King James I the Conqueror and the artillery revolution of the Middle Ages

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The thirteenth century witnessed stunning change in nearly all aspects of Western life.[1] The great European rulers of this century —Emperor Frederick II Hohenstaufen (1194-1250), Louis IX of France (1214-1270), James I of Aragon-Catalonia (1208-1276), and Alfonso X el Sabio, or the Learned, of Castile (1221-1284)— were magnets of change and conduits of change to the wider world. To properly understand these innovative rulers and the world in which they lived requires an appreciation of the concentric circles of change that enveloped their reigns —in commerce, law, urban development, warfare, technology, exploration, religion, philosophy, education, science, literature, language, art, and architecture. These rulers were not simply the passive recipients and beneficiaries of change; they contributed to and accelerated the ongoing changes that were transforming the Latin West during the thirteenth century. The eighth centennial of the birthday of James I the Conqueror provides an opportunity to examine this transformative ruler within the concentric layers of change that convulsed the thirteenth century. One such layer of change was the artillery revolution of the Middle Ages.

Centuries before the development of effective cannons, heavy artillery was used to demolish fortifications with projectiles weighing hundreds of kilograms. The Big Bertha of the pre-modern era was the trebuchet. This formidable weapon dominated warfare far longer than any other form of artillery, yet it remains the least understood piece of military ordnance. It displaced the torsion artillery of the classical world and maintained its dominance until well after the coming of the cannon. Dramatic breakthroughs in the development of the trebuchet occurred during the thirteenth century, and King James took full advantage of these advances. His conquests of the Islamic provinces along the Mediterranean coast from the Balearic Islands down to Murcia employed the most powerful form of the trebuchet —the counterweight trebuchet— as well as the very powerful gravity-assisted, traction-powered trebuchet (*fenèvol*). Conquest laid the path for King James's achievements, but victory was won by the successful application of mechanized siegecraft and the use of heavy artillery (or the threat of it).

1. James Brundage, *Medieval Canon Law*, New York, 1995, p. 165.

The Trebuchet

During the Middle Ages, the dominant form of siege-artillery was the trebuchet.[2] It consisted of a long tapering beam that pivoted near its butt-end around an axle mounted on top of a framework. At the end of the long arm of the beam, a sling was attached which held the missile. This was designed to open when the beam's motion and position reached the desired state for discharge. To launch a projectile, the beam —equipped with pulling-ropes at its short end— was set in a horizontal position. The operator of the machine readied the machine for launch by placing a projectile in the pouch of the sling. The sling had two ropes: one attached firmly to the end of the beam and the other looped over an iron prong extending from the tip of the beam. The alignment of the prong and the length of the sling were crucial to achieving maximum range. Human muscle force was applied to the pulling-ropes by a team of men —or, in some cases, women— while the operator guided the missile through the initial phase of the launch cycle. When the operator released the sling, a sudden surge of power was imparted to the beam, as the maximum force exerted by the pulling-crew took full effect. This action propelled the throwing arm skyward and allowed the looped end of the sling to fly free, thus hurling the missile from the sling.

In later versions of the trebuchet a weight was added to the butt-end of the beam. This weight was first used to counterbalance the weight of the long arm of the beam at discharge when the sling was loaded with a heavy stone shot. The horizontal counterbalancing of the two arms of the beam was an ergonomic innovation in artillery design that greatly improved the efficiency of the human-powered trebuchet. The human energy required to hold the beam in place at discharge was greatly reduced, thereby allowing a greater amount of force to be exerted by the pulling crew to accelerate the beam. The great turning point in the evolution of the trebuchet came with the introduction of the counterweight machine that utilized gravity power alone to accelerate the beam. The counterweight trebuchet replaced the pulling crew with a gravitating mass that was either fixed rigidly to the butt-end of the beam or was articulated to the beam's end by means of a hinge in order to allow the counterweight to move freely.[3]

Trebuchets fall into three broad categories: (1) traction trebuchets, powered by crews pulling on ropes; (2) hybrid trebuchets, powered by crews that received a gravity assist; and, (3) counterweight

2. On this form of artillery, see Paul E. Chevedden, Les Eigenbrod, Vernard Foley, and Werner Soedel, «The Trebuchet: Recent Reconstructions and Computer Simulations reveal the Operating Principles of the Most Powerful Weapon of its Time», *Scientific American* (July 1995), pp. 66-71; Paul E. Chevedden, «Artillery in Late Antiquity: Prelude to the Middle Ages», in *The Medieval City under Siege*, ed. Ivy Corfis and Michael Wolfe, Woodbridge, UK, 1995, pp. 131-173; Paul E. Chevedden, «The Artillery of King James I the Conqueror», in *Iberia and the Mediterranean World of the Middle Ages: Essays in Honor of Robert I. Burns, S.J.*, ed. Paul E. Chevedden, Donald J. Kagay, and Paul G. Padilla, Leiden, 1996, pp. 47-94; Paul E. Chevedden, «The Hybrid Trebuchet: The Halfway Step to the Counterweight Trebuchet», in *On the Social Origins of Medieval Institutions: Essays in Honor of Joseph F. O'Callaghan*, ed. Donald J. Kagay and Theresa M. Vann, Leiden, 1998, pp. 179-222; Paul E. Chevedden, Zvi Shiller, Samuel R. Gilbert, and Donald J. Kagay, «The Traction Trebuchet: A Triumph of Four Civilizations», *Viator*, no. 31 (2000), pp. 433-486; Paul E. Chevedden, «Fortifications and the Development of Defensive Planning during the Crusader Period», in *The Circle of War in the Middle Ages*, ed. Donald J. Kagay and L. J. Andrew Villalon, Woodbridge, UK, 1999, pp. 33-43; Paul E. Chevedden, «The Invention of the Counterweight Trebuchet: A Study in Cultural Diffusion», *Dumbarton Oaks Papers*, no. 54 (2000), pp. 71-116; Paul E. Chevedden, «Une innovation militaire decisive», *Qantara*, no. 41 (Autumn 2001), pp. 50-55; Paul E. Chevedden, «Black Camels and Blazing Bolts: The Bolt-Projecting Trebuchet in the Mamluk Army», *Mamluk Studies Review*, no. 8/1 (2004), pp. 227-277.

