Gunpowder and Galleys: Changing Technology and Mediterranean Warfare at Sea in the 16th Century, by John Francis Guilmartin

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For most of the five millennia that separate Pharaonic Egypt from the Age of Discovery, maritime warfare in European waters was dominated by rowed ships known as galleys. Viking longships, Aegean polyremes, Roman pentaconters, Byzantine dromonds, Norman snakes, and English barges are all representative of the type, sharing long, shallow, light-weight hulls, and a low freeboard pierced by one or more banks of oars. Galleys usually carried a single mast with a square-rigged sail, to spare the rowers on longer voyages, and mounted a variety of weapons - bow rams, "Greek fire," ballistae, and so on; though their principal armament consisted of the personal weapons of the men on board. Tactically, the decisive stroke in a clash of galleys was combat between the respective ships' companies, which engaged each other in roughly the same fashion as soldiers on land. In ancient and early medieval times galleys were employed for trade as well as war, but improvements in the design of sailing ships gradually imposed a division of labor: beamy, slab-sided, lightly-manned merchantmen, powered by the wind, could carry a worthwhile cargo great distances at low unit cost, while the all-azimuth tactical mobility and short-range, on-demand speed of the oared galley made it the natural choice for fighting.

Beginning sometime after 1300, galleys were replaced by sailing warships armed with broadside-mounted cannon. It is scarcely possible to overstate the significance of this change. By combining the striking power of massed artillery with the sea-keeping qualities and logistical capacity of cargo ships, the sailing man-of-war eroded a tactical consensus stretching back to antiquity. It also became the means by which European overseas empires were created. Those empires lived off of transoceanic trade, which trade alone could provide the financial and material basis for a strong sailing navy. The workings of this virtuous circle lay at the heart of what Alfred Thayer Mahan called "sea power." Its central requirement, in military terms, was a fleet capable of preserving access to the sea for one's own commerce, while denying access to adversaries. The best means of exercising such control, Mahan concluded, was to defeat the enemy's fleet in pitched battle, a principle for which he claimed to find historical vindication in the global ascendancy of Great Britain during the previous three centuries.

The strategic possibilities of the broadside man-of-war were not immediately apparent. Its development was full of the false starts and dead ends that are typical of any comparably profound technological innovation. Nevertheless, the slowness with which such ships displaced the galley in the Mediterranean has always called for special explanation, as Mahan himself recognized, though he was unable to supply one. Sailing warships came to predominate in
European waters, and then to project European power around the world, because they provided the only platform capable of mounting large numbers of heavy guns. Yet for two centuries following the development of effective artillery, galleys remained the primary fighting ships in the Mediterranean, despite their limited ability to employ the best weapon then available.

John Guilmartin's classic study *Gunpowder and Galleys* is an effort to solve this mystery. It was first published in lamentably small numbers by Cambridge University Press in 1974, and has now been reprinted by the Naval Institute, thus earning the thanks of all the graduate students who have rummaged through used book stores looking for it these past thirty years. Guilmartin rejects the idea that traditionalism or mere institutional conservatism could explain the prolonged divergence of Mediterranean navies from emerging practice elsewhere in Europe. He proposes instead to analyze galley warfare not as a vestige of earlier times, but as a "system of armed conflict at sea" (21) that was, in many respects, better suited to Mediterranean conditions than available alternatives. In systemic terms galleys continued to make sense, despite the fact that, viewed abstractly and in isolation, they appear to be no match for the broadside warship.

Maritime warfare in the Mediterranean was fundamentally amphibious. Galleys could not "control" the sea in Mahanian terms, because their narrow hulls could not carry the food and water necessary to sustain their large compliment of rowers, archers, and soldiers for more than a couple of weeks. Nor were galleys suited to the protection or raiding of commerce. Galleys could not escort commercial vessels moving day and night under sail, and as the latter grew larger and better armed they became unpromising targets as well. Even a few guns, when combined with a high freeboard and a reasonably numerous crew, could make a merchantman prohibitively difficult to board from a low-lying galley.

Because the victory of one galley fleet over another could not be exploited by means of blockade — the ultimate pay-off for successful fleet actions in the Age of Sail — such combats were not sought in the Mediterranean, where the main object of war at sea was not the enemy's ships, but the bases from which they operated. Those bases defined the effective range of galley fleets and, by extension, the range of a state's economic and political influence. Gaining and maintaining control of them was rarely a mission for naval forces alone. Guilmartin is reluctant to use the expression "naval warfare" to describe the war of galleys, and rightly so, given the intimacy of the interaction that prevailed between sea and shore.

