
The Catapult: A History by Tracey E. Rihll

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Ancient catapults would appear to be an immensely popular topic. A quick Google search reveals the existence of sites that sell catapult-making kits, and of the alarmingly-named ‘The Hurl’ (‘a worldwide community of catapult enthusiasts pursuing the art, history, science and engineering of hurling!’).¹ In contrast, there is relatively little scholarly literature on the subject, and the best recent studies have come out in German or Italian.² Thus, for years, the main point of reference for English speakers has been the work of E. W. Marsden [1969, 1971]. Now the publication of Tracey Rihll’s book has finally provided an update that is both authoritative and widely accessible.

Rihll’s account is organized chronologically. Unlike most accounts that focus on the bow as an obvious precursor, she starts the pre-history of the catapult by describing in her first chapter the bow *and* sling—the rationale for this will emerge later. Chapter 1 sets the tone for the rest of the book in more than one way: Rihll focuses on the older, more ‘primitive’ weapons, because she will argue throughout that newer technologies did not displace older ones. Moreover, the way in which she describes the sling and bow, by paying attention both to the materials used and to actual deployment and effects in a military setting (what could one actually do with a sling? How accurately could one hit a target, and with how much force? How would slingers fit in with their differently-equipped co-fighters?), mirrors her description of catapults later. Rihll’s attention to the likely circumstances of production and use of military technology is one of the strong points of this book.

¹ <http://www.thehurl.org> (accessed 26 Mar 2009).

² I am thinking especially of D. Baatz’s and F. Russo’s works, abundantly cited in Rihll’s bibliography.

The catapult is introduced in chapter 2, in the form of a ‘bow catapult that shot sharps’ [46], or *gastraphetes*. Rihll accepts Diodorus of Sicily’s account, according to which in 399 BC ‘the catapult was invented in Syracuse by an artisan responding to the encouragement and incentives offered by Dionysios I’ [35]. Despite some (to me unconvincing) speculations to the effect that the artisan in question may have been a slave [36], Rihll makes as strong a case for Diodorus’ credibility as perhaps could be made. Whether that is enough to settle the question of discovery once and for all, I am not sure. Rihll herself is prepared to be sceptical elsewhere. For instance, at a later point she remarks of crossbows:

It is far more likely that, even though we have no record of it, this type of weapon—a personal compound bow with mechanical locking device and trigger—was being reproduced and developed over the centuries, than that it was lost and then reinvented in a slightly different form. [74]

The operative words here are ‘even though we have no record of it’. The documentary record for catapults, or for specific types of catapult such as those later described by Rihll in chapter 5, is very patchy—even authors who could, in principle, talk about them do not, or do so in such terms that a lot of ambiguity remains [60, 82, 83, 134, 183]. The silence, or muttering, of many sources is in itself an interesting issue, which deserves further exploration. But could we not, conveniently, also invoke the sources’ silence about a possible version of the weapon developed in the Eastern Mediterranean at an earlier stage? Be that as it may, more interesting is, in my view, Rihll’s reconstruction of the early third-century-BC political and military environment which led to the invention or re-discovery by the Greeks of the hurling device.

On cue, chapter 3 discusses the development and diffusion of tension (otherwise known as non-torsion) catapults. Rihll’s choice of term is motivated by her desire not to see everything in terms of the torsion catapult, for reasons that we shall see later. She is clear from the beginning about the ‘scattered and fragmentary’ [47] nature of the evidence from the period: this includes fortifications, notoriously difficult to date, and inscriptions, notoriously difficult to interpret with accuracy. Rihll does a good job of both showing the intricacies of reading the sources, and getting what she can out

of them. The tension catapults of the title would have been larger versions of the original *gastraphetes*, shooting sharps. She also argues for the invention around this time of the ‘torsion one-armed stone-thrower’, possibly at the hands of the Phocians or the Thessalians [62]. While the tension two-armed sharp-caster was ‘a mechanization of the hand bow’ [62], the *monagkon* (one-arm) is to be seen as ‘a mechanization of the staff sling’ [62].

Bow and sling: the choice of subject of the first chapter is now brought to bear on Rihll’s argument in chapter 4 that

[t]he torsion catapult has two very different antecedents and predecessors It makes sense for it to have emerged as a union of two machines, a mechanized bow, the *gastraphetes*, and a mechanized sling, the *monagkon*. [77]

Chapter 5 is another strong chapter, on small, hand-held, one-man-operated catapults, whose existence and role in ancient fighting Rihll draws out of obscurity. In both chapters, her detailed analysis of the evidence is hard to summarize here and it involves some leaps, but I found both cases generally persuasive.

