Volume 3: Issue: 1

The Diffusion of Artillery Terminology in the Early Thirteenth Century

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Cardiff University Press

Gwasg Prifysgol Caerdydd

STUDIES IN HISTORY ARCHAEOLOGY RELIGION AND CONSERVATION
ASTUDIAETHAU HANES ARCHAEOLEG CREFYDD A CHADWRAETH

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Abstract

As medieval mechanical artillery developed, variants of a new term for identifying the heaviest engines spread across Latin Europe. First appearing in northern Italy at the end of the twelfth century, early forms of the word 'trebuchet' found their way into French, German, English and crusader sources by the second decade of the thirteenth century. Although the terms appear to have been used to refer exclusively to counterweight trebuchets by the time they were adopted north of the Alps, the invention of this engine-type would appear to predate the vocabulary with which it came to be associated. Writing on the fringe of Latin Europe in the 1220s, Henry of Livonia did not employ any of these new terms in his account of the Christian campaigns in the Baltic. Whether Henry was ignorant of the new terminology or avoided it deliberately, he appears to have employed traditional terms to identify what may have been engines of this newer and heavier type. While sources appear to have used pre-existing vocabulary to refer to the earliest counterweight trebuchets in the twelfth century, some, like Henry, continued to employ such terms in the early thirteenth century, avoiding the new vocabulary embraced by others.

A series of new terms relating to artillery spread across Latin Europe in the early thirteenth century.[1] These terms, variants of the modern 'trebuchet', appear to have been used to identify a heavier type of artillery than traditional lighter types by the second quarter of the thirteenth century: distinguishing counterweight trebuchets from traction models. Henry of Livonia, writing on the fringe of Latin Europe from about 1224 to 1227, was an enthusiast of military activities; however, at no point in his chronicle of the Christian campaigns in the Baltic, from the 1180s to 1227, does he use one of these new terms to identify a heavy stone-thrower. This

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[1] I would like to thank Gregory Leighton for providing me with some helpful comments and suggestions after reading an earlier draft of this article.

does not mean that such engines were not employed, only that the new terminology had not yet reached Henry or that he preferred to employ traditional terms, to which his audience might have been more accustomed.[2] By examining the spread of the new vocabulary and Henry's references to artillery, it will be suggested that counterweight artillery was embraced in the Baltic ahead of the new terminology.

New Terminology

The most common word used specifically to identify artillery by Latin sources in the twelfth century was *petraria*. This term was almost always used to identify a traction trebuchet: a simple form of stone-throwing lever-artillery.[3] Paul the Deacon mentions a *petraria* in the late eighth century and references to these engines dramatically increase through the eleventh and twelfth centuries as vernacular variants also become more popular.[4] The other notable artillery-specific term, *manganum* (and variants *mangonella* and *mangonellus*), was a classical term that remained in use through the Middle Ages. The less specific *machinae*, however, was most frequently employed to identify artillery in the twelfth century.

With time came specificity and the more frequent use of artillery-specific terms. This trend can be seen in the terminology used by certain successive sources. For example, William of Tyre designated the Frankish artillery at the siege of Jerusalem in 1099 as *machinae*, the later *Eracles* translation replaced this with *perriers et mangoniaux*.[5] While many sources employed variants of *petraria* and *manganum* interchangeably, some appear to differentiate

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[2] For a narrower study of the artillery described by Henry, see Ain Mäesalu, 'Mechanical Artillery and Warfare in the Chronicle of Henry of Livonia,' in *Crusading and Chronicle Writing on the Medieval Baltic Frontier: A Companion to the Chronicle of Henry of Livonia*, ed. by Marek Tamm, Linda Kaljundi and Carsten Selch Jensen (Farnham: Ashgate, 2011), pp. 265-90 (esp. pp. 276-89). See also the brief analysis of Stephen Turnbull, 'Crossbows or Catapults? The Identification of Siege Weaponry and Techniques in the Chronicle of Henry of Livonia,' in *Clash of Cultures on the Medieval Baltic Frontier*, ed. by Alan V. Murray (Farnham: Ashgate, 2009), pp. 307-20 (pp. 316-18).

[3] These engines could be constructed fairly quickly and easily if need be and worked by reasonably untrained personnel. They could also be constructed more carefully and, when operated by trained crews, could yield a rapid rate of fire with relative accuracy over extended periods of time.

[4] Paul the Deacon, *Historia Langobardorum*, ed. by Georg Waitz, *Pauli Historia Langobardorum*, Monumenta Germaniae Historica Scriptores Rerum Germanicarum (hereafter MGH SS rer. Germ.) 48 (Hanover, 1878), p. 189, trans. by William Dudley Foulke, *History of the Langobards* (Philadelphia: University of Pennsylvania, 1907), p. 221.

[5] William of Tyre, *Chronicon* 8.6, ed. by R. B. C. Huygens, *Cronique*, Corpus Christianorum, Continuatio Mediaevalis 63, 2 vols. (Turnhout: Brepols, 1986), I, pp. 392-93, trans. by Emily Babcock and A. C. Krey, *A History of Deeds Done Beyond the Sea*, 2 vols. (New York: Octagon Books, 1976), I, pp. 350-51; *Eracles Continuation of William of Tyre* 8.6, ed. as *L'Estoire de Eracles empereur et la conqueste de la terre d'Outremer: c'est la continuation de l'estoire de Guillaime arcevesque de Sur*, Recueil des historiens des croisades occidentaux (hereafter RHC Oc) I-II (Paris: Imprimerie Impériale, 1844-59), I, p. 563.
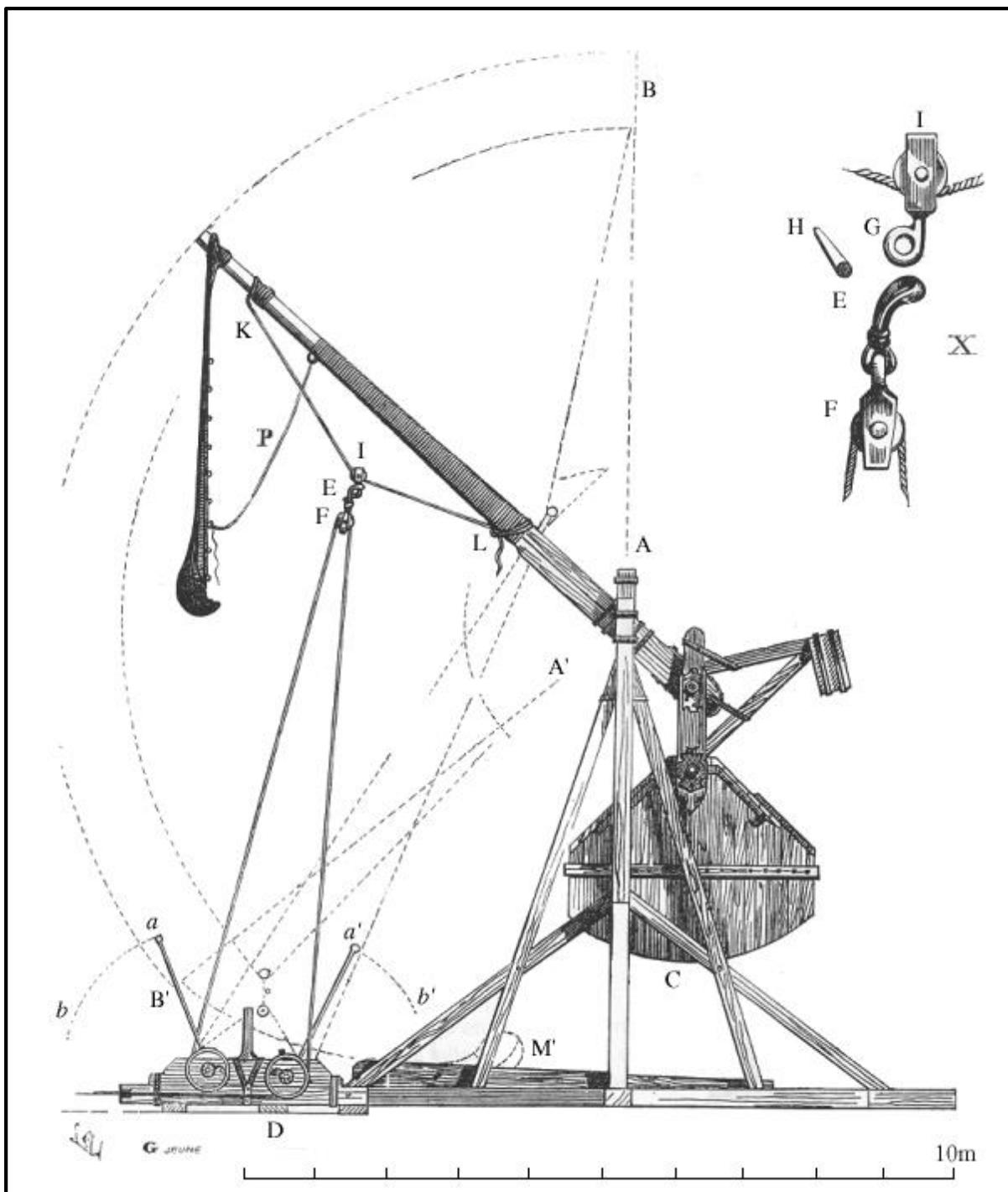
Fig. 1: Conceptual drawing of a counterweight trebuchet (from Viollet-le-Duc, *Dictionnaire*)

between a heavier *petraria* and lighter *manganum* from the late twelfth century.[6] This trend was far from universal and which terms certain sources employed appear to have remained a matter of personal preference. Despite the unspecific use of *petraria* and *manganum* by most,

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[6] See William of Tyre 8.13, Huygens, I, p. 403, Babcock and Krey, I, p. 362; William the Breton, *Philippide* 7, ed. by H.-François Delaborde, in *Oeuvres de Rigord et de Guillaume le Breton*, 2 vols. (Paris: Société de l'histoire de France, 1882-85), p. 202.

variants of *trebuchet* appear to refer exclusively to the heaviest mechanical artillery from the early thirteenth century onwards.

