changed to a completely different shape. We may find their remains, but sometimes only a name. From a North European perspective sea-marks vary in form and even in function—mainly due to natural conditions. In many ways they 'formed counterparts, presumably also contemporary, to markings along the roads ... a parallel between land roads and sea routes' (p.133). They 'became or even from the start could have been a part of the ritual landscape', in folklore developing into human and supernatural beings (p.133). Most importantly, sea-marks have always been a significant element of the social landscape with a close relationship to power, compulsion and social conditions. Overall, Westerdahl's examination of sea-marks unites sea and land, taking maritime culture as the starting point for the study of the ancient maritime cultural landscape and thereby broadening the routes of research and interpretation in maritime archaeology.

Remaining on the subject of navigation but moving inland, the next section, 'Navigation in inland waters' provides an important contribution by Stettner, the third in a series published in previous yearbooks (2002 and 2003) on pre-mechanical bank-bound ship-driving by means of rope-pull on rivers, canals and narrow harbour entrances. This part offers an annotated selection of pictures and a supplement to parts 1 and 2 about towing by man- and horse-power.

The next section, 'Fishing and Whaling', consists of three papers which explore different aspects of whaling from various perspectives, evidence, and periods. Rheinheimer's 'Whale depictions on old gravestones of the Wadden Sea Islands', investigates the 17th-century tradition of decorated gravestones in maritime communities where whaling reflected the prosperity of seafarers. Keeping a focus on the social dimension of whaling, Barthelmess and Grohmann present Bertha Stapel's diary, written in 1905 while on the German whaling station in Iceland. Kock, by contrast, provides a critical approach to the history and politics of German whaling, with a particular focus on whale-fishing management.

The last two sections of Yearbook 33 bring us up-to-date with more subjects in maritime history and

technology. For instance, Neumann's 'The Krupp Company and the development of marine reactors 1955–1980' gives an informative account of nuclear-powered ship industry and research, along with a description of the only such vessel constructed in Germany, the NS *Otto Hahn*.

The latest *Deutsches Schiffahrtsarchiv* maintains the great thematic variety of the series, with some exceptional and finely illustrated contributions by specialists. This meets the Museum's requirement to publish research on all aspects of German maritime archaeology and history, and happily sometimes beyond Germany's borders: a thoroughly rewarding miscellany.

PANAGIOTA MARKOULAKI
Dept of Archaeology, University of Nottingham, England

Russian Warships in the Age of Sail, 1696–1860: design, construction, and fates

JOHN TREDREA and EDUARD SOZAEV

447 pp., over 300 b&w illustrations including drawings and prints, 4 maps

Seaforth Publishing, Pen & Sword Books Ltd, 47 Church Street, Barnsley S70 2AS, UK, 2010, £40.00 (hbk), ISBN 978-1843320581

The naval history of Russia from Peter the Great to the end of wooden shipbuilding has long been the province of obscure, often inaccessible Russian-language works, produced in small numbers. Even the most basic facts and figures were uncertain. No reliable listing of warships existed in any western language. This truly magnificent book not only fills that gap in our knowledge, but also develops a deeper and more systematic appreciation of how and why the Russian Navy differed from the fleets of other powers. Tredrea and Sozaev not only provide full lists of ships, with career details, but they also examine the evolution of the Russian Navy as a strategic instrument for war, deterrence and prestige. The single most important piece of evidence of Russian naval policy and strategy is the ships that were built, and the way in which they were used.

In reality this is two books in a single, commodious volume. The first 113 pages constitute the best account of the history, administration, policy, strategy, dockyards, weapons, wars and battles of the Russian sailing navy. The authors' assessment of the uneven historiography of their subject is masterly. Having provided their subject with the essential context, the remaining 330 pages move through successive eras of naval construction in the Baltic, Sea of Azov, Black Sea, Caspian and Sea of Okhotsk, reflecting the fundamentally divided nature of Russian navigation. The final sections detail coastal (mainly oar-driven) forces, and naval auxiliaries, completing the most comprehensive possible coverage. The appendices provide orders of battle and fleet lists.

Critically, readers learn that the Russian Navy was built to deal with regional threats from Ottoman Turkey and Sweden, not to challenge the British or the French. The Russians invariably deferred to the great western navies, whenever possible avoiding pitched battles at sea. The basic mission of the fleet was to defend the seaward flanks of a massive land empire that had neither the need nor the desire to expand across the seas. In the period covered by this book Russia marched east, extending the empire from the Urals to Vladivostok, from the Ukraine to the Crimea and Armenia. Where possible the navy supported the coastal flanks of these advances, but it usually operated as an amphibious task-force rather than sea-control battlefleet. If the Royal Navy turned up the fleets scuttled back into port, taking shelter under the guns of major fortresses, the true symbols of Russian sea-power. Like any great continental power Russia happily sacrificed fleets to secure territory.

Nor did the fleets built to meet this strategy conform to western ideas. The Russians built quickly, with little concern for timber quality or seasoning, often replacing major ships after only a decade. Along with poor materials, limited maintenance, harsh weather and careless navigation ensured the demand for replacement ships was endless. Almost all Russian ships were built in state dockyards, which cost the same to run whether busy or slack, and timber was very cheap. From the early-19th century the Navy tried to build the biggest prestige ships, first- and second-rate battleships, from good-quality oak, but the improved longevity only took effect when such wooden sailing ships became hopelessly obsolete.

The history of the Navy was episodic because few tsars really understood the utility of naval power. While Peter the Great was unique in his expertise and commitment to the fleet, Catherine II certainly understood regional sea-power, and used it with considerable effect against Turkey and Sweden, and Nicholas I made the navy more efficient and effective than hitherto. In 1833 Nicholas's Black Sea Fleet landed a small army opposite Istanbul, to protect the city from the Egyptians. It was the high-water-mark of Russian sea-power in the age of sail. Other tsars, notably Alexander I, tsar of *War and Peace*, were remarkably uninterested. Alexander allowed the fleet to decay into insignificance. The final straw came with the devastating St Petersburg flood of 1824 when upwards of 10,000 people drowned, and most of the fleet lying in ordinary at Cronstadt was washed ashore and wrecked, while the shore defences of the capital were left in ruins.