In chapter 6, Rihll moves on to what we could call the golden age of catapults, the time of Demetrius Poliorcetes (the Besieger) and, later, Archimedes. It is at this stage, she claims, that the technology really came into its own:

The first catapults had not made a decisive difference to the outcome of battles in which their users were engaged. By 320 there had been perhaps one to three decades of unspectacular development of two-armed torsion machines during which time they had moved from being a new technology with potential to a hallmark technology. . . . The real breakthrough came in the penultimate decade of the fourth century. This breakthrough was, I suggest, the discovery of the formula and scaling law, so that people understood why some catapults worked well and others did not; they realized that good experimental models could be scaled up to produce good weapons, and good weapons could be replicated again and again. . . . The random element that had plagued catapult technology to this point . . . was squeezed out by the introduction of mathematics. [110–111]

This ‘great leap forward’ [110] begs more questions: Why was there no name attached to the discovery of the formula? How did the involvement of mathematics change the skills and knowledge required of people who built and operated catapults? Later, Rihll draws a neat picture of the relationship between theory and practice in ancient catapult-building [154, 172–175], where she rightly emphasizes the approximation and informality of practice—how does that square with the prominent role she gives to mathematics here? I do not think that these questions are problems for Rihll’s argument, but I do think that answering them would enrich and complicate it.

Chapter 7 concentrates on the main technical treatises. Rihll and I disagree on the nature of one of them (of which more later). The chapter valuably weaves archaeology into the discussion of some of the texts, which helps in several cases to make sense of them. On the other hand, it does not give much of an idea of the variety of voices involved, and of what may have been the individual contexts for each (of which also more later).

The last three chapters focus on Roman catapults. Chapter 8 covers the Roman Republic, during which nothing much new happened, at least not in the world of catapult technology. Rihll goes through the evidence from this period, mostly showing that it conforms to the picture she has put together so far. Chapter 9 moves on to the Empire and to different types of catapult developed then, boasting a metal frame and, in some cases, in-swinging arms. Rihll’s discussion of the, here, mainly archaeological evidence is on the whole persuasive even when, or especially because, she sensibly leaves some questions of definitive interpretation open, as in the case of the *Hatra ballista* [226–227]. On the other hand, I had some trouble with chapter 10, which seems informed by a declinist view of late antiquity. Decline is apparently back in fashion; but still, one would expect a remark to the effect that those were years of ‘ignorance, arrogance, suspicion, and rampant superstition’ [234] to be post-modernly tongue-in-cheek, rather than (apparently) to be taken at face value as the background to a stifling of the ‘the natural tendency to diversity in technology’ [234]. It is almost surprising that in this barren landscape Rihll finds enough material for a whole chapter. Interesting material it is too, leading rather seamlessly into the early Middle Ages and the end of the book.

There are two appendices: one on the calibration formulae and elements of the catapult, and one a useful list of the known remains. The bibliography includes an again very useful list of relevant inscriptions, with a summary description of their contents.

One of the great merits of Rihll's book is that she moves effortlessly between archaeological and literary evidence and reflects on the fit, or lack thereof, between the two. Sometimes the standard specifications that we have from the texts allow useful speculation on the type of weapon that the material remains are remains of [132–133]. Other times Rihll offers sensible reflections on the mismatch between artifact and text:

T]he [Azaila] counterplate came from a catapult that did not follow Philon's formula exactly, for the frame at least. . . . We might be tempted to suppose that this counterplate is so badly made. . . . that it was discarded, but the eight surviving nails that once fixed it to a frame speak loudly against that idea. Perhaps what we have here is one of those catapults that was not even trying to be a formulaic scorpion or a ballista, but was rather one of the many other types of catapult to which the historical sources keep referring but about which we have no details. [188]

Her willingness to leave some questions of interpretation open (I have mentioned the Hatra material [226–227]), rather than force an explanation on the material, is definitely to be praised.

Rihll also has a good grasp of the physics and engineering involved, both in terms of dynamics and of material science. All combined, this allows her to talk competently about both what the ancient designers of catapults might have been saying in their works, and about what the objects themselves might have been like. It is unfortunate that we often do not have a full context for the archaeological remains—whenever Rihll tells the reader more about where the pieces of a torsion spring were found, as in the case of Ephyra [130–134], for instance, it is always a fascinating story.

Above all, Rihll makes a very valuable contribution on a more general level, as will be made clearer by providing a summary of the (by-and-large still dominant) orthodoxy, namely, Marsden's work. In addition to publishing (collected in one place) the ancient technical treatises with an English translation, Marsden provided a simple

model for the development over time of catapult technology. Simplifying (and note that the orthodoxy that I refer to is already a simplified version of Marsden's arguments), he proposed what we could call a linear model of development: it all started from the bow (not the bow and sling). The first catapult was a sort of big bow, the belly-bow or *gastraphetes*, a non-torsion weapon invented at Syracuse in 399 BC. The drive to build bigger and stronger catapults then led, around the time of Philip II of Macedonia, to the invention of torsion catapults, which were powerful enough to shoot large stones. Torsion catapults more or less made non-torsion catapults obsolete, to the point that, chronologically, evidence for a non-torsion catapult would point to an earlier date than evidence for a torsion catapult. Marsden, like many historians of technology of his generation, assumed that, generally speaking, new, 'better' technology displaces an older one.