The earliest known uses of the term 'trebuchet' date to the late twelfth century. *Trabuchellus* is found in a fealty agreement established at Vicenza on 6 April 1189 and *trabucha* are found a decade later in Codagnellus's account of the siege of Castelnuovo Bucca d'Adda in October 1199.[7] In both instances, the new term is listed alongside established terms for artillery: *manganum* and *prederia* in the former, and *predariae* in the latter. Although it is tempting to automatically equate these new terms with a new technology (the counterweight trebuchet), John France has astutely noted that there is nothing to support such an impetuous jump: neither source describes these engines and Codagnellus appears to portray them as quite light at times.[8] Similarly, Cathcart King discarded the *trabucha* in Codagnellus's account as it appears alongside other machines in an effort to secure a ditch – not the most obvious use for a counterweight trebuchet.[9]

The origin of the term 'trebuchet' is not clear. Cathcart King suggested that it might come from *trebucher*, to rock or tilt,[10] while William Sayers has provided a more thorough etymological study.[11] A single origin is hard to discern given the variety of forms that appear in the early thirteenth century, including *trubechetum*, *tribuclietta*, *trabocco*, *tribok* and numerous other vernacular renderings.[12] Although the earliest forms of the term may not have been applied to counterweight trebuchets, most sources who employ these terms appear to have associated them with this type of artillery by about 1220.

The earliest surviving illustration of a counterweight trebuchet is found in Mardi ibn ʿAli al-Tarsusi's *Tabsirah fi al-Hurub*, composed and presented to Saladin in the 1180s.[13] Although this is strong evidence that this type of technology was known, and likely employed, in the Levant before the first known use of 'trebuchet', there is little consensus among scholars

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[7] *Storia degli Ecelini*, ed. by Giambasta Verci, 3 vols. (Bassano: Stamperia Remondini, 1779), III, no. 52, pp. 96-101 (p. 97); Iohannes Codagnellus, *Annales Placentini*, ed. by Georg Heinrich Pertz, *Annales Plancentini Guelfi*, Monumenta Germaniae Historica Scriptores (hereafter MGH SS) 18 (Hanover, 1863), pp. 411-457 (p. 420), ed. by Oswald Holder-Egger, *Iohannis Codagnelli Annales Placentini*, MGH SS rer. Germ. 23 (Hanover, 1901), p. 25. See also John France, *Western Warfare in the Age of the Crusades, 1000-1300* (Ithaca: Cornell University Press, 1999), pp. 121-23; Kalervo Huuri, *Zur Geschichte des mittelalterlichen Geschützwesens aus orientalischen Quellen*, Studia Orientalia 9-3 (Helsinki: Druckerei A. G. der Finnischen Literaturgesellschaft, 1941), p. 171.

[8] France, pp. 122, 273 n. 33.

[9] D. J. Cathcart King, 'The Trebuchet and other Siege-Engines,' *Chateau Gaillard* 9-10 (1982), pp. 457-69 (p. 461).

[10] Cathcart King, p. 461.

[11] William Sayers, 'The Name of the Siege Engine *trebuchet*: Etymology and History in Medieval France and Britain,' *Journal of Medieval Military History* 8 (2010), pp. 189-96.

[12] For more on the appearance of these terms, see Huuri, pp. 63-64.

[13] Oxford, Bodleian Library, MS Hunt. 264, fols. 134v-135r. See Figure 4 below.

as to when and where the counterweight trebuchet was first developed. Al-Tarsusi's description and accompanying illustration are far from conclusive proof that this type of engine was developed in the Islamic world. At the siege of Acre in 1189-91, eyewitness sources provide no indication that the artillery employed by either the Muslim garrison or the crusaders was superior.[14] In addition to revealing that neither side possessed a technological advantage, this episode demonstrates how quickly artillery technology spread in the Middle Ages. In the decades that followed the siege of Acre, Muslim sources describe the *manjaniq maghribi* (Western trebuchet) and later *manjaniq ifranji* (Frankish trebuchet) as the most powerful types of artillery employed by Muslim armies.[15] Had the counterweight trebuchet been invented under Islam, its development appears to have been championed in the West during the thirteenth century.

With clear evidence that the technology of the counterweight trebuchet was known in the 1180s, this would appear to be the heavy type of artillery that the new terminology came to identify in the early thirteenth century. In the East, the first variant appears as *trabuculus*, at the crusaders' siege of Damietta in 1218-19.[16] Oliver of Paderborn and James of Vitry, eyewitnesses to the siege, portray these engines as more powerful than the *petrariae* that they also mention. The strength of the heavier engines is made apparent in 1219 when the various sources of the Fifth Crusade highlight the damage that they inflicted after the crusaders crossed the Nile and besieged the landward defences of Damietta. Oliver of Paderborn claims the *trabuccus* of the duke of Austria was particularly powerful while Roger of Wendover celebrates the *trebuculus* of the Templars.[17] The *Eracles* account states that a *trebuchet* was erected by

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[14] See Michael S. Fulton, *Artillery in and around the Latin East, (1097-1291)* (unpublished PhD thesis, Cardiff University, 2016), pp. 161-75.

[15] See Fulton, *Artillery in and around the Latin East*, pp. 366-69.

[16] Oliver of Paderborn, *Historia Damiatina* 12, 38, 39, ed. by Hermann Hoogeweg, *Historia Damiatina*, in *Die Schriften des Kölner Domscholasters, späteren Bischofs von Paderborn und Kardinal-Bischofs von S. Sabina* (Tubingen: Litterarischen Verein in Stuttgart, 1894), pp. 159-280 (pp. 181, 237-38, 239), trans. by John J. Gavigan, 'The Capture of Damietta, by Oliver of Paderborn,' in *Christian Society and the Crusades*, ed. by Edward Peters (Philadelphia: University of Pennsylvania Press, 1971), pp. 49-139 (pp. 64, 94, 96); James of Vitry, *Lettres* nos. 4, 6, ed. by R. B. C. Huygens, *Lettres de Jacques de Vitry* (Leiden: Brill, 1960), pp. 105, 130; Roger of Wendover, *Flores historiarum*, ed. by Henry G. Hewlett, *Rogeri de Wendover Liber qui Dicitur Flores Historiarum ab Anno Domini MCLIV. Annoque Henrici Anglorum Regis Secundi Primo / The Flowers of History by Roger de Wendover: From the Year of Our Lord 1154, and the First Year of Henry the Second, King of the English*, Rolls Series 84, 3 vols. (London: Her Majesty's Stationary Office, 1886-89), II, pp. 229, 243, 250, trans. by J. A. Giles, *Roger of Wendover's Flowers of History, comprising the History of England from the descent of the Saxons to A.D. 1235*, 2 vols. (London: Bohn, 1849), II, pp. 406-7, 418, 424-25; *Cronica Reinhardsbrunnensis*, ed. by O. Holder-Egger, *Cronica Reinhardsbrunnensis*, MGH SS 30, pt. I (Leipzig, 1925), pp. 490-658 (p. 592); *Eracles* 31.14, II, p. 327. Cf. Ernoul, *Chronique* 36, ed. by M. L. de Mas Latrie, *Chronique d'Ernoul et de Bernard le Trésorier* (Paris: Société de l'histoire de France, 1871), p. 416.

[17] Oliver of Paderborn 38, Hoogeweg, pp. 237-38, Gavigan, p. 94; Roger of Wendover, Hewlett, II, p. 250, Giles, II, pp. 424-25.