Little wonder Tsar Nicholas I, who came to the throne in the following year, was concerned to make the fleet efficient. By 1850 he had created a powerful, relatively efficient seagoing fleet in the Baltic, a smaller but more professional force in the Black Sea and solid

infrastructure to build and operate wooden sailing ships. Among the many surprises this book throws up is the pre-eminent role of the Archangel shipyard as a constructor of warships. This long-established Russian port had access to ample supplies of fir and larch, along with iron from the Urals. It built most of the standard small battleships, frigates and transports down to the Crimean War.

Russian design and construction owed a great deal to British practice. Not only did Peter the Great come to Deptford to learn the craft, but he sent his best men to follow up his work. Later the Russians became adept at espionage, acquiring 'at considerable expense' (p.153) the plans of Thomas Slade's superb HMS *Victory*; ten *Ches'ma*-class copies were produced. Tsar Paul preferred French and even Spanish designs. Even the United States did not escape. The Russians acquired the draught of HMS *President*, a straight copy of the USS *President*, which they used to build the *Pallada* and *Diana*. Both ended their days in the Far East during the Crimean War, the first irreparably damaged by ice in the Amur River, the second wrecked by a *tsunami* on the coast of Japan. By the 1850s the Russians were once again buying designs, openly admitting that *Imperator Nicolai I* and *Il'ia Muromets* were based on the British screw-propelled 131- and 51-gun ships *Duke of Wellington* and *Imperieuse*.

Including the wooden steam navy allows the authors to address the transitional era of paddlewheel warships, converted screw-propeller sailing ships and the brief efflorescence of purpose-built wooden steam warships. Steam technology exposed the most serious weakness of Russian seapower: the state was so far behind Britain, and other advanced nations, in the design and production of steam machinery that most Russian ships were either built abroad or fitted with foreign machinery. In 1854 the new screw-propelled fleet was just taking shape, only for the outbreak of the Crimean War to ensure the British engines were impounded, along with two new corvettes, and turned to use against the original purchaser. The corvettes, renamed HMS *Cossack* and HMS *Tartar*, served in the Baltic in 1855.

Once the war began Russian shipbuilding turned to coast-defence assets, mostly oar- and then steam-powered gunboats to defend the vital area of Cronstadt/St Petersburg, the massively vulnerable 'window on the west' built by Peter the Great to demonstrate Russia's emergence as a front-rank European power. The British built five times more steam gunboats. In the Black Sea the battle-fleet annihilated a Turkish frigate squadron at Sinope in December 1853, before being sacrificed to the defence of Sevastopol; some ships were scuttled to close the harbour entrance, the rest went down when the city fell in September 1855. After the war ended fresh machinery was ordered for incomplete warships, along with steam frigates to conduct cruiser warfare, recognising the failure of the battle-fleet to defend Russia's many coasts from Anglo-French assault. The Black Sea Fleet had been abolished by the Peace of Paris.

This essential work for all those who have an interest in Russian warships and naval history is a major event in naval publishing. It answers many questions that have long troubled western historians and it brings Russian naval history into the mainstream of the subject, a little late perhaps, but benefiting greatly from following the format established by British and American scholars. It is no accident that the book mirrors the layout of Rif Winfield's critical listing of all British warships from 1603 to 1860 and, as with that series, Seaforth Publishing have produced a book whose quality matches the merit of the content.

ANDREW LAMBERT
War Studies, King's College London

Britannia's Realm: in support of the State: 1763–1815

(*History of the British Merchant Navy, Vol. 2*)

RICHARD WOODMAN

352 pp., 24 colour illustrations, 17 in-text line drawings

Masters Under God: makers of Empire: 1816–1884

(*History of the British Merchant Navy, Vol. 3*)

RICHARD WOODMAN

383 pp., 24 colour illustrations, 20 in-text line drawings

The History Press, The Mill, Brimscombe Port, Stroud GL5 2QG, UK, 2009, £30 each (hbk), ISBN 978-0752448190 and 978-0752448206

It is the mark of Richard Woodman's five-volume series, from which this central pair of books has been drawn, that no individual has attempted such a project since William Schaw Lindsay 140 years ago. A comparison of the authors suggests why. Lindsay—seaman, ship-broker, ship-owner and Member of Parliament—knew the business from top to bottom: Woodman is equally well qualified, an Elder Brother of Trinity House he served at sea for 40 years, and is a successful author in several genres. Both books are structured around five long chapters examining key trades, following the evolution of markets, routes and new ships across relatively long periods.

This is a work focused on men, ships, cargoes and trades: the economics of merchant shipping are largely implicit from the failure of businesses, and the shifting pattern of activity. Instead it is the sea that dominates. In parts the litany of disaster—wrecks, fire, collision, disease and disappearance—reads like a tragic history of the sea. Each new trade-route posed difficulties and dangers that had to be overcome by skill, and science, improved ships and, latterly, steam and iron. In large

part this structure reflects the nature of the evidence. Where naval historians have the luxury of examining the records of centrally-run state bureaucracies, the history of the 'Merchant Navy' is one of shifting, amorphous ownership, and inconsistent record-keeping, often involving small-scale activity from minor ports, with the lightest regulatory touch, outside the obvious demand to raise revenue from customs. In this respect subsidised trades like Greenland whaling have left far better records because they had to submit their papers to earn their bounty. The slow growth of charting, lighthouses, pilot services and the key role of Trinity House stresses the role of state agencies in precaution, prevention and safety. Many harrowing disaster stories serve to highlight the slow progress of buoying and lighting.