3. An engineering analysis of the trebuchet that compares the principles of design and operation of traction-powered trebuchets with that of gravity-powered trebuchets is provided by Zvi Shiller, in Paul E. Chevedden *et al.*, «Traction Trebuchet», pp. 447-457.

trebuchets, powered by gravitational energy. The supporting framework for the axle of all three types of trebuchets adhered to two basic designs: (1) a pole framework; and, (2) a trestle framework. Pole-framed machines required either (1) a fork mount, or pivot yoke, that surmounted the pole frame and held a rotating axle upon which the beam pivoted, or (2) a forked beam, similar in shape to the letter Y, that pivoted at its bifurcated-end around an axle positioned atop a pole frame. Pole-framed machines needed less material to construct than trestle-framed ones and had the great advantage of being able to discharge stone-shot in any direction without requiring the framework to be repositioned. Both mounting systems of the pole-framed trebuchet —yoke or axle arrangement— enabled the machine to be aimed instantly in any required direction. Trestle-framed machines pivoted the beam on an axle supported by the two triangular trusses of the framework. They could only be aimed at a new target with great difficulty. To point such machines just a few degrees to the right or to the left required a change in position of the entire framework, which necessitated the expenditure of considerable labor. Although trestle-framed trebuchets were cumbersome and expensive, and were difficult to line up on a new target, they had the advantage of being sturdy and reliable.

Development and Diffusion of the Trebuchet

The invention of the trebuchet was a unique discovery that was diffused from a single center of origin. China developed this powerful form of artillery between the fifth and fourth centuries B.C.E. From China, the two fundamental types of trebuchets —the traction-powered, pole-framed machine and trestle-framed machine— spread westward.[4] The new ordnance reached the eastern Mediterranean

4. On the development and diffusion of the Chinese trebuchet, see Herbert Frankle, «Siege and Defense of Towns in Medieval China», in *Chinese Ways in Warfare*, ed. Frank A. Keirman, Jr. and John K. Fairbank, Cambridge (MA), 1974, pp. 151-201; Joseph Needham, «China's Trebuchets, Manned and Counterweighted», in *On Pre-Modern Technology and Science: Studies in Honor of Lynn White, Jr.*, ed. Bert S. Hall and Delno C. West, Malibu (CA), 1976, pp. 107-145; Sergei A. Shkoliar, «L'Artillerie de jet a l'époque Sung», in *Etudes Song: In memoriam Étienne Balazs*, série 1, *Histoire et institutions*, part 2, ed. Françoise Aubin, Paris, 1971, pp. 119-142; Sergei A. Shkoliar, *Kitaiskaia doognestrelnaia artilleriia: Materialy i issledovaniia*, Moscow, 1980; Robin D. S. Yates, «Siege Engines and Late Zhou Military Technology», in *Explorations in the History of Science and Technology in China*, ed. Li Guohao, Zhang Mehgwen, and Cao Tianqin, Shanghai, 1982, pp. 409-452, at pp. 414-419; Yang Hong (ed.), *Weapons of Ancient China* , New York, 1992; Joseph Needham and Robin D. S. Yates, *Science and Civilisation in China*, vol. 5, *Chemistry and Chemical Technology*, pt. 6, *Military Technology: Missiles and Sieges*, Cambridge (UK), 1994. The Chinese developed an elaborate nomenclature for the trebuchet to identify many different types of trebuchets, but they divided all of these types into two basic categories according to the configuration of the framework of the machine: (1) the pole-framed machine, called a «Whirlwind» trebuchet (*xuan feng pao*); and (2) the trestle-framed machine, called a «Four-footed» trebuchet (*si jiao pao*). Thus, a binary nomenclature for the trebuchet was born. As the traction trebuchet was diffused across Eurasia and North Africa, a binary terminology, based on the framework of the machine, was used by all who adopted the new artillery. In Arabic, for example, the pole-framed trebuchet was designated an *ʿarrādah*, and later a *luʿbah* («Plaything»); the trestle-framed trebuchet was called a *manjanīq*. The employment of the *ʿarrādah* and the *manjanīq* by Islamic armies during the period 632 to 945 is examined by Hugh Kennedy in *The Armies of the Caliphs: Military and Society in the Early Islamic State*, London, 2001, pp. 110-113, 133-136, 154, 155, 163, 184, 185, 189. In the Latin West, a variety of terms were used to refer to the trebuchet in both Latin and the European vernaculars, but a clear terminological dichotomy is evident prior to the introduction of gravity-powered artillery, based upon the configuration of the machine's framework. The most commonly used term to denote the pole-framed trebuchet was *manganellus* (mangonel), while the heavier trestle-framed machine was usually identified by the term *petraria* («rock-thrower»). Scholars who have examined the nomenclature for artillery have erroneously concluded that the diversity of terms may reflect differences in the size of the machine, in the weight of the projectile discharged from it, or even fundamental differences in the kind of artillery employed (e.g., tension, torsion, or traction). In the era of human-powered artillery, the terminology was related to the most obvious design feature of the machine: its framework. Even with the introduction of the hybrid machine, trebuchet terminology underwent no fundamental change, since this terminology was based on the configuration of the framework of the machine, a component that remained unchanged regardless of whether the