John of Brienne, another by the Hospitallers and a third was held communally; of these, it was the damage inflicted by the Hospitallers' *trebuchet* that was most impressive, but all were clearly more significant that the many *perrieres* and *mangoneaus* that were also used.[18] Although none of these accounts conclusively proves that the *trabuculi* were counterweight trebuchets, this seems likely. Only the Ernoul account fails to provide some kind of distinction, stating simply that the crusaders employed *perrieres*, *mangoniaus* and *trebucés*.[19]

While the crusading army was in Egypt, Muʿazzam ʿIsa is said to have employed three *petrariae*, four *mangonelli* and a *trabuculus* when he attacked ʿAtlit in 1220. These proved ineffective and were neutralised by the garrison's *trabuculus*, *petraria* and *mangonellus*.[20] From whom the sources learned this new terminology is unclear, but its sudden appearance and fairly regular appearance in the Latin East after the Fifth Crusade suggest that the vocabulary was brought to the Levant by the crusaders. The terminology appears to have begun to spread across Europe less than a decade earlier.
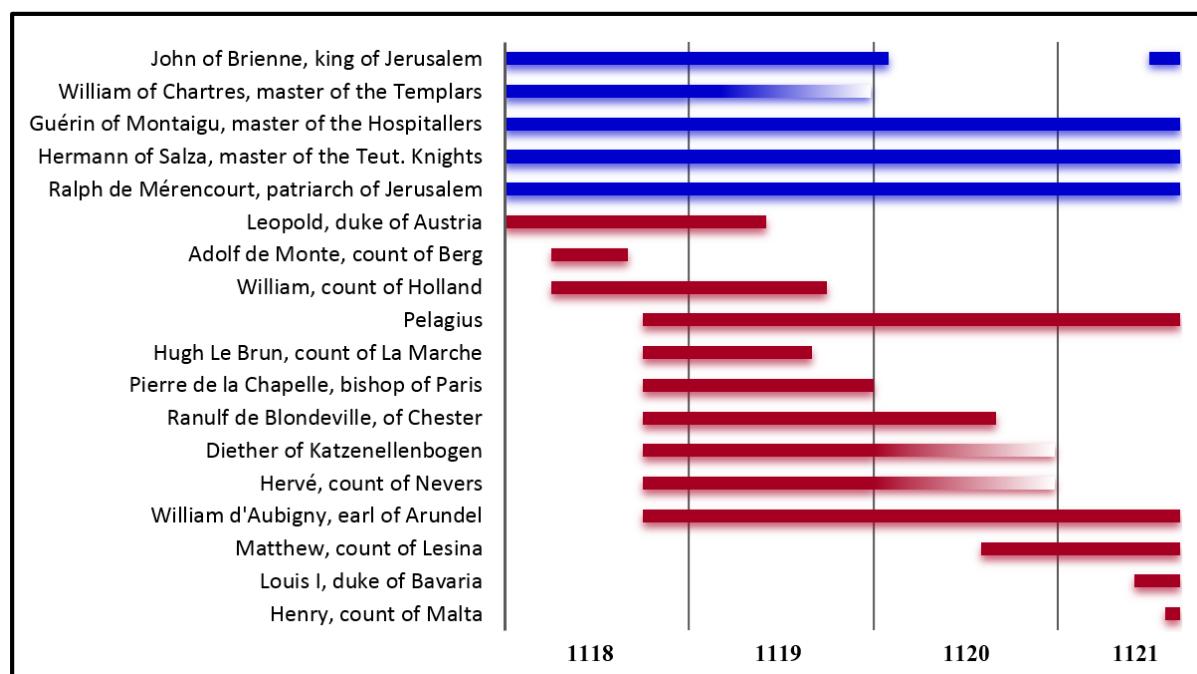

Fig. 2: Leaders of the Fifth Crusade and their time in the East (blue: Eastern Franks, red: Crusaders)

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[18] *Eracles* 32.8, 14, II, pp. 337-38, 345. Cf. *Chronicle of Melrose*, ed. by Joseph Stevenson, *Chronica de Mailros* (Edinburgh, 1835), p. 136; Marino Sanudo Torsello, *Liber secretorum fidelium crucis* 3.11.8, ed. by J. Bongars, *Liber Secretorum Fidelium Crucis* (Hanover, 1611, reprinted with an introduction by Joshua Prawer, Jerusalem: Massada Press, 1972), p. 208, trans. by Peter Lock, *The Book of the Secrets of the Faithful of the Cross - Liber Secretorum Fidelium Crucis* (Farnham: Ashgate, 2011), p. 331.

[19] Ernoul 36, p. 421.

[20] Oliver of Paderborn 52-53, Hoogeweg, pp. 254-55, Gavigan, pp. 108-9. Oliver was at this time with the crusading army in Egypt. Cf. Abu al-Fidaʾ, *al-Mukhtasar fi Akhbar al-Bashar*, ed. and trans. as *Résumé des Histoire des Croisades tiré des Annales d'Abou'l-Feda*, Recueil des historiens des croisades orientaux (hereafter RHC Or) I (Paris: Imprimerie Nationale, 1872), p. 94; *Annales of Dunstable*, ed. by Henry Richards Luard, *Annales prioratus de Dunstaplia*, in *Annales Monastici*, Rolls Series 36, vol. III (London: Longman, 1866), p. 63.

According to the *Chanson de la Croisade Albigeoise*, *trabuquetz* were employed in Provence by the French crusaders as well as the defenders of Toulouse. Unlike the earlier Italian references, the engines identified by this term appear to have been exceptional. For example, a French trebuchet was reportedly able to smash a tower of Castelnaudary with only one shot in 1211, and only one more was needed to destroy the great hall. Although this is clearly an exaggeration, William of Tudela's emphasis on the count of Toulouse's subsequent abandonment of a *trabuquet*, reveals the value assigned to such engines.[21] The power of the Toulousians' trebuchets is also expressed during the French siege of Toulouse (1217-19) and the defenders' investment of the Narbonnais castle. "[S]o many carpenters were busy building strong fast-firing double trebuchets that no tower or hall, rampart or merlon was left undamaged".[22] These *trabuquetz* are distinct from the *calabres* and *peirers*, which are also characterised as quite strong at times: such engines were used by Simon de Montfort to breach one of Toulouse's towers, granted the crusaders temporary entrance into the city.[23] Rather than exaggerated notions of power, it is the mention of certain mechanical features that is the strongest evidence that a new type of engine was employed.

It is recorded that "more than ten thousand tallied on the ropes" of these *trabuquetz* at one point,[24] initially suggesting that these were traction trebuchets; however, it is noted soon afterwards that men "ran to the ropes and wound the *trabuquetz*".[25] Winches are not a feature of traction trebuchets but they are known to have been used to draw back the beams of counterweight trebuchets. Furthermore, the Toulousian *trabuquetz* were fired when the men "released their ropes",[26] which appears to describe the freeing of a counterweight to fall – quite different from the pulling power applied to fire a traction trebuchet. Although there are few indications that the *trabuquetz* were significantly more powerful than the *calabres* and *peirers*, which are often mentioned alongside them, their use of well-dressed projectiles is perhaps revealing. Unlike the inconsistent pulling-force that powered a traction trebuchet, the same amount of energy was behind every shot fired by a counterweight trebuchet. By using finely dressed spherical projectiles of a consistent mass, these engines were capable of firing with

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[21] *Chanson de la croisade Albigeoise* 92, 106, ed. and trans. by Paul Meyer, *La chanson de la croisade contre les Albigeois*, 2 vols. (Paris: Société de l'histoire de France, 1875-79), I, pp. 93-94, II, pp. 103-4, trans. by Janet Shirley, *The Song of the Cathar Wars* (Aldershot: Ashgate, 1996), pp. 51, 54-55.

[22] *E lains en Toloza ac aitans carpentiers / Que fan trabuquetz dobles e firens e marvers, / Qu'el castel Narbones que lor es frontaliers / No i remas tor ni sala, dentelh ni murs entiers*, *Chanson de la croisade Albigeoise* 192, Meyer, I, p. 285, Shirley, II, p. 141.

[23] *Chanson de la croisade Albigeoise* 198, Meyer, I, pp. 311-13, Shirley, pp. 156-57.

[24] *Chanson de la croisade Albigeoise* 198, Meyer, I, p. 310, Shirley, p. 155.

[25] *Chanson de la croisade Albigeoise* 203, Meyer, I, p. 332, Shirley, p. 167.