The physical environment of the tideless, sandy-rimmed Mediterranean created tactical possibilities unknown in the Atlantic, the North Sea, or the Baltic, where rock-bound coasts and treacherous currents afforded fewer opportunities for such cooperation. Sailing warships gained quicker ascendency in northern Europe not just because they were more capable tactically, but also, and primarily, because their stronger and more capacious hulls offered a better chance of surviving the fearsome effects of wind and weather, if only by allowing a ship to stand off from the land for however long it might take for danger to pass. This sort of capability meant little in the Mediterranean, particularly if it required the employment of deep-draft ships that could not operate exceedingly close to shore. Much of what Guilmartin has to say on this score may seem irretrievably exotic: it was not unusual, for instance, for a galley fleet to avoid defeat by deliberately grounding stern-first on a friendly beach, thus transforming itself into an extemporaneous coastal fort. Yet conditions in the sixteenth century Mediterranean can also seem disconcertingly familiar: the whole region, after all, was conceived by those who fought there as one vast littoral, in which the object of naval operations was to project power from sea to shore by means of what would today be called a joint task force.

Guilmartin's central concern is to analyze the impact of gunpowder weapons on this system of war. Of these the most important were cannon, which galleys were quick to employ to the extent they could, by mounting sometimes quite large artillery in their bows. Such guns were supposed to be fired at point blank range, as an aid to boarding. Fleet tactics were calculated to amplify the resulting shock. A well-ordered galley fleet advanced, like a land army, in line abreast, so as to concentrate the fire of its guns (a consideration that also explains the practice of stern-first defensive grounding, with all guns pointing out to sea). Individual ships could then employ their
oars to maneuver at the last second, in order to bring their ordinance to bear most effectively against their targets. Repeated long range bombardment was deemed pointless, since a rowed galley could cross the effective range of existing guns in less time than it took to reload them.

The bow-mounted artillery of Mediterranean galleys is just the sort of half-hearted adaptation to technological change that casual observers are inclined to dismiss as a failure of insight, a characteristic refusal by a privileged and blinkered elite to see the true logic of a revolutionary system, and to accept that the old ways had to be thrown out root and branch. As Guilmartin demonstrates, however, the faltering application of artillery to naval war in the Mediterranean had less to do with a lack of understanding than with limited resources and competing strategic commitments. In the sixteenth century large guns were not industrial commodities, but expensive products of skilled craftsmen employing rare materials, which required similarly rare know-how to operate effectively. The slow adaptation of the broadside sailing ship in the Mediterranean, in Guilmartin's analysis, was driven above all by a shortage of adequate guns and proficient gunners: artillery experts were usually slaughtered if captured alive, a perverse but unmistakable sign of how highly their knowledge was valued.

In addition, two of the major contestants on the water, Spain and the Ottoman Empire, were also continental powers, whose leaders were inclined to reserve the best of whatever guns they had for their armies. It was perfectly possible for a galley mounting a meager handful of bow cannon to be transporting a half-dozen more powerful guns, useless to itself, in the form of a siege train to support a land campaign. Technological adaptation in the Mediterranean was thus shaped by a wide range of economic and social forces, as well as by timeless problems of resource allocation common to all military organizations. Given a limited number of guns and gunners, the question was ultimately whether tactical proficiency was better served by employing them in a small number of powerful ships designed to stand off from the land, or in a larger number of smaller and more maneuverable vessels designed to operate against the shore. This is, to say the least, a familiar puzzle, and no easier to solve today than it was five hundred years ago.

The difficulties of Mediterranean sailors were worsened by the fact that, while they may have operated in a closed sea, they were not alone in the world. The so-called "price revolution" that swept across Europe as a consequence of the influx of precious metals from the New World added an inexorable, inflationary pressure to the already thorny trade-offs required by new technology. In the broadest terms galleys could employ cannon only if their hulls became larger and more robust, and their crews correspondingly more numerous. By the 1570s, as Guilmartin demonstrates, their designs were approaching the limits of what human muscle could propel through the water. By then, however, it was not just the guns, but the muscle, that was becoming prohibitively expensive: the price of the humble ship's biscuit — the fuel by which galleys moved — tripled over the course of the sixteenth century, a change that was not match by any corresponding expansion of the Mediterranean economy. If the future belonged to the broadside warships of the Atlantic world, it was chiefly because they created the economic conditions by which their ultimately superior fighting qualities could be sustained. By the end of the sixteenth century it was possible for a bold sailor like Francis Drake to take a small but heavily armed sailing ship around the world, and return with a cargo of specie and spices worth twice the annual income of the English crown. No such possibilities existed in the Mediterranean, and it was this, above all, that doomed the system of war that had prevailed there for so long.

John Guilmartin's study of this complex transformation is the best available account of the technical and tactical issues involved, and an exemplary demonstration of what it means to fully contextualize technological change. It deserves a wide readership among a new generation of students of naval warfare.

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