

bibliography of sources and books used. In the index of places cited in the *Liber* and the maps, I can locate some places listed but not specified. *Portus Milum* is Port Miou, *Canalia* is cap Canaille which lies between Portus Milum and Marseilles, not between *Aquila* (La Ciotat) and *Portus Milum*, *ostia de Lentheolarum* (called *Lenzuolo* in the *Conpasso*) is the strait between *ile Maire* and *cap Croisette*, *Leene de Carotha* is cap Croisette, *Scopuleth*, *Ireth* is If. This work opens a new perspective on the medieval history of navigation in the Mediterranean by advancing by at least half a century the use of portolan in this area.

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#### THE DEVELOPMENT OF THE RUDDER: A Technological Tale

By LAWRENCE V. MOTT

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xv + 160 pages, 89 figures and illustrations, 4 charts. Price \$19.95

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Mr Mott's fine book is the fruit of wide-ranging research, primarily in iconographic sources, but also making good use of the somewhat sparse ancient and medieval documentary and archaeological evidence for steering gear. This is combined with the results of mathematical modelling and tank-testing to investigate the operation of quarter-rudders (the maths of which left this reviewer up the creek without any steering-gear!).

The book focuses on the development of rudders in Europe from Roman times to the end of the Middle Ages: it is 'a technological tale' of two types of rudder, the side or quarter rudder, mounted on the side of a vessel, and the stern rudder or pintle-and-gudgeon rudder. It is the quarter rudder that occupies centrestage for the first several thousand years of the story: it was ubiquitous in the ancient world (in Asia as well as Europe) by about 2500 BC. Sometimes regarded by scholars as a technological dead-end and nothing more, the quarter rudder emerges as the hero of this tale. Mr Mott shows that it was a simple device, but very effective and capable of considerable refinement and enlargement: by the thirteenth century Mediterranean shipbuilding

contracts for giant ships could envisage quarter rudders that were nearly 18m long and weighed over 11 tonnes.

The medieval northern quarter rudder had certain structural weaknesses (not present in its southern counterpart), which inhibited the development of larger ships. The pintle-and-gudgeon rudder was developed in northern Europe in the twelfth century, perhaps to suit larger bulk-carriers with straight sternposts such as the cog, and it gradually replaced the northern quarter rudder. In the fourteenth and fifteenth centuries the pintle-and-gudgeon rudder went on to supplant the Mediterranean quarter rudder on the larger sailing warships and merchantmen but, as Mr Mott shows, this was not a simple case of 'linear development', with a superior device ousting a less effective one. In the fifteenth and sixteenth centuries the full-rigged ship, with its balanced sail-plan, ultimately combined with the newer rudder type to produce an ocean-going ship that was much more controllable than its predecessors.

There is not space here to go into the many interesting topics with which the book deals: it covers matters such as hull design and rig, and includes some interesting speculation about the forces that drove the development of steering gear. If the work has one weakness, it is that it does not make as much use of north European sources as it might have done. It would have been interesting, for example, to see what the author would have made of the medieval English steering-gear terminology analysed in Bertil Sandahl's *Middle English Sea Terms*. However, the clear, informative and thoughtful content of the book does more than make up for this omission. *The Development of the Rudder* sets a new standard for the study of rudder development, but it is about much more than just rudders!

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