[26] *Chanson de la croisade Albigeoise* 204, Meyer, I, p. 333, Shirley, p. 168.

considerable accuracy. Finally, the presence of Bernard Parayre and Master Garnier, whose task it was to "manage the trebuchets as they were accustomed to this work", suggests a higher degree of expertise was merited to oversee this type of engine.[27] Such figures are not found working the *calabres*, *peirers*, and *engenhs*. The new terminology, apparent in this region from 1211, took root and in 1226 the defenders of Avignon are noted to have made use of *trabucheta*, along with *petrarie*, and *mangonella*.[28]

In Britain, variants of 'trebuchet' first appear in accounts of the siege of Dover by Prince Louis of France in 1216-17. The *Histoire des ducs de Normandie* mentions the use of a *trebuket*, rendered as *tribuclietta* in the *Annals of Dunstable*. This engine would appear to be associated with the *trebuchez* that reportedly weighed down a vessel sailing to support French expeditionary force in early 1217.[29] Roger of Wendover, who does not provide an account of the 1217 portion of the siege, during which the other sources mention this engine, may refer to the same machine when he describes Louis summoning a notable *petraria* before beginning the siege in 1216.[30] Roger uses the term *trebuculus* to identify certain engines at the sieges of Jerusalem in 1099 and Damietta in 1218 but at no point uses this term in a European context.[31] Suspiciously, his first mention of *mangonella* accompanies his account of the siege of Lincoln, an episode playing out at the same time as Louis' second siege of Dover in 1217.[32] It is possible that Roger integrated this term to differentiate lighter traction trebuchets from the newer and increasingly powerful counterweight trebuchets, identifying the former as *mangonella* and the latter as *petrariae*. Roger was not alone in his continued, and possibly discriminate, use of traditional terminology.

Having employed the term *tribuclietta* during his account of the siege of Dover, the annalist of Dunstable appears to revert back to traditional terminology when describing the siege of Bedford in 1225. Like Roger of Wendover, he refers to these engines as *petrariae* and

[27] *Chanson de la croisade Albigeoise* 198, 213, Meyer, I, pp. 310, 377, Shirley, pp. 155, 191.

[28] *Chronico Sancti Martini Turonensi*, ed. by O. Holder-Egger, *Chronico S. Martini Turonensi*, MGH SS 26 (Leipzig, 1925), p. 73.

[29] *Histoire des ducs de Normandie et des rois d'Angleterre*, ed. by Francisque Michel, *Histoire des Ducs de Normandie et des Rois d'Angleterre* (Paris: Société de l'histoire de France, 1840), pp. 188, 192-96; *Annales of Dunstable*, pp. 48-49; *L'Histoire de Guillaume le Marechal* ll. 17,387-96, 17,452, ed. by A. J. Holden, trans. by S. Gregory, with D. Crouch, *History of William Marshal*, 3 vols. (London: Anglo-Norman Text Society, 2002-6), II, pp. 370-73, 374-75.

[30] Roger of Wendover, Hewlett, II, p. 191, Giles, II, pp. 374-75. See also Matthew Paris, *Chronica maiora*, ed. by Henry Richards Luard, *Chronica Majora*, Rolls Series 57, 7 vols. (London: Longman, 1872-83), II, p. 664; Ralph of Coggeshall, *Chronicon Anglicanum*, ed. by Joseph Stevenson, *Chronicon Anglicanum*, Rolls Series 66 (London: Longman, 1875), p. 185.

[31] Roger of Wendover, *Flores historiarum*, ed. by Henry Coxe, *Chronica, sive Flores Historiarum: in qua lectionum varietas additionesque, quibus chronicon istud ampliavit et instruxit Matthaeus Parisiensis*, 4 vols. (London: Sumptibus Societatis, 1841-44), II, p. 135, Hewlett, II, p. 229, Giles, I, p. 423, II, pp. 406-7.

[32] Roger of Wendover, Hewlett, II, p. 214, Giles, II, p. 393.

maggunella.[33] While the *petraria* found in the *Annales* is characterised as more significant than the *maggunella*, it is unclear why the annalist reverted back to using traditional vocabulary. Despite such examples, the use of variants of 'trebuchet' increase through the early thirteenth century and first enter English administrative documents as *trebucheta* in 1225.[34]

Trebuchets are first mentioned in James of Aragon's autobiographical chronicle among the events of 1229.[35] The term is one of a number that James used to identify artillery, including *fonèvol*, *almajanech*, *algarrada* and *manganell*. While he appears to have rarely employed his artillery vocabulary consistently, clearly using certain terms interchangeably, it is possible that James originally held the term *trebuchet* apart from others, reflecting a distinctly more powerful engine.

The first 'trebuchet' mentioned in Germany belonged to Otto IV: the engine, a *tribok* or *tribracho*, was used to besiege Weissensee in 1212.[36] These terms may imply that the beam of this engine was composed of three spars, although this is far from certain. The appearance of such terms in a German context reveals that this vocabulary had spread to at least parts of Germany by the time that Henry of Livonia, a German, was about thirty years old. Like some of his Western contemporaries, however, Henry does not employ any of these terms in his chronicle of the wars in the Baltic.

The absence of 'trebuchets' in Henry's chronicle does not rule out the possibility that some of the engines he identifies were counterweight trebuchets. Before the appearance of *trabuchellus* and spread of such terms, certain sources in Latin Europe may have used traditional terms to identify counterweight trebuchets. Richard I may have used counterweight trebuchets at Nottingham in 1194 and it is possible that Philip II employed such at Verneuil in 1194 and Château Gaillard in 1203-4.[37] It is important to consider that both men would likely

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[33] *Annales of Dunstable*, pp. 87-88; Roger of Wendover, Hewlett, II, pp. 279-81, Giles, II, pp. 452-53.

[34] See David S. Bachrach, 'English Artillery 1189-1307: The Implications of Terminology,' *English Historical Review* 121.494 (Dec., 2006), pp. 1,408-30 (pp. 1,421-22).

[35] James of Aragon, *Llibre dels fets* 69, trans. by Damian Smith and Helena Buffery, *The Book of Deeds of James I of Aragon: A Translation of the Medieval Catalan* Llibre dels Fets (Aldershot: Ashgate, 2003), p. 93.

[36] *Annales Marbacenses*, ed. by R. Wilmans, *Annales Marbacenses*, MGH SS 17 (Hanover, 1861), p. 172; *Cronica Reinhardsbrunnensis*, p. 580; *Cronica S Petri Erfordensis moderna*, ed. by O. Holder-Egger, *Cronica S. Petri Erfordensis Moderna*, MGH SS 30, pt. I (Leipzig, 1925), p. 383. See also Rudolf Schneider, *Die Artillerie des Mittelalters* (Berlin: Weidmannsche Buchhandlung, 1910), p. 28.

[37] For Nottingham, see Roger of Howden, *Chronica*, ed. by William Stubbs, *Chronica*, Rolls Series 51, 4 vols. (London: Longman, 1868-71), III, pp. 238-40, trans. by Henry T. Riley, *The Annals of Roger de Hoveden: Comprising the History of England and of Other Countries of Europe, from A.D. 732 to A.D. 1201*, 2 vols. (London: Bohn, 1853), II, pp. 314-16; Roger of Wendover, Hewlett, I, pp. 231-32, Giles, II, p. 134. See also *Pipe Roll 40*, ed. by Doris M. Stenton, *The Great Roll of the Pipe for the Sixth Year of the Reign of King Richard the First, Michaelmas 1194 (Pipe Roll 40)*, Pipe Rolls Society 43 (new series 5) (London: Pipe Roll Society, 1928), p. 43. For Verneuil, see Roger of Wendover, Hewlett, I, p. 233, Giles, II, p. 135; Ralph of Diceto, *Ymagines historiarum*, ed. by William Stubbs, *Ymagines historiarum*, in *Opera Historica: The Historical Works of Ralph de Diceto, Dean of London*, Rolls Series 68, vol. II (London: Longman, 1876), pp. 114-15. For Château Gaillard,
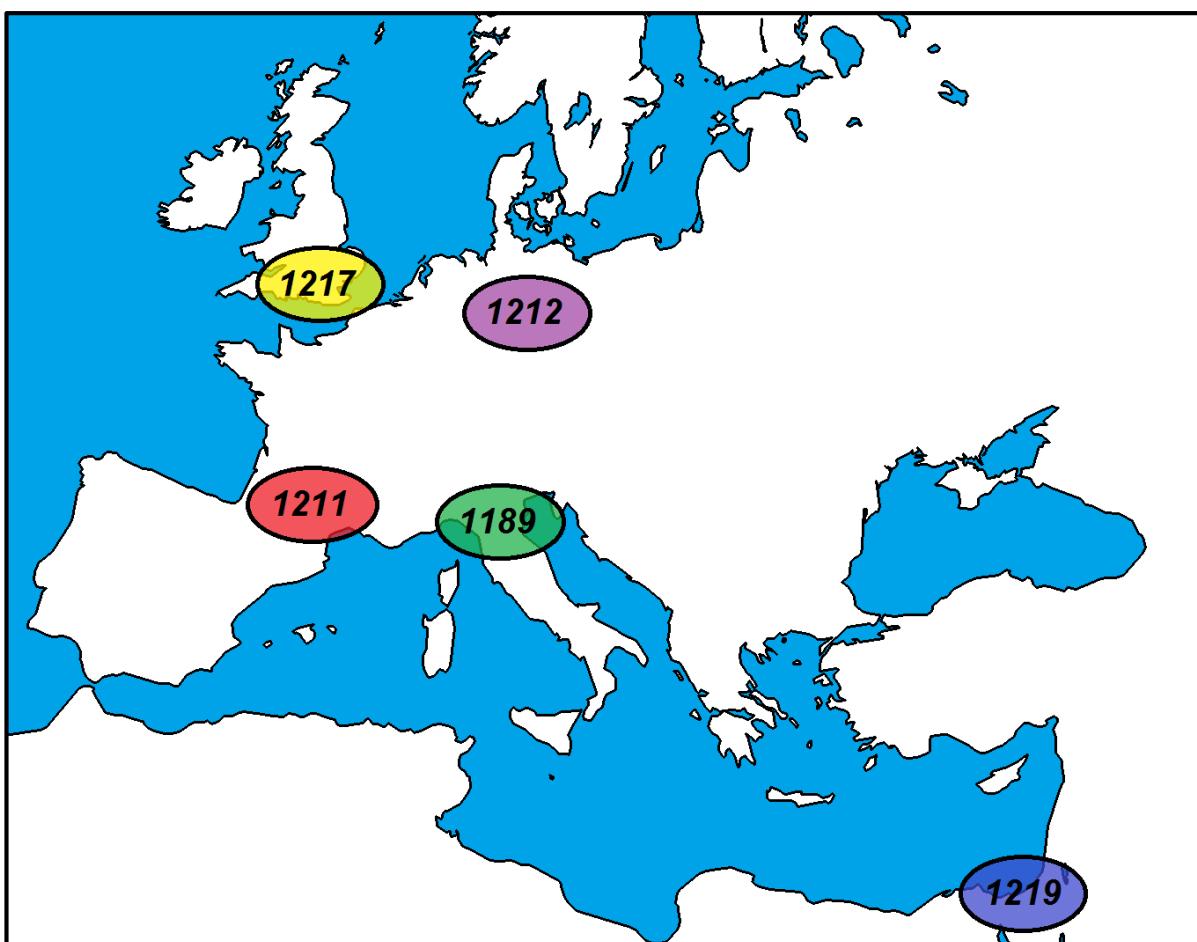
Fig. 3: Appearance of trebuchet terminology