during the sixth century C.E. and rapidly displaced the heavy artillery of the classical world. Widespread diffusion of the new artillery throughout the Mediterranean and the Middle East followed. Arabia was familiar with the pole-framed and trestle-framed trebuchet prior to the rise of Islam, and, during the century following the death of Muḥammad in 632, the armies of the Prophet carried the new artillery from the Indus to the Atlantic in a ballooning movement of conquests.[5] These conquests spurred innovations in weaponry that led to the development of the hybrid trebuchet. The Byzantine Empire soon acquired this advanced piece of artillery, and by the second half of the ninth century it was being used in northern Europe.[6]

Another conquest movement, or more exactly an enterprise of reconquest, is likely to have led to the development of the counterweight trebuchet. In his efforts to reconquer Anatolia from the Saljuq Turks, Alexios I Komnenos (r. 1081-1118) constructed large trebuchets, referred to as ἑλεπόλεις (*helepoleis*, or «city-takers») of several types, «but most of them were fashioned according to an unprecedented design of his own devising which amazed everyone».[7] These machines were so innovative in design that the learned monk Euthymios Zigavēnos, a close associate of Alexios, ranked these engineering marvels with the works of Archimedes, the most famous inventor of ancient

trebuchet was a traction or hybrid model. This explains why only a few languages —Armenian, Syriac, Latin, French, and Oc— introduced new terms to identify the hybrid trebuchet. Arabic literary culture generally ignored the hybrid trebuchet, but Arabic oral culture did not. It was dubbed *al-ghaḍbān* («The Furious One»), and this term for the hybrid machine entered both Armenian and Turkish. For a discussion of the terminology of the trebuchet and its meaning, see Paul E. Chevedden, «Artillery of King James I», pp. 56-76; Paul E. Chevedden, «Hybrid Trebuchet», pp. 182, 198-212; Paul E. Chevedden, «Invention of the Counterweight Trebuchet», pp. 71-116; Paul E. Chevedden *et al.*, «Traction Trebuchet», pp. 433-486, esp. 452 (Table 3), 460-461, 474-484.

5. On the development and diffusion of the trebuchet outside of China, the following studies are of fundamental importance: Guillaume Dufour, *Mémoire sur l'artillerie des anciens et sur celle du Moyen Âge*, Paris, 1840, pp. 87-112; Louis-Napoléon Bonaparte, *Études sur le passé et l'avenir de l'artillerie*, 6 vols., Paris, 1846, vol. 2, pp. 26-61; Eugène-Emmanuel Viollet-le-Duc, *Dictionnaire raisonné de l'architecture du XI^e^ au XVI^e^ siècles*, 10 vols., Paris, 1854-1868, vol. 5, pp. 218-242; Alwin Schultz, *Das höfische Leben zur Zeit der Minnesinger*, 2 vols., Leipzig, 1889, vol. 2, pp. 363-393; Gustav Köhler, *Die Entwickelung des Kriegswesens und der Kriegführung in der Ritterzeit von Mitte des II. Jahrhunderts bis zu den Hussitenkriegen*, 3 vols. Breslau, 1886-1889, vol. 3, pp. 139-211; Sir Ralph Payne-Gallwey, *The Crossbow, Mediaeval and Modern, Military and Sporting: Its Construction, History and Management, with a Treatise on the Balista and Catapult of the Ancients*, London, 1903; Rudolf Schneider, *Die Artillerie des Mittelalters*, Berlin, 1910; Marco Polo, *The Book of Ser Marco Polo, the Venetian, Concerning the Kingdoms and Marvels of the East*, 3d ed., trans. and ed. Colonel Sir Henry Yule, 3 vols., London, 1926, vol. 2, pp. 161-169; Bernhard Rathgen, *Das Geschütz im Mittelalter*, Berlin, 1928; reprint, Düsseldorf, 1987, pp. 578-638; Kalervo Huuri, «Zur Geschichte des mittelalterlichen Geschützwesens aus orientalischen Quellen», in *Studia Orientalia (Societas Orientalia Fennica)*, no. 9/3, Helsinski, 1941; Claude Cahen, «Un traité d'armurerie pour Saladin», *Bulletin d'études orientales*, no. 12 (1947-1948), pp. 103-163; José Frederico Finó, «Machines de jet médiévales», *Gladius*, no. 10 (1972), pp. 25-43; José Frederico Finó, *Forteresses de la France médiévale: construction, attaque, défense*, 3d ed., Paris, 1977, pp. 149-163; Donald R. Hill, «Trebuchets», *Viator*, no. 4 (1973), pp. 99-115; Carroll M. Gillmor, «The Introduction of the Traction Trebuchet into the Latin West», *Viator*, no. 12 (1981), pp. 1-8; D. J. Cathcart King, «The Trebuchet and other Siege-Engines», *Chateau Gaillard*, nos. 9-10 (1982), pp. 457-469; Randall Rogers, «The Problem of Artillery», Appendix III of *Latin Siege Warfare in the Twelfth Century*, Oxford, 1992, pp. 254-273; Peter Vemming Hansen, «Experimental Reconstruction of a Medieval Trébuchet», *Acta Archaeologica*, no. 63 (1992), pp. 189-208; Paul E. Chevedden *et al.*, «Trebuchet»; Paul E. Chevedden, «Artillery of King James I»; Paul E. Chevedden, «Hybrid Trebuchet»; Paul E. Chevedden *et al.*, «Traction Trebuchet»; Paul E. Chevedden, «Fortifications and the Development of Defensive Planning»; Paul E. Chevedden, «Invention of the Counterweight Trebuchet»; Paul E. Chevedden, «Une innovation militaire decisive»; Paul E. Chevedden, «Black Camels»; George T. Dennis, «Byzantine Heavy Artillery: The *Helepolis*», *Greek, Roman and Byzantine Studies*, no. 39 (1998), pp. 99-115.