Successful as Marsden's work has been, it also had its weak spots. For instance, his translations often stand in need of revision. The whole view of technical literature has changed, and there is a tendency now to situate it more and more within the background of the literary production of its time, rather than seeing it almost as the product of a separate subculture. This means emphasizing rhetorical strategies, for instance, or harboring more doubts about the precise meaning of technical terms. Above all, Marsden's developmental model has become problematic in the light of new approaches to the history of technology, where notions such as 'progress' or 'effectiveness' are increasingly seen as culturally constructed rather than absolute.

Rihll makes two substantial revisions to Marsden's arguments: she argues that the torsion catapult derived from a merging of the non-torsion, or tension, catapult and the one-armed torsion catapult. Secondly, she argues that, while large catapults existed and attracted much attention, small, hand-held catapults were much more common than previously recognized.

Her first claim³ introduces the one-armed catapult as a main player on the scene, and indicates that she is much more comfortable with the idea of tension and torsion weapons co-existing than

³ A similar claim is made independently Russo 2004.

Marsden was. Her shift of emphasis explains why she terms some catapults ‘tension’ rather than ‘non-torsion’. Rihll also envisages a more gradual development of the two-armed torsion catapult than Marsden did. Her second claim serves as a corrective to the ‘noticeable desire by moderns to emphasize size’ [137] and again contributes to a picture where old technologies, including bow and sling, are not replaced by new ones, where small weapons can be just as important in battle as big ones, and the machines given pride of place in the extant technical treatises need not be the only ones in existence.

Thus, Rihll’s two claims significantly change the catapult’s development story. Instead of an allegedly ‘natural’ progression towards stronger, bigger and higher, smaller catapults co-existed alongside large ones, and more ‘primitive’ weapons alongside more ‘advanced’ technical products. She puts to rest the ‘widespread but false assumption that since bow catapults preceded torsion catapults, any bow catapult described by someone living in the torsion catapult age must be an old catapult, if not an antique’ [169]. Political and economical circumstances played an obvious part: ‘there were simultaneously, for essentially the same design of catapult and the same problems, different solutions that would have suited different clients with different budgets’ [146].

The notion that technology does not follow universal rules of efficiency, simplicity or ‘progress to the best artefact’, is still being absorbed by specialists working on the pre-modern period. It is, however, common currency in other periods of the history of technology, and there is plenty of literature on the topic. Despite her declared intention to provide historiographical discussion at the end of each chapter, I found Rihll a bit disappointing here. She inclines towards a sort of evolutionist view of technology [19, 111, 234], which one may not completely agree with, but which gives the reader a handle on several of the issues she discusses. Other than that, however, her discussion of big questions such as technological innovation, or the relationship between ‘theory’ and ‘practice’, are impressionistic rather than fully and cogently articulated. Admittedly, the space at her disposal does not allow for deeper delving, but she might have helped her case by choosing more substantial and more up-to-date literature from the general field of the history of technology. Hardly

any of the works familiar to an STS student from either side of the Atlantic are mentioned here.⁴

The other aspect of Rihll's book that I found a bit disappointing was its emphasis on the thing itself, more than on the people making or designing or operating it. Granted, she does talk about some of them and lists their names [318n38] but the focus is squarely on the catapult—whose history this is, after all. The problem of training is dealt with by assuming, rather hurriedly, that no great skill was needed to operate the new devices [189, 195]. Then why did some Greek cities introduce catapult shooting as part of the ephebes' training [64]? The motivations of catapult writers, a very motley bunch in my view, are not as thoroughly discussed as they could have been. What function did these texts serve, exactly—who were they for? At one point, we find the implication that technology could be transferred through books [195]—but surely not in the absence of people to supply the background, tacit knowledge? Again, what relationship was there between catapult construction and other branches of knowledge, in the cases, such as Philo of Byzantium, where we know that an author wrote about other things as well? On the authorship of Ctesibius/Hero's treatise [142 and chapter 7 *passim*], Rihll and I disagree; and I am afraid I did not see any arguments here to make me change my mind. It would have been interesting for the reader, however, and would have partially filled the gap that I described above, if Rihll had given more thought to the question of why someone like Hero of Alexandria, given his other works and what else we know about him, should decide to 'edit' a centuries-old catapult treatise at a time of alleged *pax Romana*, especially when such an undertaking (an 'edition' of a technical treatise, without the author's at least occasional explicit intervention into the text) is virtually without parallel in the ancient literature?

But these are relatively minor quibbles (as is my dislike of 'authentic' spellings—'Arkhimedes'??—when 'wrong' spellings are so commonly established). Indeed, more than quibbles, they are opportunities to open and stimulate further discussion. On balance, *The Catapult: A History* is a must-have for anyone interested in the

⁴ Cf. for quick references the material contained in popular textbooks such as MacKenzie and Wajcman 1985 or Collins and Pinch 1998. See also the more recent Edgerton 2007.

subject, a pleasant and instructive read for novices to the field, and the best systematic attempt so far to return what has become a rather specialized topic to its wider context, and thus to mainstream ancient history.

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