Volume 2 focuses on war: between 1776 and 1815 three world-wide conflicts exposed British commercial shipping to the risk of capture by enemy warships and swarming French and American privateers. Little wonder the men of commerce were vehemently opposed to the coercion of the American colonies before 1776. That said, Woodman holds no brief for the Navy, which is frequently pilloried for impressing and putting other interests above trade defence. Yet when Captain John Moutray abandoned a rich East and West India convoy to the French in 1780 he was cashiered and disgraced. The resulting losses suffered by insurers, half of whom failed, led to the transformation of the insurance market. It also ensured close ties between insurance and the Admiralty, which was obliged to convoy the traders. This connection would endure into the 20th century, stressing the fundamentally maritime nature of the British state. War was something of a lottery, making and breaking fortunes with equal abandon. Liverpool was devastated by the American war, and continued to oppose coercive measures against the new nation down to the War of 1812.

Despite a litany of problems British merchant shipping dominated the world by the end of the 18th century, a position that was amplified by the 22-year cycle of the Revolutionary and Napoleonic Wars, when other shipping nations were occupied, crushed and demoralised. British ships grew bigger, and the number increased despite wrecks from Archangel to Cape Agulhas and beyond into the China Seas. Shipping had a critical role in the ultimate British victory against France and America, carrying the means of war, and paying the taxes that funded the conflict; in the process ship-owners became rich. The imposition of obligatory convoys reduced losses to around 3%, well within the manageable range, while Lloyds Patriotic Fund issued prestigious swords to officers who saved merchant shipping, and owners and masters of well-handled convoys frequently showed their appreciation. By contrast the masters of ships that left convoys were fined and often ended up in prison. The defence of trade was never perfect, but the system remained effective throughout. The Navy and the merchant marine were the twin pillars of success.

Volume 3 changes tack as war gave way to peace and prosperity. The Napoleonic wars had taught the British that their food supply was vulnerable, and this helped push the Government from protection to free trade. The wartime flouting of the Navigation Laws made it hard to re-impose them, instead post-war developments centred around the creation of effective state regulation of seafaring skills, the evolution of the Master's Certificate and the work of the Board of Trade, which helped to re-invigorate British shipping after 1850. The development of trade with China was held up by the East India Company's monopoly and Chinese indifference. The British state depended on the EIC for high grade saltpetre, vital for good gunpowder, and regular customs revenues, while the Chinese had little interest in British goods—only Indian-grown opium would sell.

Once the Company monopoly ended, a swarm of vessels, including several with dubious business practices, pushed into the Chinese market, and after two Anglo-Chinese wars found markets opening, and a safe commercial base at Hong Kong. The challenge of American sailing ships in the Atlantic was met with improved domestic designs, and then the shift into iron and steam, with Canadian owners, builders and operators, not least wartime defence contractor Samuel Cunard, often to the fore. The strategic needs of an expanding global empire led to the Mail contracts of the late 1830s that effectively funded the evolution of new commercial models, and new steamships. By the end of volume III, telegraph cables, reliable charts and improved navigational aids had reduced the risks of seafaring, and the annual toll of seafarers, just as global trade began to take off. It has long been known that the global economy was created by the British; Woodman shows us that globalisation only worked because there were ships and men ready to carry cargoes around the world, and push the boundaries of the possible in the search for a profit and a market. Unlike many accounts of commercial shipping he also addresses not just the new ships and routes that caught the headlines, but shows how older ships—notably time-served East Indiamen—found new roles in humbler service, lugging West India cargoes and finally the lowest form of ocean-going life, the North American timber trade, last refuge of old vessels with capacious holds. In the ultimate antidote to the 'romance of the sea', we learn that the beautiful tea-clippers were soon replaced by prosaic economical steamers, and, after carrying the Australian wool-cut back to Britain, ended their days freighting guano.

The plate sections and line drawings provide an excellent feel for the size, design and function of the evolving merchant ship, from sailing coasters to the *Great Eastern*, the finer points of their handling explained by an expert. This is a work of astonishing scope and erudition. Although largely drawn from secondary

sources it reflects a rare melding of practical knowledge, serious research and compelling writing.

ANDREW LAMBERT
War Studies, King's College London

Commanders of Dutch East India Company Ships in the Eighteenth Century

JAPP R. BRUIJN

xiv + 336 pp., 26 b&w illustrations, 22 maps, 4 tables

Boydell Press, PO Box 9, Woodbridge, Suffolk IP12 1DF, UK, 2011, £75.00 (hbk), ISBN 978–1843836223

Europe's engagement with Asia in the 18th century was a fundamentally international experience. European merchants entered the sophisticated maritime trading world of the Indian Ocean, characterised by its complex flow of goods, people and ideas; they travelled there on ships manned by multi-national and polyglot crews; and they returned to Europe with goods that were in demand across the continent. Until recently, however, the historiography of this precursor of today's globalised economy has remained resolutely constrained within national boundaries. One of the explanations for this is the limitations imposed by language. Scholars of the trading world of the European East India companies, therefore, will welcome the opportunity to read the work of one of the leading Dutch maritime historians. This translation of a book that was first published in Amsterdam in 2008 by De Bataafsche Leeuw as *Schippers van de VOC in de achttiende eeuw aan de wal en op zee* opens up many new avenues for comparative analysis of this pan-European phenomenon.

The focus of the book is on those who commanded the ships which plied the trade-routes between the East Indies and the Netherlands. Its principal strength lies in the wide-ranging research on which it is based, permitting the reconstruction and analysis of these commanders' careers. The wealth of material garnered from national, provincial and municipal archives indicates the importance and impact of Bruijn's book. Ships' pay-ledgers survive for the 18th century, covering the years 1700 to 1795; they include 655,000 names, probably 95% of the all the men who sailed aboard Company ships.