6. On the development and diffusion of the hybrid trebuchet, see Paul E. Chevedden, «Hybrid Trebuchet»; and Paul E. Chevedden *et al.*, «Traction Trebuchet».

7. Anna Komnena, *Alexiade: Règne de l'empereur Alexis I Comnène (1081-1118)*, 3 vols., ed. and trans. Bernard Leib, Collection byzantine publiée sous le patronage de l'Association Guillaume Budé, Paris, 1937-1945, 11.2.1.

Greece.[8] This suggests that an important breakthrough in the design and construction of the trebuchet was achieved at Nicaea. Given the imminent appearance of gravity-powered artillery, this breakthrough is most likely to have been the development of the first counterweight trebuchet.[9] The Byzantine emperor supplied the new artillery to the Latin Crusaders in 1097 to aid in the conquest of Nicaea in western Anatolia. During the twelfth century, the dynamics of conflict and contact quickly diffused the counterweight trebuchet throughout the Mediterranean and the Middle East. New terms arose to identify the machine that had started the gravity-powered revolution in artillery —the trestle-framed, counterweight trebuchet. Arabic sources designated it a «big» trebuchet (*manjanīq kabīr*), a «great» trebuchet (*manjanīq ʿazīm*), or as a «huge» or «frightful» trebuchet (*manjanīq hāʾil*). During the thirteenth century, it was given a new Arabic name, the «Western Islamic» trebuchet (*manjanīq maghribī* or *manjanīq gharbī*), perhaps reflecting a design improvement.[10] Syriac sources named the machine a «great» trebuchet (*manganīqē rawrbē*), and a Greek source called it a «great siege-engine» (μηγάλη μηχανή, *megalē mēkhanē*). In the Latin West, the new artillery was designated by the term «trebuchet», a diminutive form derived from the medieval Latin word *trabuc[h]us*. The term first appeared as *trabuchellus* in 1189, and a decade later *trabuchus* entered the record.[11] Today the term «trebuchet» is used to refer to the entire class of artillery that draws its energy from a beam pivoted around an axle.

8. Euthymios ZIGAVĒNOS, *Panoplia dogmatikē*, in *Patrologiae cursus completus, Series graeca*, ed. J.-P. Migne, 161 vols. in 166 pts., Paris, 1857-1866, vol. 130, col. 20. On the introduction of the counterweight trebuchet, see Paul E. CHEVEDDEN, «Invention of the Counterweight Trebuchet».

9. Others disagree; cf. Ronnie ELLENBLUM, *Crusader Castles and Modern Histories*, Cambridge (UK), 2007, pp. 194, 210, which rejects this conclusion and instead maintains that the «first use of a counterweight trebuchet» was at the second Crusader siege of Tyre in 1124. Since the counterweight trebuchet was first identified by a new terminology at this siege, there is no doubt that it was employed there, but this fact hardly indicates that the 1124 siege of Tyre saw the «first use of a counterweight trebuchet». In the pre-modern era, a new technology commonly received its nomenclature only after that technology had come into active existence and was utilized on a regular basis. See Paul E. CHEVEDDEN, «Invention of the Counterweight Trebuchet», p. 106: «the counterweight trebuchet was probably not recognized by the new nomenclature until it had evolved to a certain stage of development and was employed on a regular basis. One would scarcely expect a distinct nomenclature for the machine to develop when it was still new and unfamiliar. Thus, the first occurrence of a new name for the counterweight trebuchet probably does not signal the date of the introduction of the machine. The counterweight trebuchet doubtless emerged prior to the use of new terms to denote it.»