have gained knowledge of such engines while engaging Saladin's forces at Acre had they not been acquainted with this technology before leaving Europe.

New Technology

The counterweight trebuchet was a significant development. By replacing traction power with gravitational force as the means of propelling the short arm of the beam downwards, the only limitation to scale was the structural strength of an engine's components. Since Gustav Köhler's seminal study, it has generally been accepted that the counterweight trebuchet became an influential siege weapon around the end of the twelfth century.[38] This timing is supported

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see William the Breton, *Philippide* 7, pp. 201-4; William the Breton, *Gesta Philippi Augusti* 128-29, ed. by H.-François Delaborde, *Gesta Philippi Augusti*, in *Oeuvres de Rigord et de Guillaume le Breton*, I, pp. 168-333 (pp. 218-19).

[38] G. Köhler, *Die Entwickelung des Kriegswesens und der Kriegführung in der Ritterzeit von Mitte des II. Jahrhunderts bis zu den Hussitenkriegen*, 3 vols. (Breslau: Verlag von Wilhelm Koebner, 1887-89), I, pp. 139-211. See also Huuri, pp. 51-65, 212-17; Paul E. Chevedden, 'The Hybrid Trebuchet: The Halfway Step to the Counterweight Trebuchet,' in *On the Social Origins of Medieval Institutions*, ed. by Donald J. Kagay and Teresa M. Vann (Leiden: Brill, 1998), pp. 179-222 (p. 179).

by al-Tarsusi's description, with accompanying illustration, of a primitive form of such an engine dating to the 1180s. Where these engines were first developed, however, is unclear.

David Nicolle has identified what he believes to be early indications of counterweight trebuchets in the Islamic world, while Randal Rogers has suggested that a phase of significant development may have taken place in southern Italy.[39] But it is the Byzantines who are most often associated with the invention of these engines. There is often an underlying impression that the Byzantines retained a technological advantage through the Middle Ages as the successors of the Latin Roman Empire. Fittingly, many believe Niketas Choniates provides the earliest description of a counterweight trebuchet. In 1165, Andronicus Comnenus is said to have employed *petrobolous mekhanas*, each making use of a sling (*sphendone*), winch (*strophalos*) and screwpress (or beam) (*lugos*), that were capable of throwing stones weighing a talent. The engines were used in conjunction with sapping efforts and collectively they were able to compromise the besieged section of fortifications.[40]

It is the reference to winches, rather than any notion of impressive power, that has led scholars to view the engines described by Niketas as exceptional. But before jumping to conclusions, it is important to acknowledge the possibility that Niketas added this component erroneously, influenced by descriptions of classical torsion engines that also made use of winches. It is also possible that Niketas may have imprecisely placed the use of an engine familiar to his own time amongst events of the past, as he did not begin to compose his account until the 1180s or 1190s.[41] On the contrary, Paul Chevedden has suggested that the counterweight trebuchet was invented decades earlier at the end of the eleventh century.

Chevedden offers the sensational proposal that no less a figure than Emperor Alexius Comnenus invented the counterweight trebuchet. Relying on a passage written by the emperor's daughter decades after events, he suggests that the first counterweight trebuchets

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[39] David Nicolle, 'The Early Trebuchet: Documentary and Archaeological Evidence,' in *La fortification au temps des croisades*, ed. by Nicolas Faucherre, Jean Mesqui and Nicolas Prouteau (Rennes: Presses Universitaires des Rennes, 2004), pp. 269-78 (pp. 270-72); Rogers, Randall, *Latin Siege Warfare in the Twelfth Century* (Oxford: Oxford University Press, 1992), pp. 247-48.

[40] Niketas Choniates, *Historia*, trans. by Harry J. Magoulias, *O City of Byzantium, Annals of Niketas Choniates* (Detroit: Wayne State University Press, 1984), p. 76. For opinions of this as the first use of a counterweight trebuchet, see Kelly Robert DeVries, *Medieval Military Technology* (Peterborough: Broadview Press, 1992), p. 138; Hugh Kennedy, *Crusader Castles*, (Cambridge University Press, 1994), p. 107. See also Paul E. Chevedden, 'The Invention of the Counterweight Trebuchet: A Study in Cultural Diffusion,' *Dumbarton Oaks Papers* 54 (2000), pp. 71-116 (pp. 86-87).

[41] For the dating the composition of the chronicle of Niketas Choniates, see Alicia J. Simpson, 'Before and After 1204: The Versions of Niketas Choniates' "Historia",' *Dumbarton Oaks Papers* 60 (2006), pp. 189-221.
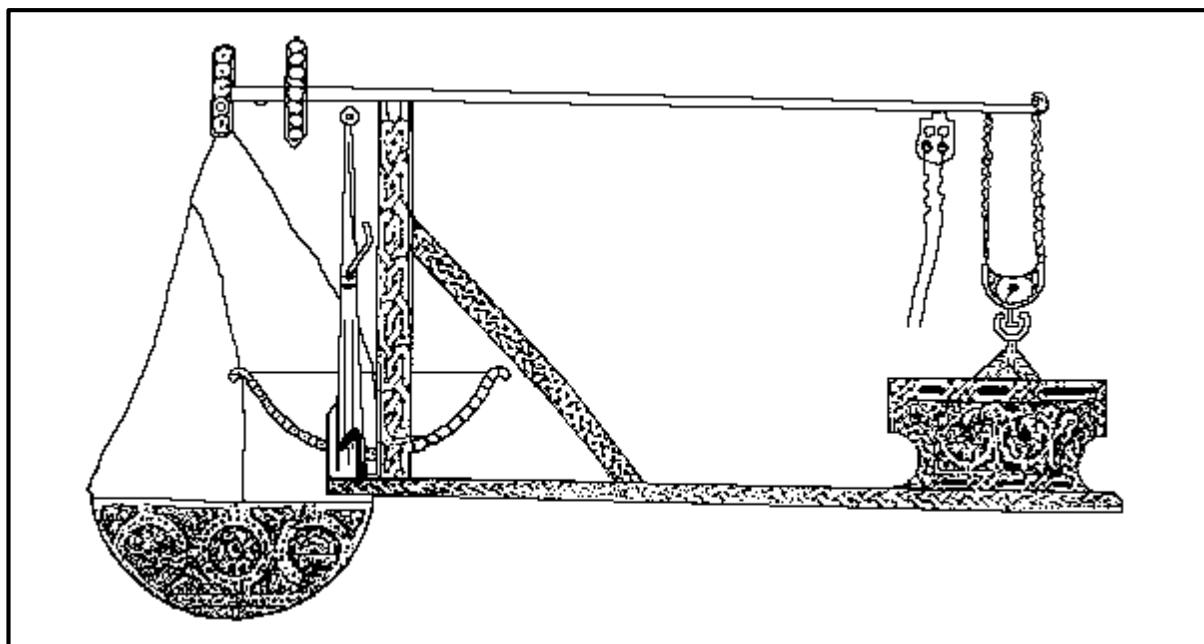
Fig. 4: Al-Tarsusi's manjaniq farsi (redrawn after Oxford, Bodleian, MS Hunt.264, fols. 134v-135r

were given to the crusaders ahead of the siege of Nicaea in 1097.[42] The summoning of an Armenian of Antioch, Havedic, to construct artillery for the Franks during their siege of Tyre in 1124 has also raised suspicions that he was commissioned to construct counterweight trebuchets.[43] Despite such tantalising indications, there is no definitive proof that the counterweight trebuchet was known before al-Tarsusi produced his description and accompanying illustration.