The Dutch East India Company reached its peak as a trading and shipping concern in the 18th century. During that century, a total of 2957 outward-bound voyages to Asia were undertaken, while 2369 homeward-bound voyages to the Dutch Republic took place. The quantities of gold and silver dispatched to Asia trebled and the value of Asian goods brought back for sale in Europe rose by 250%. During the 17th century, perhaps 20 ships sailed to Asia every year; this number nearly doubled between 1720 and 1740. These statistics act as a very powerful reminder to Anglophone readers that the East India Company based in London was not the only institution with interests in Asia. Indeed, although they were founded within two years of each other (the English company in 1600; the Dutch equivalent in 1602), a number of important differences emerge between the two. One of the key and striking distinctions is the federated structure of the Dutch company. While the English monopoly centred on London, saturating that city with the wealth of Asian trade, the Dutch spread the riches. The Dutch East India Company (*Vereenigde Oost-Indische Compagnie*, or VOC) was formed of six chambers: Enkhuizen and Hoorn in the northern part of Holland; Amsterdam, Rotterdam and Delft in the southern part; and Middleburg in Zealand. In the four smaller cities, the VOC became the largest employer and was a key source of economic activity.

The book is arranged in two sections: chapters in the first part discuss the social background and origins of the commanders (*schippers*) of VOC vessels. Bruijn paints a vivid picture of the sorts of men who commanded these ships, offering the reader a wealth of information about their geographical origins, their family backgrounds, their financial circumstances, and the rise in social status precipitated by their involvement in the Asian trade. As a result, this section of the book is essentially concerned with life ashore. It grounds these 18th-century sea-captains in their social, cultural and economic milieux, and highlights the impact on European societies of this exponential growth in trade and contact with Asia. The second part of the book deals with the commanders as professional seamen. It explores a raft of issues connected with this aspect of life on Company ships: how commanders procured their appointments; the qualifications they possessed; their incomes and extra earnings; and, ultimately, the vessels in which they served. A final chapter compares the commanders of VOC ships with their counterparts in other East India trading companies.

Readers of this *Journal* will be particularly interested in the chapters which deal with the ships these men commanded, and which detail their lives and experiences on board. Chapter 13, for example, explores such things as commanders' responsibilities while ships were in the roads, as well as the sorts of instructions and orders issued to guide and direct them over the course of a voyage. It also explores issues such as the layout and composition of the commander's cabin, and social life aboard. Chapter 14 deals more specifically with the ships themselves.

The book is illustrated with some fine examples of the material culture which played such an important part in the lives of these men. For example, on p.176 there is a picture of an octant, found by divers on the wreck of the *Hollandia*, which went down in 1743. It provides tangible evidence of the use of this relatively new navigational instrument on board VOC ships. On p.258 we find an image of a model of the *Gerechtighied*, built in Enkhuizen in about 1742. The deck above the commander's quarters can be removed

to reveal the way in which these were arranged, complete with table, wine bottles and pipe-smoking figures. While on p.239 there are images of some of the more unusual contraptions used on board: a ventilator, or air-pump, which was employed on East Indiamen from 1746 onwards and allowed the air below decks to be refreshed; and a model of a 'cooling sail', which provided some relief from heat in the lower latitudes. One might have hoped for more contextualisation of the images and objects within the text, but their presence alone is commendable.

Using the wealth of archival resources at his disposal, Jaap Bruijn has succeeded in reconstructing an elaborate picture of the social world of the VOC's commanders—at sea, in Asia, and in the Netherlands. This book represents a major contribution to our knowledge and understanding of the world of the European East India trading companies, whose wrecked ships figured so frequently in the early years of underwater archaeology.

JOHN McALEER
National Maritime Museum, London

Northern Lights: the Age of Scottish Lighthouses

A. D. MORRISON-LOW

xxvi + 262 pp., numerous illustrations, many colour

National Museums Scotland, Chambers Street, Edinburgh EH1 1JF (www.nms.ac.uk/books), 2010, £25 (hbk) ISBN 978-905267576, £17.99 (sbk), ISBN 978-905267477

Dynasty of Engineers: the Stevensons and the Bell Rock

ROLAND PAXTON

xvi + 120 pp., numerous illustrations including 20 colour plates

Northern Lighthouse Heritage Trust, Edinburgh, via Whittles Publishing, Dunbeath, Caithness, Scotland KW6 6EG, 2011, £20 (hbk), ISBN 978-0956720900

Northern Lights was produced to coincide with an exhibition on lighthouses, to mark the bicentenary of the Bell Rock Lighthouse (1811), 'now the oldest surviving rock lighthouse in the world' (p.75). But it is far more than an exhibition catalogue. It is a celebration of Scotland's lighthouses, and the leading role in their design, building and optics played by the Stevenson family of Edinburgh. Such books appear fairly regularly, given the importance of Scotland's role in the development of lighthouses, but few are as well illustrated, or based on so much technical knowledge. The author is Principal Curator, History of Science and Photography, in National Museums Scotland (NMS), which holds 'one of the finest and most internationally significant collections of artefacts relating to the history of sea-marking of any nation' (p.xxiii). Many in Scotland fondly remember the lighthouse models and related material displayed in the Civil Engineering Gallery from 1928 to 1992.

Chapter 1 sets the scene, discussing navigational marks and the gradual introduction of lights. The early fires of wood or coal were costly and inefficient, and could be confused with accidental fires or industrial kilns. The breakthrough came with oil lamps, which gave a steady light, enclosed and not vulnerable to the weather, and systems of reflectors to increase the intensity of the light, and therefore the distance at which it could be seen. Developments in lighting technology were a by-product of the rapid growth of cities. Thomas Smith (1752–1815), a tinsmith making oil lamps, won a contract for lighting the streets of Edinburgh. The Argand lamp, invented in 1780, and improved by Arago and Fresnel in 1821, provided a basis from which Smith, his son-in-law, Robert Stevenson, and Robert's sons and grandsons, could develop lighting systems for lighthouses, with parabolic reflectors, and then lenses. As more lights were erected, there was a need to distinguish between neighbouring ones, and so revolving mechanisms were developed, to produce regularly-spaced 'flashes' of light. Smith and the Stevensons travelled to study other lighthouses, and improved on what was best.