10. On the *manjanīq maghribī/gharbī*, a gravity-powered, trestle-framed trebuchet with a hinged counterweight, see Najm al-Dīn Ayyūb AḤDAB AL-RAMMĀḤ, *al-Furūsīyah wa-al-Manāṣib al-Ḥarbīyah: al-Barūd, al-Nīrān al-Ḥarbīyah, al-Taqṭīr, al-Nīranjāt*, ed. Aḥmad Yūsuf al-Ḥasan, Maṣādir wa-Dirāsāt fī Taʾrīkh al-ʿUlūm al-Taṭbīqīyah, vol. 8, Aleppo, 1998, p. 118, fig. 71; Paul E. CHEVEDDEN, «Artillery of King James I», pp. 62-63, figs. 7-9; Paul E. CHEVEDDEN, «Invention of the Counterweight Trebuchet», p. 106, fig. 3; Paul E. CHEVEDDEN, «Black Camels», pp. 231, 244. Since the *manjanīq maghribī* had a hinged counterweight, it is likely that the feature that distinguished it from earlier counterweight trebuchets was the hinged counterweight box or a new method for hanging the counterweight box with a hinge. It should be noted that the earliest extant illustration of a gravity-powered trebuchet, the double-purpose machine described and illustrated by al-Ṭarsūsī, had a «hinged» counterweight consisting of a rope sack filled with stones held by three strong cords. Murḍī ibn ʿAlī ibn Murḍī AL-ṬARSŪSĪ (d. 589/1193), *Tabṣirat Arbāb al-Albāb fī Kayfīyat al-Najāh fī al-Ḥurūb min al-Aswāʾ wa-Nashr Aʿlām al-Iʿlām fī al-ʿUdad wa-al-Ālāt al-Muʿīnah ʿalá Liqāʾ al-Aʿdāʾ* (Instruction of the Masters on the Means of Deliverance in Wars from Disasters, and the Unfurling of the Banners of Information: Equipment and Engines that Aid in Encounters with Enemies), Bodleian Library, MS Hunt. 264, fols. 133*v*-135*r* (hereafter cited as *Tabṣirah fī al-Ḥurūb*); AL-ṬARSŪSĪ, *Tabṣirah fī al-Ḥurūb*, Süleymaniye Library MS Ayasofya 2848 mü, fols. 100*r*-102*r*; AL-ṬARSŪSĪ, *Mawsūʿat al-Asliḥah al-Qadīmah: al-Mawsūm Tabṣirat Arbāb al-Albāb fī Kayfīyat al-Najāh fī al-Ḥurūb min al-Anwāʾ* [sic] *wa-Nashr Aʿlām al-Aʿlām* [sic] *fī al-ʿUdad wa-al-Alāt* [sic] *al-Muʿayyanah* [sic] *ʿalá Liqāʾ al-Aʿdāʾ*, ed. Kārīn Ṣādir, Beirut, 1998, pp. 168-169, 256-257 (fig. 12); Claude CAHEN, «Traité», pp. 119, 120, pl. 3, fig. 14; Paul E. CHEVEDDEN, «Invention of the Counterweight Trebuchet», pp. 87-90, 115-116, fig. 1.

11. For a discussion of the nomenclature of the counterweight trebuchet, see Paul E. CHEVEDDEN, «Artillery of King James I», pp. 61-63, 68-76; Paul E. CHEVEDDEN, «Invention of the Counterweight Trebuchet»; Paul E. CHEVEDDEN, «Black Camels», pp. 229-238, 242-244; George T. DENNIS, «Byzantine Heavy Artillery».

By the end of the twelfth century the diversification of the counterweight trebuchet into different forms had begun. In the Latin West, a pole-framed machine was introduced that had a bifurcated beam with two counterweights suspended from its fork arms. Its pivoting shaft and paired counterweights earned it its name, the *bricola*, or the «Two-Testicle» machine, from the combination of the prefix *bi-*, «having two», and the Latin *coleus*, meaning testicle (Fr. *bricole*, It. *brìccola*, Oc. *bricola*, Catal. *brigola*, Cast. *brigola*, late L. *bric[c]ola*, Gk. *praikoula* or *prekoula*). The *bricola* required fewer structural components than the trestle-framed trebuchet and was far easier to turn than the trestle-framed trebuchet in order to adjust the direction of the missile discharged from it. This ingenious machine originated in the western Mediterranean basin, a creation most likely of the Normans of Sicily, who employed these «newly invented» engines at their siege of Thessalonica in 1185.[12] In 1242, Emperor Frederick II of Hohenstaufen sent *bricolae* to the Levant, and soon thereafter (post 1250) the Mamluks incorporated this versatile piece of artillery into their siege arsenal, calling it the «Frankish» or «European» trebuchet (*manjanīq ifranjī* or *manjanīq firanjī*). Muslim engineers employed by the Mongols brought the *bricola* to China, where it was designated the «Muslim» trebuchet (*hui-hui pao*). Batteries of *bricolae* (sing. *manjanīq firangī*) rained destruction on the cities of Fancheng (1272) and Xiangyang (1273), on the Han River in northwest Hubei province, and broke the power of the Song Empire (960-1279). On the high seas, the *bricola* was mounted on the poops of ships and was used to bombard coastal cities and fortresses.[13]

12. Eustathios, Archbishop of Thessalonica, *Eustathios of Thessaloniki, The Capture of Thessaloniki*, trans. John R. Melville Jones, Canberra, 1987, pp. 72-99; Paul E. Chevedden, «Invention of the Counterweight Trebuchet», pp. 94-95, 109-110, fig. 5; Paul E. Chevedden, «Black Camels», pp. 232-233, 244, 245, 247, 252, 255, 257-259, 271, fig. 6.