Al-Tarsusi's tone and claim that such an engine had previously been built imply that this technology had been around for at least a few years; however, the crude nature of the engine suggests that it may not have reached an effective stage of development. The low axle, short sling, and use of only three slender ropes to attach the counterweight to the short arm of the beam, indicate that this was a light and inefficient engine. In the years that followed this design was improved: the axle was raised allowing the counterweight to swing freely, no longer requiring a hole be dug for it to fall into; a longer sling was used, positioned horizontally under

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[42] Chevedden, 'The Invention of the Counterweight Trebuchet,' pp. 86-87; Paul E. Chevedden, 'King James I the Conqueror and the Artillery Revolution of the Middle Ages,' *Institut d'Estudis Catalans: Memòries de la Secció Històrico-Arqueològica* 91 (2011), pp. 313-39 (p. 316). Cf. Anna Comnena, *Alexiad* 11.2.1, trans. by E. R. A. Sewter, *The Alexiad of Anna Comnena* (London: Penguin, 1969), p. 271. The context of this description bears resemblance to supposed engines invented by Alfred of England in the ninth century, Florence of Worcester, *Chronicon ex chronicis*, ed. by Benjamin Thorpe, *Florentii Wigorniensis Monachi Chronicon ex Chronicis*, 2 vols. (London: Sumptibus Societatis, 1848-49), I, p. 89, trans. by Thomas Forester, *The Chronicle of Florence of Worcester with the Two Continuations* (London: Bohn, 1854), p. 66. For Chevedden's broader theory, see Chevedden, 'The Invention of the Counterweight Trebuchet,' pp. 90-93.

[43] William of Tyre 13.10, Huygens, I, pp. 597-98, Babcock and Krey, II, pp. 15-16. For interpretations, see Chevedden, 'The Invention of the Counterweight Trebuchet,' p. 92; Ronnie Ellenblum, *Crusader Castles and Modern Histoires* (Cambridge: Cambridge University Press, 2007), pp. 193-94, 208-10; Chevedden, 'King James I the Conqueror,' p. 317 and n. 9.

the axle before firing; and a much more substantial counterweight was employed. Collectively these amendments increased the amount of energy that could be transferred to a projectile and improved mechanical efficiency. The improvements appear to have been made by the second decade of the thirteenth century, at which point the new terminology is found identifying particularly heavy engines, such as those employed at Damietta, Toulouse, Dover and Weissensee.

While al-Tarsusi has provided a valuable *terminus ante quem*, it is possible that the process of improving the design that he describes had begun much earlier. Ignorant of such, the model provided by al-Tarsusi may have been significantly outdated in some regions. There is limited evidence, however, to suggest that any counterweight trebuchets built before the end of the twelfth century were significantly more powerful than traditional traction engines.[44] This might explain why the first 'trebuchets' that appear in northern Italy appear to have been quite modest engines.

By the second decade of the thirteenth century, sizable counterweight trebuchets appear to have been employed at sieges across western Europe; what is more, they were increasingly being identified with new terminology to distinguish them from less powerful stone-throwers. But how far had this technology spread to the east? Although Henry of Livonia does not employ the new vocabulary, there is evidence that he identifies the introduction of this new technology to the Baltic.

Henry of Livonia

The first reference to artillery, *patherelli*, in Henry of Livonia's chronicle accompanies the Christian siege of Holm (Martinsala) in 1206.[45] The term *patherellus* appears to be a variant of the *petraria*.[46] Although the term *petraria* is most often associated with a traction trebuchet, this is insufficient evidence to rule out the possibility that Henry used the term to refer to a counterweight engine as other sources, such as Roger of Wendover, evidently used the term to refer to both types of engine. Henry's second reference to artillery appears shortly after the first, accompanying the Russians' siege of Holm later in 1206.

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[44] See Michael S. Fulton, 'A Ridge Too Far: The Siege of Saone/Sahyun in 1188 and Contemporary Trebuchet Technology,' *Crusades* (forthcoming).

[45] Henry of Livonia, *Chronicon Lyvoniae* 3 (10.9), ed. by Wilhelm Arndt, *Henrici Chronicon Lyvoniae*, MGH SS rer. Germ. 31 (Hanover, 1874), p. 33, trans. by James A. Brundage, *Chronicle of Henry of Livonia* (Madison: University of Wisconsin Press, 1961, new edition New York: Columbia University Press, 2003), p. 60.

[46] Bradbury has linked *patherellus* with *patera*, (lat. 'dish' or 'cup'), suggesting that these were classical torsion engines, Jim Bradbury, *The Medieval Siege* (Woodbridge: Boydell, 1992), p. 259.

Fig. 5: Map of the Baltic in the early thirteenth century

Henry claims that the Russians made a *machina parva*, like that of the Germans, but as they did not understand such engines they ended up throwing rocks backwards, harming some of their own men.[47] This episode is reminiscent of the mishap that occurred during the Scottish siege of Wark in 1174, when an engine similarly misfired, and an episode found in a Franciscan *liber exemplorum* from the second half of the thirteenth century.[48] The adjectives 'little' and

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[47] *Fecerunt eciam Rutheni machinam parvam more Theuthonicorum, sed nescientes artem lapides iactandi, plures ex suis post tergum iactantes leserunt*, Henry of Livonia 3 (10.12), Arndt, p. 37, Brundage, p. 63.

[48] Jordan Fantosme, *Chronique* ll. 1,240-55, ed. and trans. by Richard Howlett, *Chronique de la guerre entre les Anglois et les Ecossois en 1173 et 1174 / Chronicle of the War between the English and the Scotch in 1173 and 1174*, in *Chronicles of the Reigns of Stephen, Henry II, and Richard I*, Rolls Series 82, vol. 3 (London: Longman, 1886), pp. 307-8; *Liber exemplorum* 44, ed. by A. G. Little, *Liber Exemplorum ad usum Praedicantium* (Aberdeen: Typis Academicis, 1908), pp. 27-28. Cf. Ammianus Marcellinus, *Res gestae*, 24.4.28, ed. by Francis

'German' used to describe the Russian engine are intriguing: Henry appears to imply that the Russians, whom he classifies as primitive in the sphere of poliorcetics,[49] built a small version of a superior type of German engine. What becomes apparent through Henry's chronicle, is that the term *machina* is not used in a general sense, as it appears in the works of many contemporary sources, but is employed specifically to identify artillery. So what, if anything, differentiated a *patherellus* from a *machina* or a *machina parva* from a *machina magna*?

Henry provides little to discern what distinguished the *machinae* that were used during the siege of Riga by the Kurs in 1210 from the *machina parva*, of the German type, that the Russians struggled with at Holm four years earlier.[50] The first indication of a classification system accompanies the German siege of Fellin in 1211, when it is stated that the besiegers brought with them a smaller machine called a *paterellus* (*machinam minorum sive paterellum*).[51] Strangely, this engine does not seem to factor into the siege unless it is the *machina* that was built after the siege had begun. The engine erected during the siege was evidently a significant engine, reported to have thrown stones day and night damaging the besieged defences and killing men and animals inside the fort. Henry's portrayal of the Germans as technologically superior to others in the region, suggests that this engine was of the same type as that built by the Russians at Holm in 1206. By comparison, he claims that the Estonians besieged in Fellin had never seen an engine of the sort and had not strengthened their houses sufficiently to withstand its projectiles.[52] Although the description of this engine's power suggests otherwise, it is possible that that this *machina* is the same as the 'smaller' one, equated with a *paterellus*, that is noted ahead of the siege.