The series of four lighthouses built on the Eddystone Rock, in the English Channel 14 miles SSW of Plymouth, is the topic of ch. 2. This is for two reasons. Firstly, because the experience of their construction, 'especially that of the third Eddystone, built by the eminent 18th-century civil engineer John Smeaton (1724–92), had such a profound influence on such structures produced thereafter' (p.31). Secondly, because NMS 'has in its collections early and important material relating to these early English lighthouses' (p.31). Winstanley's Eddystone Light, the first rock lighthouse in Britain, was finished in 1698, heightened in 1699, and destroyed, along with its designer, in the great storm of November 1703. This was soon replaced by a tower with a stone base encased in timber, and a timber superstructure. Completed in 1709, its timbers were soon attacked by marine worms, and in 1755 it caught fire. The keeper on duty tried to put out the fire, but as he looked up molten lead from the roof fell on him, and some got down his throat. The tower burned down. The keepers were rescued, but the man who had swallowed the lead died 12 days later. The lump of lead survives in the NMS collections, to the delight of generations of ghoulish children, including Morrison-Low (p.vii).

Smeaton was commissioned to replace the lighthouse. He realised that building all in stone, though more expensive, would produce a better result, and that the strongest shape would be like a tree—a tapering cylinder with a spreading base. The use of mortar, and of iron bolts, had failed to anchor previous stone

structures to the rock, and he proposed the use of cement (natural 'hydraulic lime', the recipe for which he worked hard to perfect), and modelling the foundations on tree-roots rather than starting with a complete course of stones. He chose granite for the exterior and softer Portland stone for the interior. The stones of each course were cut to interlock sideways, and there were vertical stones which held each pair of courses together. Work started in 1757 and was completed in 1759. The tower remained in use until 1877, when the rock it stood on was found to be eroding. The fourth lighthouse, completed in 1882 and still standing, was built on another part of the rock.

'Scottish Lights before the Bell Rock' is the subject of ch.3, starting with maritime trade, the development of charts, and the Scots navy—its largest vessel, the 'great' *Michael*, launched in 1511, was copied by England's Henry VIII as the *Henri Grace a Dieu*, launched in 1512. The first surviving chart of Scotland dates from 1583, and there is no record of Scottish makers of navigational instruments before the 18th century. The first lighthouse was built on the Isle of May (in the Firth of Forth) in 1636, with another three before the establishment in 1786 of the Commissioners of Northern Lights, who set to work to replace the four old lights and to establish new ones. All the early lighthouses had been built on headlands or islands. It became clear, however, that the greatest hazards to navigation were reefs which were covered or barely exposed at high tide. Of these, the first to be tackled was the Inchcape or Bell Rock, off the mouth of the Tay estuary, 12 miles from Arbroath. Even at low spring tides only about 4 feet of rock was exposed (far less than at the Eddystone), so building on it was a challenge (though it was reputedly marked in medieval times by a bell, hence the name).

Robert Stevenson (1772–1850), stepson, son-in-law and apprentice of Thomas Smith the lighting engineer, claimed to have been thinking about how to erect a lighthouse on the rock since 1794. He visited other rock lighthouses, first landed on the Bell Rock in 1800, then began to prepare plans and estimates for a stone lighthouse. The Board consulted Smeaton, who approved Stevenson's conclusions, but it took time to raise the money. In 1807 a lightship was moored near the rock, to allow dues to be collected. Like Smeaton's Eddystone the exterior of the tower was to be built of granite, with a local stone for the interior. A work-yard was established in Arbroath, where the stones were cut to size. In 1807 the rock was prepared, with a refuge for the workmen, and lifting-gear and railways for handling the stone blocks. The foundation-stone was laid in 1808. The base blocks were dovetailed to each other for stability, and other aspects such as the use of pozzolanic cement, were also based on Smeaton's Eddystone. The lamp was lit in February 1811, and the final cost was over £61,000.

Chapter 5, 'Lighthouses in Scotland after the Bell Rock', continues the story of the Stevenson dynasty and their achievements, with further improvements to lighting mechanisms, and specialist glass manufacture allowing lenses to replace reflectors. The most notable achievements were Alan Stevenson's Skerryvore in 1843, 155 feet (47 m) high, at another remote reef location. His brothers David and Thomas were responsible for lights including Muckle Flugga (1854), and the rock tower of Dhu Artach (1872) south-west of the Isle of Mull.

The following chapter covers 'Stevenson Exports and Later Works'. The Great Exhibition of 1851 helped to advertise the Stevensons' skills, which were exported across the empire. Before that, several lighthouses in Newfoundland had bought second-hand lighting apparatus from Scottish lighthouses which were being upgraded. The Stevenson firm also provided designs or advice or personnel for the construction of lighthouses in Singapore, India, Burma, Aden, Japan, New Zealand and Chile. Chapter 7, 'Modern Times', covers automation, further developments in lighting technology, radio, radar, satellite navigation systems, and solar and wind power generation. In 2005 the last Scottish foghorn was switched off, as navigators no longer rely on such sounds, and modern ship's bridges are fairly soundproof. Scotland's 208 lighthouses, however, are still needed and, though unmanned, are continuously monitored and maintained.

What distinguishes this book from some of its predecessors is an interest in the history of the technology behind Scotland's iconic lighthouses, an ability to explain to the general reader the equipment and its historical and scientific context, and an overview uncluttered by excessive enthusiasm for either the towers themselves or the Stevenson family. By avoiding the wholly architectural or wholly biographical approach, being centred instead on the NMS collections, this book, like those collections, includes some unexpected and interesting material.

The thematic chapter topics lead to some repetition. There is overlap, for example, between the subject matter of chapters 1 and 3, and a block of text on p.136 is exactly repeated on p.189. The book is beautifully produced, with many unusual illustrations, but the binding of my paperback copy is already coming apart. Scots are proud of the Stevenson family and the lighthouses they built, which are objects of great beauty as well as magnificent technical achievements. This well-researched volume does justice to this heritage, introducing many aspects not covered by previous authors. It also reflects the quality of the lighthouse collection at National Museums Scotland.