13. On Frederick II's dispatch of *bricolae* to the Levant, see Caffaro, *Annali genovesi di Caffaro e de'suoi continuatori*, 5 vols., ed. Luigi T. Belgrano and Cesare Imperiale di Sant'Angelo, Fonti per la storia d'Italia pubblicate dall'Istituto storico italiano, Scrittori, Secoli XII e XIII, nos. 11-14 bis, Rome, 1890-1929, vol. 3, p. 128: «Et cum inimici mari et terra cum machinis, prederiis [= *petrariis*], bricolis, scalis et aliis hedifficiis eorum infortunio ad locum Levanti pervenissent.» On the Muslim engineers who brought the *bricola* to China and the role these machines played in forcing the surrenders of Fancheng in 1272 and Xiangyang in 1273, see Rashīd al-Dīn Faḍl Allāh Ṭabīb, *Jāmiᶜ al-Tavārīkh*, ed. Bahman Karīmī, 2 vols., Tehran1338/1959, vol. 1, pp. 651-652; Rashīd al-Dīn Ṭabīb, *Jāmiᶜ al-Tavārīkh*, trans. John Andrew Boyle, *The Successors of Genghis Khan*, New York, 1971, pp. 290-291; Arthur C. Moule, *Quinsai: With Other Notes on Marco Polo*, Cambridge (UK), 1957, pp. 70-78. Both Rashīd al-Dīn (1247?-1318) and Chinese historian Cheng Ssu-hsiao (1206-1283) provide details on the heavy artillery used at the sieges of Fancheng and Xiangyang (modern-day Xiangfan). Rashīd al-Dīn identifies the most powerful pieces of artillery as «European» trebuchets (sing. *manjanīq firangī*), or *bricola*s (*Jāmiᶜ al-Tavārīkh*, vol. 1, p. 651; *The Successors of Genghis Khan*, p. 290), and Cheng, who calls the machines «Muslim» trebuchets (*hui-hui pao*), indicates that, «in the case of the largest ones, the wooden framework stood above a hole in the ground» (quoted in Joseph Needham and Robin D. S. Yates, *Science and Civilisation in China*, vol. 5, pt. 6, p. 221). Since the *bricola* was the only counterweight piece of artillery that had a framework capable of being set up by using a posthole, there is little doubt that Cheng is referring here to the *bricola*. The stone-shot launched by these machines weighed 150 *jin*, or 94.5 kilograms (208 lb) (Arthur C. Moule, *Quinsai*, p. 76), and Cheng states that, «the projectiles were several feet in diameter, and when they fell to the earth they made a hole three of four feet deep. When [the artillerists] wanted to hurl them to a great range, they added weight [to the counterpoise] and set it further back [on the arm]; when they needed only a shorter distance, they set it forward, nearer [the fulcrum]» (Joseph Needham and Robin D. S. Yates, *Science and Civilisation in China*, vol. 5, pt. 6, p. 221). The Castilian fleet under Pedro the Cruel attacked Barcelona on 11 June 1359 with *bricolae* mounted on the poops of their galleys. Peter IV of Aragon (III in Catalonia), *Crònica de Pere el Cerimoniós*, in *Les quatre grans cròniques: Jaume I, Bernat Desclot, Ramon Muntaner, Pere III*, ed. Ferran Soldevila, Biblioteca perenne, vol. 26, Barcelona, 1971, 6.24. For more information on the *bricola* and the *manjanīq ifranjī/firanjī*, see Paul E. Chevedden, «Artillery of King James I», pp. 62-63, 68, 71-76, 79, 84, fig. 11; Paul E. Chevedden, «Invention of the Counterweight Trebuchet», pp. 102-103, 106-110, fig. 5; Yūsuf ibn Urunbughā al-Zaradkāsh, *Kitāb Anīq fī al-manājanīq*, Topkapı Sarayı Müzesi Kütüphanesi, Ahmet III Collection, MS 3469/1, fols. 20*r*, 22*r*; Yūsuf ibn Urunbughā al-Zaradkāsh, *al-Anīq fī al-manājīq*, ed. Nabīl Muḥammad ᶜAbd al-ᶜAzīz, Cairo, 1981, pp. 47, 51; Yūsuf ibn Urunbughā al-Zaradkāsh, *al-Anīq fī al-manājanīq*, ed. Iḥsān Hindī, Maṣādir wa-Dirāsāt fī Taʾrīkh al-Taknūlūjiyā al-ᶜArabīyah, vol. 4, Aleppo, 1985, pp. 97-98.

Human ingenuity and engineering skill combined to produce another type of gravity-powered trebuchet during the thirteenth century, the «Black Camel» trebuchet (*manjanīq qarābughrā*). This new machine extended the capabilities of the trebuchet enormously; it enabled the machine to do what it had never done before: discharge immense bolts. This machine was invented in the eastern realms of Islam and was diffused westward over the course of the thirteenth century. Its use by the Mamluks at the siege of Acre in 1291 is likely to have inspired Europeans to incorporate it into their siege arsenal. The great architect-engineers of the Renaissance devoted attention to the bolt-projecting trebuchet and provide evidence of its use in Europe.[14]

King James and his Artillery

In his capacity as chief architect of the conquest of *Sharq al-Andalus*, or Eastern Islamic Spain, King James could draw upon a formidable military technology to achieve his ambition. James proved himself to be a master of siege warfare and a skilled artillerist. His fascination and experience with artillery can be seen in his earliest military operations —the sieges of Albero de Suso and Lizana— when he was about ten years of age. To attack these two castles he transported to each stronghold a piece of artillery (*fenèvol*) that he had made at Huesca. After two consecutive days of artillery bombardment, the castle and town of Albero de Suso surrendered. Following this quick victory, James advanced on Lizana where he supervised the setting up of his *fenèvol*. Once the machine was readied for action, a murderous bombardment commenced with 500 stones discharged during the first night and a thousand more the next day. James's account of the siege is especially focused on the operation and destructive effects of his *fenèvol*. He relates that at about the time of vespers on the first full day of bombardment the *fenèvol* had made a great breach in the wall. While he describes the subsequent infantry assault on the breach, James is still attentive to the action of his machine, saying that it continued to discharge stones that wounded many of the enemy. As the *fenèvol* destroyed the wall, the governor of the castle, Don Pedro Gómez, leapt into the breach to stop the coming infantry assault. Because the incessant artillery bombardment had dislodged so much earth from the wall, he was buried up to his knees in dust and debris. When the final assault came, he was so anchored in place that he was unable to defend the breach, and the castle and easily taken.[15]