While it is difficult enough to reconcile *machina*, *machina parva* and *patherellus*, the matter becomes even more complicated when a *machina maior* is noted in 1218.[53] Although bad weather prevented the employment of this engine, which had been constructed to use against the Oeselians, another is found at the siege of Mesoten in 1220. It is here that Henry clearly distinguishes between two types of engines, stating that a great engine and other smaller ones (*machinam magnam et alias minores*) were brought to Mesoten. As the siege began, Henry states that some of the Germans set to work building a tower, others erected *patherelli*

Eyssenhardt, *Rerum gestarum libri* (Berlin: Vahlen, 1871), p. 308, trans. by C. D. Yonge, *The Roman History of Ammianus Marcellinus: During the Reigns of the Emperors Constantius, Julian, Jovianus, Valentinian, and Valens* (London: Bell & Sons, 1902), p. 362.

[49] Cf. Henry's derogatory description of the Russian fort of Kokenhusen (Koknese) and, implicitly, those who had inhabited it, Henry of Livonia 4 (13.1), Arndt, p. 61, Brundage, p. 88.

[50] Henry of Livonia 4 (14.5), Arndt, p. 71, Brundage, p. 98.

[51] Henry of Livonia 4 (14.10), Arndt, p. 78, Brundage, p. 104.

[52] Henry of Livonia 4 (15.1), Arndt, pp. 79-80, Brundage, p. 106.

[53] Henry of Livonia 4 (21.5), Arndt, p. 138, Brundage, p. 164.

and employed *ballistae*, and the sappers set up a penthouse and began to undermine the besieged defences.[54] The *patherelli*, noted in the plural, would appear to be associated with the *machinae minores*, much as the *machina parva* had been equated with a *patherellus* before the siege of Fellin. These seem to have been different from the *machina maior*, which came into action later in the siege. This engine is described as throwing great rocks at the fort, terrifying those within. Henry claims the first stone thrown by this engine was loosed by the Duke of Saxony and that it crushed a certain section of the parapet, killing the men thereon. The second and third shots dislodged some planks of the rampart, hitting some men as well, and compelled the defenders to abandon their defences and seek refuge.[55] Like the *machina* at Fellin, this engine appears to have taken a prolonged period of time to erect and is praised for its power once operational.

The first type of artillery described by Henry at Holm would appear to be lighter traction trebuchets, mentioned alongside *ballistae* (probably crossbows) and similarly well suited to providing antipersonnel fire. The second, a single heavier and more destructive engine, was probably a counterweight trebuchet. Although Henry seems to employ distinct terms to differentiate between these engine-types at Mesoten, caution is required before attempting to use this vocabulary to evaluate engines mentioned earlier, apart from the *machina maior* noted in 1218.

It is hard to imagine that traction trebuchet technology was unknown to most Russian armies before 1206, as such engines had been used across Latin Europe for centuries.[56] Accordingly, it is tempting to suggest that the little 'German' engine that was built at Holm in 1206, of which the Russians had little knowledge, was a counterweight trebuchet. It is possible that Henry's use of the adjective *parva* in this instance was meant to provide a sense of scale rather than type. However, Henry claims that the Oeselians were completely ignorant of the *patherellus* as well as *machinae* until 1220, when they acquired knowledge of such from the people of Warbole (who had received this technology as subjects of the Danes).[57] This anecdote is almost certainly more ethnocentric than accurate, similar to Theophylact Simocatta's account

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[54] *Quorum alii propugnaculum edificant, alii patherellos erigunt, alii balistas exercent, alii edificant ericeos, de subtus fodere vallum incipiunt…* Henry of Livonia 4 (23.8), Arndt, p. 156, Brundage, p. 180.

[55] *Erigitur tandem machina maior, iactantur in castrum lapides magni, quorum magnitudinem intuentes in castro, terrorem magnum concipiunt. Fit ipse dux rector machine, proiecit lapidem primum, et erkerum ipsorum et viros in eo comminuit. Proiecit secundum, et plancas cum lignis munitionis in terram deiecit. Proiecit tertium, et arbores tres magnas munitionis perforando constringit hominesque ledendo concutit. Quo viso, castrenses de munitione fugiunt, loca tutiora adire querunt*, Henry of Livonia 4 (23.8), Arndt, pp. 156-57, Brundage, p. 181.

[56] Cf. Kurt Villads Jensen, 'Bigger and Better: Arms Race and Change in War Technology in the Baltic in the Early Thirteenth Century,' in *Crusading and Chronicle Writing*, pp. 245-64 (pp. 252-54).

[57] Henry of Livonia 4 (26.3), Arndt, p. 183, Brundage, p. 206-7.

of the Avars receiving a new long-range siege technology, possibly the traction trebuchet, from a captured Roman soldier at Appaireia in 587.[58] In both instances, the anecdote is meant to reinforce the simplicity of the supposedly inferior ethnicity, crediting their acquisition of a 'civilised' technology to a traitorous element of the superior society. In reality, the rapid spread of artillery science in the Baltic was an unavoidable by-product of the aggressive advances of German and Danish forces. Trebuchets were not complicated engines and anyone inclined to carpentry, let alone a background in shipbuilding, would have been able to build a replica of moderate size with relative ease.[59] Henry reinforces this notion when claiming that the Oeselians were able to spread their knowledge of *patherelli* and *machinae* to such a degree that by 1223 such engines were found in every Estonian fort.[60]

Terminologically, this anecdote poses an issue as it can be interpreted in three ways: that the Estonians were completely ignorant of the traction trebuchet, an unlikely but perhaps ethnically charged judgement; that *patherellus* (and *machina maior* by extension) can also refer to a counterweight trebuchet, along with *machina maior*; or, that Henry used fairly flexible vocabulary, except when identifying multiple engine-types in the same thought, much as the modern term 'trebuchet' is used. There are merits and weaknesses to all three possibilities and only slightly more insight can be gained from the sieges of 1223-24.

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[58] Theophylact Simocatta, *History* 2.16.1-11, trans. by Michael Whitby and Mary Whitby (Oxford: Oxford University Press, 1986), pp. 65-66.

[59] For a brief discussion of the links between nautical traditions and trebuchet artillery, see Rogers, pp. 201-7.

[60] Henry of Livonia 4 (26.4), Arndt, pp. 184, 187, Brundage, pp. 207, 210. Although neither the Slavs nor Danes had a strong tradition of building with stone, neither did the Franks, yet the *manganum* is found in their siege trains by the ninth century, see Carroll Gillmor, 'The Introduction of the Traction Trebuchet into the Latin West,' *Viator* 12 (1981), pp. 1-8 (pp. 6-8). Although it is unlikely that the Frankish campaigns beyond the Elbe reached the Estonians, Einhard claims that the Franks were in contact with the Baltic Slavs and Estonians by the early ninth century, Einhard, *Vita Karoli Magni*, ed. by O. Holder-Egger, *Einhardi Vita Karoli Magni*, MGH SS rer. Germ. 25 (Hanover: Impensis bibliopolii Hahniani, 1911), p. 15. Certain Slavic groups had knowledge of traction trebuchets by the late sixth century, as are noted at the siege of Thessalonica in the *Miracles of St Demetrius*, but it is unclear how far north or what rate this knowledge spread, *Miracles of St Demetrius*, ed. by Paul Lemerle, *Les plus anciens recueils des miracles de saint Démétrius et la pénétration des Slavs dans les Balkans*, vol. I (Paris: Centre National de la Recherce Scientifique, 1979), pp. 148-54. In 1147, participants of the Wendish Crusade would also have brought knowledge of trebuchet technology east of the Elbe, although how far this knowledge may have spread is again unclear. While none of these instances links the use of artillery with the Estonians before the 1220s, it suggests that the peoples of the Baltic probably had probably gained an idea of these engines before the arrival of the Germans, via traders if not direct contact. Having seen such engines deployed by the crusaders, it would have been easy for the Estonians to replicate them. Although stone defences were not widespread in the Baltic at this time, the use of traction trebuchets was as effective an antipersonnel weapon against defenders of timber defences as against those of stone fortifications. Stone fortifications were not widespread in Norman France and England during the eleventh century and early twelfth, yet contemporary sources appear to note the use of light stone-throwing artillery at this time, see Michael S. Fulton, 'Anglo-Norman Artillery in Narrative Histories, from the Reign of William I to the Minority of Henry III,' *Journal of Medieval Military History* 14 (forthcoming, 2016). For Baltic defences at the end of the twelfth century and start of the thirteenth, see Armin Tuulse, *Die Burgen in Estland und Lettland* (Dorpat (Tartu): Estnischer Verlag, 1942), pp. 23-62.

At the siege of Fellin in August 1223, the Germans and their allies are said to have employed *machinae minores* and *patherelli*, while the defenders employed *patherelli* and *machinae*.[61] *Machinae* and *patherelli* are again noted without any indication of power or form at the siege of Danish Lone that winter.[62] At the siege of Dorpat in August 1224, Henry claims that the *machinae minores* of Rigginian-led force killed some of the defenders while their *patherelli* threw heated iron or pots of fire into the fort.[63] At both the sieges of Fellin in 1223 and Dorpat in 1224 Henry expresses a sense of equality between the attackers and defenders by stating that the besieged erected *machinae* and *patherelli* to counter those of the besiegers. This complicates any attempt to suggest that Henry employed his vocabulary consistently throughout his chronicle as the *machinae minores* of the attackers are implicitly the same type of engine as the nondescript *machinae* of the defenders and distinct, or at least used to throw a different type of projectile, from the *patherelli* used by both sides. This undermines his earlier equation of a *machina minor* with a *patherellus* and forces a re-evaluation of his use of the term *machina*.