There is some uncertainty as to how much of the design of the Bell Rock lighthouse was the work of John Rennie (1761–1821). Robert Stevenson's book about its building took a long time to write, and was published after Rennie's death. The success of the Bell Rock certainly established Stevenson's reputation, and there is no doubt that he was a successful project manager. Roland Paxton, a civil engineer and engineering historian discusses this question in *Dynasty of Engineers*. The

book is in three parts. The first reproduces from the new Oxford Dictionary of National Biography (2004) the entries for Thomas Smith and seven members of the Stevenson family who 'from 1786 to 1952 contributed significantly to the nation's transport infrastructure and international lighthouse engineering' (p.xiii). In addition there is a biographical note on Robert Louis Stevenson, who was intended to join the family firm, but rebelled and became a writer. This is reprinted from Paxton's earlier book, *Bright Lights* (1999). It highlights RLS's writings about his experience on these major civil engineering projects. He even persuaded people to allow him to try diving at harbour construction sites. 'Diving was one of the best things I got from my education as an engineer ... it takes a man into the open air; it keeps him hanging about harbour sides ... it carries him to wide islands ... it will go far to cure him of any taste ... for the miserable life of cities. And when it has done so, it carries him back, and shuts him in an office!' (p.30). Part 3 is a chronological list of Stevenson lighthouses in Scotland and the Isle of Man, illustrated with some fine photographs by Ian Cowe.

The main content is in Part 2, 'A new look at the creation of Bell Rock Lighthouse from little-known records'. This argues persuasively from primary sources that John Rennie was the 'chief engineer' for the project, Robert Stevenson the 'assistant' or 'resident' engineer. Rennie was responsible for the overall design, and Stevenson for some of the details which could only be worked out on site. Subsequent publications by members of the Stevenson family have downplayed or even denied Rennie's active role as chief engineer for the Bell Rock lighthouse. The author does, however, point out that Rennie could be difficult, and was himself unfairly critical of Thomas Telford.

This book, as one would expect from an engineer, is brisk and to the point. As well as the modern photographs there are numerous illustrations from Robert Stevenson's 1824 book on the building of the Bell Rock light. The structure of the argument is clear, and the book fulfils its stated aims effectively. Well produced and firmly bound, it is a must for lighthouse enthusiasts, but does not have the breadth or general appeal of *Northern Lights*.

PAULA MARTIN
Institute of Archaeology, University College London

Nautical Training Ships: an illustrated history

PHIL CARRADICE

192 pp., 150 b&w images

Amberley Publishing, The Hill, Stroud GL5 4EP, UK, 2009, £17.99 (sbk), ISBN 978-1848686960

The skills of handling a ship at sea have, since distant antiquity, been passed on essentially by practical experience and informal or formal processes of apprenticeship. Literacy and numeracy were not essential skills for the majority of early sailors; the sophisticated observational and mathematical skills required for oceanic navigation were closely-guarded secrets for many centuries, and ordinary sailors relied on specialists to direct their ship to its chosen destination. As the principles of celestial navigation became better understood, they began to be taught formally at academies in the Middle East, the Iberian countries and eventually throughout the Mediterranean.

The average size of European ships began to increase exponentially as entrepreneurs learned of the profits to be earned carrying spices and exotic cargoes. In the military sphere, gunfounders developed heavier ordnance from the 16th century, requiring bigger ships to carry more powerful guns. By the 18th century, the shortfall between numbers required to man Britain's merchant ships and volunteers to serve at sea was increasingly acute, exacerbated by the Navy's reliance on impressment of merchant sailors into warships. Phil Carradice has made an extensive study of the role of nautical training-ships in Britain, and has previously published a novel set on one such vessel, the once-proud warship *Havannah* which had escorted Napoleon into exile on St Helena in 1815 but spent her final 40 years from 1860 as a grounded 'industrial-school ship' in Cardiff. But he begins his survey a century earlier, when the Marine Society was established in London by Jonas Hanway to recruit poor boys for service at sea, particularly during the Seven Years' War. That generation helped Nelson and his colleagues to naval supremacy, but many were put ashore without further employment after 1815.

By the mid-19th century, steam-propulsion and shipbuilding in iron had facilitated another significant increase in tonnages, and Britain again found itself short of sailors. In 1850 Parliament voted to establish a network of 'Schools of Navigation' across the country, and there were 17 of these by 1862. Rapid population growth and migration into cities earlier in the century had brought an increase in juvenile deprivation, frequently leading to punishment by transportation. By mid-century, reformers were campaigning for less drastic sanctions against delinquency. Liverpool took the lead in trying confinement afloat, coupled with reformatory education, to deal with its youth crime. The author lucidly distinguishes between the 'voluntary' training vessels accepting boys of good character, the 'reformatory' vessels to which courts could sentence miscreants, and the 'industrial-school ships' which emulated the 'ragged schools' in taking in economically-destitute boys and offering them a route out of begging and dependence.

Conditions on all these types were frequently tough. The Admiralty was relied on for the loan of obsolete wooden hulks to house them; disease could spread quickly where sanitary conditions were poor, and bullying was common. Arson was a likely cause

in several of the seven instances of training ships destroyed by fire at their moorings; the fact that few lives were lost in these incidents is a tribute to the orderly procedures instilled into the trainees. Carradice devotes a separate chapter to the officer-training schools, exemplified by *Conway* and *Worcester*, whose origins also lay in the mid-19th century when the officer corps in Britain's merchant service needed to expand rapidly. The cadets who completed their courses had no difficulty in obtaining employment at sea, and generally retained a strong affection and loyalty for their training ships. Indeed, reunions continued decades after these two well-loved vessels were broken up.

The author does not neglect the Royal Navy's own training vessels, including *Britannia*, *Caledonia* and *Ganges*. He deals briskly with the scandals surrounding Beatie Sumner, wife of C. B. Fry and *de facto* Superintendent of the TS *Mercury* at Hamble, but neglects to mention that the ship survives to this day at Chatham under her original name HMS *Gannet*. Several of the former RNVR and RNR drill-ships which remained in commission around our coast until the 1980s are also described, and we are reminded that the former *Arethusa*, sold to New York in 1975, remains at South Street Seaport, albeit now for sale again.