King James took more than just a military interest in artillery. As instruments of great power, artillery was understood intuitively as a visual symbol of power. The sword had been the symbol of kings. Now, as the artillery revolution transformed warfare across Eurasia and North Africa, rulers favored deadlier and more scientific weapons. James's contemporaries easily grasped the message communicated by such deadly instruments, and James made every effort to closely associated himself with artillery.[16] He supervised the placement of artillery in siege operations, and even took direct charge of the shooting of a trebuchet (*fenèvol*) during a siege when the operator of the machine had

14. Paul E. Chevedden, «Black Camels».

15. James I, count and king, Realms of Aragon, *Llibre dels fets del rei En Jaume*, ed. Jordi Bruguera, 2 vols., Barcelona, 1991, ch. 15.

16. Robert I. Burns, «The Spiritual Life of James the Conqueror, King of Arago-Catalonia (1208-1276): Portrait and Self-Portrait», *Catholic Historical Review*, no. 62 (January 1976), pp. 1-35, at p. 33. Luis Monreal y Tejada also has observed the lexicographical richness of King James's memoirs with regard to artillery and the descriptive force of his accounts dealing with artillery. This evidence, he concludes, indicates that James had a technician's acquaintance with the artillery of his day. Luis Monreal y Tejada, *Ingeniería militar en las crónicas catalanas*, Discurso de Ingreso en la Real Academia de Buenas Letras, Barcelona, 1971, p. 10.

missed his intended target, an enemy counterweight trebuchet (*brigola*). King James boastfully relates that he hit the *brigola* on the first shot and put it out of action.[17] King James was intimately familiar with the construction and operation of trebuchets, and he provides a great deal of descriptive information on these machines throughout his memoirs. This information can be used to identify the structural differences between the different types of trebuchets that King James employed in his many sieges, as well as to evaluate the power and capabilities of these machines and determine their importance in siege operations. Earlier attempts to identify the structural differences between the different pieces of artillery used by James have only been partially successful.[18] Because of this, all past efforts to present an overall view of siege warfare in the realms of Aragon during the thirteenth century have been seriously flawed, including my own.

With loving attention to the details of war, King James specifies by name more types of artillery than any other medieval European chronicler. The eight machines that he names are the *fenèvol*, *algarrada*, *almajanech*, *manganel*, *manganel turquès*, *trabuquet*, *brigola*, and *geny*. The *fenèvol*, *algarrada*, *almajanech*, *manganel*, and *manganel turquès* are most likely all traction-powered trebuchets.[19] The

17. James I, *Llibre dels fets*, chs. 460 and 461.

18. For earlier attempts to identify the artillery used by King James, see John Forster (trans.), *The Chronicle of James I, King of Aragon, Surnamed the Conqueror (Written by Himself)*, 2 vols., London, 1883, vol. 1, pp. 26, n. 1, 29, n. 1, 139, n. 1, 307, n. 2; vol. 2, p. 525, n. 1; Pascual de Gayangos, «Siege Engines in the Thirteenth Century», Appendix A of *The Chronicle of James I, King of Aragon, Surnamed the Conqueror (Written by Himself)*, trans. John Forster, 2 vols., London, 1883, vol. 2, pp. 679-681; F. Darwin Swift, *The Life and Times of James the First, the Conqueror*, Oxford, 1894, p. 273; Joseph Goday y Casals, «Medis d'atach y de defensa en la Crònica del Rey D. Jaume», in *Congrés d'historia de la corona d'Aragó, dedicat al rey En Jaume I y a la seua época*, 2 vols., Barcelona, 1909-1913, vol. 2, pp. 799-810; Wilhelm Giese, «Waffen nach den katalanischen Chroniken des XII. Jahrhunderts», *Volkstum und Kultur der Romanen*, no. 1 (1928), pp. 140-182; Wilhelm Giese, «Altprov. *algarrada*», in *Verba et Vocabula*, ed. Helmut Stimm and Julius Wilhelm, Munich, 1968, pp. 251-254; Wilhelm Giese, «Waffen der Araber und Türken in katalanischen Texten des XIII bis XV Jahrhunderts», *Estudis universitaris catalans*, no. 23 (1979), pp. 237-241; Feran Soldevila (ed.), *Llibre dels feits*, in *Les quatre grans cròniques: Jaume I, Bernat Desclot, Ramon Muntaner, Pere III*, Biblioteca perenne, vol. 26, Barcelona, 1971, ch. 15, n. 9, ch. 16, n. 5, ch. 69, nn. 3, 4, and 7, ch. 460, nn. 4 and 11, and ch. 461, nn. 4 and 7; Luis Monreal y Tejada, *Ingeniería militar en las crónicas catalanas*, pp. 10, 13, 18-25; Jordi Bruguera, «Vocabulari militar de la Crònica de Jaume I», *Estudis de llengua i literatura catalanes*, no. 1 (1980), pp. 39-64; Ada Bruhn de Hoffmeyer, *Arms and Armour in Spain: A Short Survey*, vol. 2, *From the End of the 12th Century to the Beginnings of the 15th Century*, Madrid, 1982, pp. 100-114; Paul D. Humphries, «'Of Arms and Men': Siege and Battle Tactics in the Catalan Grand Chronicles (1208-1387)», *Military Affairs*, no. 49 (October 1985), pp. 173-178; Paul E. Chevedden, «Artillery of King James I».