Near the end of his chronicle, Henry again draws a distinction between the *patherelli* and the *machinae* built at the siege of Mona on the island of Moon in early 1227. While it is not clear how the *machinae* were used, the attacking *patherelli* fired stones at defensive engines of the same type.[64] A similar distinction is apparent at the siege of Waldia soon after: the attackers' *instrumenta bellica* are equated with *patherelli* and clearly differentiated from the *machina magna* that was also prepared.[65] Whereas *patherellus* was once associated with smaller varieties of *machinae*, by the 1220s a shift had occurred that was carried through the remainder of the chronicle.

From the first reference to artillery in 1206 to the last in 1227, Henry notes the use of *patherelli* (and on occasion *paterelli*) nineteen times and *machinae* twenty-four times. Of the latter, on four occasions the engines are classified as *minor*, once as *parva*, twice as *maior*, and twice as *magna*. Mäesalu has suggested that the three references to a heavier engine are to the same machine, that prepared by Count Albert von Lauenburg in early 1218.[66] Henry states that the notable engine was brought to Mesoten, implying it was built ahead of time, but it is conspicuously absent from the narrative for the next seven years.

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[61] Henry of Livonia 4 (27.2), Arndt, p. 192, Brundage, p. 215.
[62] Henry of Livonia 4 (27.6), Arndt, pp. 195-96, Brundage, pp. 218-19.
[63] Henry of Livonia 4 (28.5), Arndt, p. 201, Brundage, pp. 223-24.
[64] Henry of Livonia 4 (30.4), Arndt, p. 218, Brundage, p. 241.
[65] Henry of Livonia 4 (30.5), Arndt, p. 220, Brundage, p. 243. Brundage identifies the collective group of *patherelli*, the *machina maior* and the siege tower as the *instrumenta bellica*, rather than just the *patherelli*.
[66] Mäesalu, pp. 276-77.

Location (Employer)	Method of use	Engines			
1206 Holm (Christians)	offensive	*patharelli*			
1206 Holm (Russians)	offensive				*machina parva*
1210 Riga (Christians)	defensive		*machinae*		
1211 prepared (for Fellin) (Christians)	offensive intention				*machina minor (sive paterellum)*
1211 Fellin (Christians)	offensive		*machina*		
1218 prepared (for Oesel) (Christians)	offensive intention			*machina maior*	
1220 Mesoten (Christians)	offensive	*patherelli*		*machina magna machina maior*	*alia minores*
1222 Warbole (Oeselians)	leant	*patherelli*			
1222 Oesel (Oeselians)	offense	*patherelli*	*machinae*		
1222 (Oeselians)	taught	*patherelli*	*machinae*		
1223 Estonian forts (Estonians)	defensive intention	*patherelli*			
1223 Fellin (Christians)	offensive	*patherelli*	*machinae*		*machinae minores*
1223 Fellin (Estonians)	defensive	*patherelli*	*machinae*		
1224 Lone (Christians)	offensive	*patherelli*	*machinae*		
1224 Dorpat (Christians)	offensive	*patherelli*	*machinae*		*machinae minores*
1224 Dorpat (Danes)	defensive	*patherelli*	*machinae*		
1227 Mona (Christians)	offensive	*patherelli*	*machinae*		
1227 Mona (Estonians)	defensive	*patherelli*			
1227 Waldia (Christians)	offensive	*patherelli*	*machina magna*		

Fig. 6: Mentions of Artillery by Henry of Livonia

The only definitively small (*parva*) engine noted by Henry is that used by the Russians at Holm in 1206. While smaller (*minor*) engines are noted later, it is possible that at this early stage of his chronicle, Henry intended *machina* to denote a counterweight trebuchet. Henry may have altered the intended meaning of his vocabulary as he continued, clearly associating the *machina minor* that was prepared in 1211 ahead of the siege of Fellin with the term *patherellus*. Although this may have been the same engine as the notable *machina* that came into action later during the siege, it is possible that this was a different, more powerful, engine

that was constructed on-site. Another step appears to have been taken in 1218 when the adjective *maior* was associated with a *machina* for the first time, leaving little doubt that this was the heaviest type of artillery employed in the region. The similarity between the various types of *machinae* becomes clear when Henry also refers to the *machina maior* at Mesoten as a *machina magna*. Thereafter, *machinae minores* are found being prepared along with *patherelli* at the siege of Fellin in 1223 and the siege of Dorpat the following year. Like the Russians' *machina parva* at Holm, Henry seems to imply that these smaller engines (identified simply as *machina* when possessed by defenders) are a smaller variety of the *machina magna* and distinct from the *patherellus*.

The occasional association *patherelli* with smaller *machinae* and what appears to be the slightly more frequent differentiating of the two obscures any certain understanding of how Henry understood these machines or to what engine-types he intended certain terms to refer. It cannot be conclusively proven that *maior*/*magna* was used to designated a counterweight trebuchet; however, this is suggested by the spread of these engines elsewhere in Europe and the emphasis placed on the power of the engine used at Mesoten in 1220. Likewise, it is possible that *patherelli* and early references to *machinae minores* were not always meant to identify traction trebuchets. The prefabricated *machina minor*/*patherellus* mentioned in the lead up to the siege of Fellin in 1211, implies that this engine, like the prefabricated *machinae maiores* found in 1218 and 1220, was particularly valuable, easy to appreciate if this was the powerful *machina* prepared during the siege.[67] Most artillery, however, appears to have been constructed locally, speaking to both the mechanical simplicity of trebuchet technology and the relative availability of materials.

What is missing to clearly discern the power of these engines and corroborate any theories regarding Henry's terminology is archaeological evidence. Artificial mounds excavated around Fellin have been identified as artillery platforms constructed during the siege of 1223;[68] while these suggest the use of counterweight trebuchets, what is missing thus far is datable projectiles. The mass of a projectile provides a good indication of whether it was thrown by traction trebuchet in an antipersonnel capacity or by a counterweight trebuchet in a more destructive manner. The former are typically no more than about 10 kg, allowing the pulling crew to accelerate the stone to around 30-35 m/s, while the latter are typically upwards of 20

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[67] For a discussion of prefabricated artillery, Michael S. Fulton, 'Development of Prefabricated Artillery,' *Journal of Medieval Military History* 13 (2015), pp. 51-72.
[68] Valter Lang and Heiki Valk, 'An Archaeological Reading of the Chronicle of Henry of Livonia: Events, Traces, Contexts and Interpretations,' in *Crusading and Chronicle Writing*, pp. 291-316 (pp. 296-301).

kg.[69] In the absence of such, there is little in Henry's descriptions to characterise the heaviest engines as breaching weapons. Although the great engine at Mesoten is portrayed as particularly powerful, neither it nor any other was responsible for opening an aperture that was subsequently stormed: they could damage wooden and even masonry ramparts but were not capable of smashing through the bulk of stone or earth walls.

Through his account of the early Christian campaigns in the Baltic, Henry of Livonia provides an insightful window into the spread of increasingly heavy artillery in the early thirteenth century. It seems likely that the counterweight trebuchet had reached the Baltic by the end of the second decade of the thirteenth century; however, Henry did not employ the new terminology that appears to have spread in the wake of the new technology. The vocabulary appears not to have reached Henry by the time he was writing in the mid-1220s, or he deliberately opted against its use. Accordingly, Henry appears to have used traditional terminology, as certain contemporaries elsewhere in Europe also did, to identify counterweight trebuchets and thus stands in the gap between the acceptance of the technology and the adoption of the terminology by which it came to be popularly identified. Henry seems to have attempted to differentiate between the more powerful counterweight trebuchets and traditional traction engines, although at no point did he utilise a clear and consistent lexicon. While a *machina maior*/*magna* may always have referred to a counterweight engine, so too may all *machinae* by the 1220s. The uncertainty that surrounds this terminological quagmire is likely to remain in the absence of archaeological evidence. Despite the enthusiasm shown for military affairs, Henry's chronicle reinforces the notion that there was little standardisation of artillery vocabulary in the works of medieval sources, let alone between various authors' sources.

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[69] Cf. Fulton, *Artillery in and around the Latin East*, pp. 169-99, 215-21, 229-37, 239-45, 252-59. For trials with a reconstructed trebuchet see W. T. S. Tarver, 'The Traction Trebuchet: A Reconstruction of an Early Medieval Siege Engine,' *Technology and Culture* 36-1 (Jan., 1995), pp. 136-67.

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