The book is generously illustrated. Some of the later chapters carry a hint of repetition, as the author searches for fresh observations to make. There are detailed references to sources, and a comprehensive bibliography, but regrettably no index. In his conclusion, the author reminds us that economic factors brought the nautical schools into being, and the same factors eventually caused their demise. What remains of their functions has passed into the aegis of a few university departments at Glasgow, Liverpool, Southampton and elsewhere. This book provides a comprehensive reminder of how much tougher that training was in previous centuries.

JOHN ROBINSON
Stonehouse, Gloucestershire, England

John Lethbridge: the most successful treasure diver of the eighteenth century

MICHAEL FARDELL

101 pp. including appendices and special index, 26 b&w figures, maps

Historical Diving Society, Little Gatton Lodge, 25 Gatton Road, Reigate RH2 0HB, UK, 2010, £24 (hbk), ISBN 978-0954383442

The publisher of this book, The Historical Diving Society, was formed in 1990 in the UK by a group of enthusiasts whose aim was, and is, to preserve and protect diving heritage. Since then the Society has grown into an international organisation with affiliated national societies across the world. The Society encourages the publication of articles of historical diving interest, and produces its own publications, a monograph series (of which this is No. 5) and a members' newsletter, the *Historical Diving Times*. The author, Michael Fardell, has been the Honorary Secretary of the Society for many years. This book, the first full-length account of the life and exploits of John Lethbridge and his invention of a revolutionary 'Diving Engine,' is the result of years of careful research, and it adds greatly to the bibliography of diving history.

Born in Devon, John Lethbridge, having fallen on hard times, and with a large family, invented in 1715 a new kind of diving apparatus which enabled him to work effectively under water, and with which he was to obtain some remarkable results. He became, without doubt, the most successful salvage diver of the 18th century. For more than 40 years from 1715, he was actively engaged in the salvage of shipwrecks off the coasts of England, Ireland, Madeira and the Cape Verde islands, South Africa and America, recovering considerable amounts of treasure and other goods for the Dutch and English East India Companies, the Royal Navy and others.

There were in existence at this time well-tested diving methods, mainly using varieties of diving bells, and while knowledge of the physics and physiology of diving was only rudimentary, these existing methods were, by-and-large, successful. How then did Lethbridge, a 'landsman,' in the words of his grandson, hope to improve on these existing methods of diving with his new design? The key factors of his 'engine'—keeping the diver at atmospheric pressure while enabling him to use his hands and arms—had been the elements of an earlier (1692) design by John Williams, formerly an Exeter merchant, who patented an 'Engine for carrying four men 15 fathoms or more under the surface of the sea'. Actively engaged in salvage work for many years, his may have been the inspiration for Lethbridge's design, but that remains speculation.

Although alternatives to the diving bell had been proposed and in some cases even tested, none had come near to replacing, or, in the majority of cases, supplementing it. Lethbridge based his design on the shape of a hogshead, an iron-hooped wooden barrel usually designed to store liquids, but constructed in such a way that it would also keep liquids out. However, if the diver was to be effective in using this apparatus, he had to be able to use his hands, so his simple solution was to keep the diver's arms outside the barrel. This in itself raised problems of pressure differential within the barrel. Air could be pumped in at atmospheric pressure at the surface prior to descent, but the exterior environment was of increasing water pressure on the exposed arms as the diver descended. At 10 fathoms (60 ft, *c*.20 m), a depth to which Lethbridge claimed to have been 'many a hundred times', the exposed limbs would be exposed

to 3 times atmospheric pressure, while the barrel interior remained at one atmosphere. The ways in which Lethbridge seems to have tried to solve this problem were ingenious, though not entirely successful. Even so, the apparatus was used very successfully at this depth—though he does admit to having great difficulty going much deeper—undoubtedly due to the pain and restriction of movement of his hands and arms and the effort required to keep his arms outside the 'engine'.

The story of Lethbridge's life and work unfolds with great interest—the amount of work, and volume of 'treasure' and artefacts recovered from various shipwrecks, including, incidentally, the *Hollandia*, where he was engaged by the Dutch East India Company in 1743, is remarkable. The author's enthusiasm for, and great knowledge of, his subject is self-evident. His research notes, appendices and bibliography are comprehensive and detailed.

All-in-all, this is a most fascinating read for anyone even remotely interested in the history of diving, shipwrecks, salvage, and the 'derring-do' of achieving such feats with what to-day seems to us such improvised equipment. Altogether an excellent book—well written, well-illustrated and comprehensively researched, and of equal interest to scholars, students of diving history, and those interested in maritime culture in general. It is a worthy addition to the monographs already published by the Historical Diving Society, who can be contacted via their website at www.thehds.com. In conclusion, it is perhaps worth mentioning that in the 1980 BBC2 series 'Discoveries Underwater,' produced and directed by Ray Sutcliffe, there was, in programme 2, a good sequence of a faithful replica of the Lethbridge 'Engine'. Built, commissioned and sponsored by the diving company Comex at their Aberdeen headquarters, it was tested in their pool in Marseilles, with Robert Sténuit taking the part of Mr Lethbridge. A most interesting adjunct to the Lethbridge story.

ADRIAN BARAK
Hastings, England

The Day the Johnboat went up the Mountain: stories from my twenty years in South Carolina maritime archaeology

CARL NAYLOR

264 pp., 38 b&w illustrations

University of South Carolina Press, 1600 Hampton St., 5th Floor, Columbia, South Carolina, USA, 2010, $34.95 (sbk), ISBN 978-1570038686

The Day the Johnboat went up the Mountain details Carl Naylor's experiences during a selection of the projects undertaken by the Maritime Research Division (MRD) of the South Carolina Institute of Archaeology and Anthropology (SCIAA), a research arm of the University of South Carolina. Carl Naylor is a diving supervisor and an archaeologist assistant in the MRD. Previous to this he worked as a newspaper journalist. In 1985 he became a SCUBA-diving instructor, a path that would eventually lead him to a career with the MRD. Naylor's journalistic background shows in the writing of this book. This is not, nor is it intended to be, a theoretical, methodological, or historical contribution to the field. The book is a memoir and a chronicle of Naylor's personal experience as a maritime archaeologist. Some of the projects presented in this work are what Naylor refers to as 'Sexy Wrecks', including the *H. L. Hunley*, the Brown's Ferry Vessel, the SS *Lawrence*, as well as the search for the French corsair *Le Prince* and the Spanish cargo-ship of the Lucas Vázquez de Ayllón expedition. Other projects are less prestigious and well known, including the Hobcaw shipyard, the Little Landing Wreck, and the French Cargo Site.

One of Naylor's most engrossing chapters, 'Mud Sucks', tells a story about the MRD's investigations of the Santee Canal Project. The Santee Canal connected the Santee River with the upper reaches of the Cooper River, and was in operation between 1800 and *c*.1850. America's first summit canal, it was intended to open up the interior of South Carolina to trade flowing through the port of Charleston. However, the system suffered from a multitude of problems, including droughts, snags, and competition from the expanding railroad system, which eventually led to its abandonment. The canal has since silted up, creating a mess of debris with mud blocking the facility. Describing the fieldwork, Naylor recalls, 'At the end of most days, we emerged from the canal dog-tired and gritty, with mud stuffed, crammed, and caked in every orifice and crevice. The canal project taught us one of the great lessons of maritime archaeology: mud sucks'. Of course while mud is indeed awful to work in, it can also produce the best-preserved ships, boats, and other maritime-related artefacts and structures. The irony of this chapter is that the mud in the canal preserved a possible canal-boat, two lock-gates, an additional wooden construction, and allowed the investigators to add to their knowledge of previously-discovered wrecks in the area.

The Day the Johnboat went up the Mountain is infused with humorous anecdotes. In 'Dredging for the First Americans' he details his stay in a rather seedy motel while working on a project at the Allendale Chert Quarries Archaeological District. In the middle of the night Naylor, who was rooming with Joe Beatty, heard a knock on the door. Unsure whether there was an emergency, or whether they were going to be robbed, Joe stumbled for a weapon—a Gideon Bible—while Naylor opened the door. He found 'a gaudily-dressed woman who, it appeared, had been drinking heavily. Her profession was obvious'. When she asked if they wanted to party, Naylor replied

nicely, 'No, thank you ... Try next door'. Unbeknownst to Naylor, Dr Albert Goodyear, a senior SCIAA archaeologist who has been working at Allendale since the 1980s, was occupying the next room.

Naylor also recalls less-humorous occasions during the course of his work. The chapter on the *SS Lawrence*, for instance, details the difficulties that arose from conflicting federal and state interpretations of just where, exactly, the South Carolina state boundary lies off the coast. This resulted in federal court proceedings that eventually found the *SS Lawrence* to be resting in state waters. Artefacts which had been lifted were returned to the wreck-site by MRD staff. During this operation, they discovered that the salvagers had ripped a large hole in the stern of the ship, and the currents were carrying other artefacts away from the wreck. The MRD had to place geofabric and sandbags over the hull in order to prevent further losses from the site.

The book contains several black-and-white photographs, illustrations, and site-plans. Some of the photographs illustrate the more candid stories described by Naylor, including a photograph of Joe Beatty holding a 9-mm Smith & Wesson found under a bridge during an underwater survey. Each image is described in detail, augmenting the text on the corresponding page. Figure numbers in the text would have assisted in relating each image to the text, but this might have distracted from the layout and readability of the text. While it is clear that Naylor has done extensive historical research and is knowledgeable about the background of many of the sites covered in this book, no footnotes are included. Instead, references are provided for each chapter. Since the book is aimed at a general readership, in-text referencing would not be desirable. Some of the terminology used, however, might be lost on international readers. For instance, 'moccasin' refers to the venomous snake found in watery areas in the US, and not a leather shoe. However, the wit, humour, and approachability of Naylor's book is quite global, and makes for an enjoyable read. Moreover, it effectively gives the texture of local 'maritime' archaeological surveillance, in the US or elsewhere, instructive in itself for comparison with other learning regimes, and showing how, in skilful hands, such bread-and-butter stuff can grip attention (Newsletter contributors please note!).

CLAIRE P. DAPPERT
Illinois State Archaeological Survey, University of Illinois, USA

John Ward's Marine Manual

GORDON BELL and ARTHUR CREDLAND

315 pp., 63 b&w figures

Blackthorn Press, Middleton Road, Pickering, YO18 8AL, UK, 2010, £14.95 (sbk), ISBN 978-1906259143

As the son of a master mariner sailing out of Hull, John Ward was able to witness the development of the dock system in that town as the early 19th century progressed. He worked as a house-painter but developed skills as a ship portraitist, and in 1831 one of his pictures was exhibited at the Royal Academy in London. He later became an accomplished print-maker, and produced an extensive sequence of lithographs of the sailing vessels, and a few steamers, which frequented the Humber. Often a single lithograph includes two or more views of the same vessel on various points of sail or in different wind conditions, and a graphic analysis of her rig, as an aid to other would-be ship portraitists. These can equally be helpful to ship researchers today. Vessels illustrated include a brig, a sloop and an early steam warship, *Alban*.

A cholera epidemic in 1849 took his life before he could complete his intended manual of ship portraiture. This publication, additionally titled *Victorian Ships*, combines his illustrations for the first time, with biographical and explanatory texts by two experts formerly active as curators at Hull Maritime Museum. Extensive technical notes and an index add to its reference value. Although reduction has forfeited some of the structural detail in the original prints, Ward's illustrations provide a valuable source-book on early-19th-century ships and how they were rigged.

JOHN ROBINSON
Stonehouse, Gloucestershire, England