19. The term *fenèvol* is derived from the Latin term *fundibulum*. Jordi Bruguera, «Vocabulari», p. 53, points out that the only medieval chronicle to utilize this term is James's. In his *Libre de Contemplació en Deu*, vol. 6, escr. a Mallorca y transl. d arabic en romanç vulgar de vers 1 any 1272, transcr. dir. ab facs. y variants dels més vells mss. per Salvador Galmés, Palma de Mallorca, 1913, p. 46 (ch. 273.73), Ramon Lull contrasts the more powerful counterweight *trabuquet* with the *fonèvol*. According to Joseph Goday y Casals, «Medis d'atach», p. 804, the *fenèvol* and *almajànec* were torsion machines. The *manganel* has been identified as a counterweight trebuchet (Luis Monreal y Tejada, *Ingeniería militar en las crónicas catalanas*, p. 19) and as a trestle-framed counterweight trebuchet having a fixed counterweight (Joseph Goday y Casals, «Medis d'atach», p. 803; Antoni M. Alcover, Francesc de B. Moll, Manuel Sanchis Guarner, and Anna Moll Marquès [eds.], *Diccionari català-valencià-balear, inventari lexicogràfic i etimològic de la llengua catalana en totes les seves formes literàries i dialectals, recollides de documents i textos*, 10 vols. [Palma de Mallorca, 1930-1962], vol. 7, p. 198 [hereafter cited as *DCVB*]; Jordi Bruguera, «Vocabulari», p. 54). The *fenèvol* has also been identified as a counterweight trebuchet (*DCVB*, vol. 5, p. 957; Feran Soldevila [ed.], *Llibre dels feits*, p. 198, n. 9; Luis Monreal y Tejada, *Ingeniería militar en las crónicas catalanas*, p. 19; and Jordi Bruguera, «Vocabulari», pp. 52-53). Ada Bruhn de Hoffmeyer, *Arms and Armour in Spain*, p. 109, claims that the «*fonèvol* apparently is identical with the *almajenech* or *manganell*», but she neglects to describe how any of these machines are structured. She identifies the «*almanganiq*» as «a larger size of the *algarrada*» (*Arms and Armour in Spain*, p. 106), but since she is unclear about the structure of these machines (see below, n. 21), there is no way to extrapolate from them any general view regarding the design of the *fenèvol*. Wilhelm Giese, «Waffen nach den katalanischen Chroniken des XII. Jahrhunderts», p. 146 and n. 228, correctly identifies the *fenèvol* as a traction machine. Forster, Soldevila, and Monreal y Tejada consider the *fenèvol*, *almajanech*, and *manganel* to be essentially identical (John Forster [trans.], *The Chronicle of James I*, vol. 1, p. 29, n. 1; Feran Soldevila

trabuquet and *brigola* are counterweight trebuchets. The word *geny* (also *geyn, gey, giny*, and *gyn*) appears to be a generic term for all types of trebuchets.[20]

By examining the structural details that James provides for some of these machines and by using Arabic sources to identify those machines that are referred to by Arabic loan-words, we may be able to make some sense of James's inventory of artillery. The *algarrada* (also *algarreda* and *alcarrada*) is perhaps the easiest piece of artillery to identify. The Catalan term is derived from the Arabic *ʿarrādah*, which refers to the light pole-framed traction trebuchet.[21] There is no doubt that this machine is a pivoting-beam engine, since James remarks that during the siege of Almàssera (Cast., Almazara) in 1240, the Christians found a pivoting beam (*pertxa*) that the Muslims had cut to make an *algarrada*.[22] James mentions the *algarrada* as being used by Muslims in the defense of Majorca city[23] and Burriana.[24] Since these machines were used to support the defense of these two cities, they were most probably positioned on the platforms of the towers or on the wall walk, so that they would achieve greater range. At Majorca city, James tells us that one of the Muslim *algarrades* shot deep into the Christian camp. This machine was also used in offensive operations. James employed an unspecified number

[ed.], *Llibre dels feits*, ch. 16, n. 5; Luis MONREAL Y TEJADA, *Ingeniería militar en las crónicas catalanas*, pp. 13, 19). For Forster, they are torsion machines, and for Soldevila and Monreal y Tejada, counterweight trebuchets. P. D. Humphries's description of King James's artillery is confused. The *algarrada, fenèvol*, *almajanech*, *manganel*, *trabuquet*, and *brigola* are all identified as being «variations of a basic standard type of machine which employed a throwing arm drawn down against torsion tension», but the *trabuquet* is also defined as «a more sophisticated type of engine that employed counterweight tension» (Paul D. HUMPHRIES, «Of Arms and Men», p. 176).

20. JAMES I, *Llibre dels fets*, 69.13, 69.22, 69.47, 73.13, 82.6, 126.4, 193.17, 193.19, 194.9, 194.16, 195.13, 261.7, 261.11, 261.11, 262.6, 265.21, 269.3, 429.9, 461.3, 482.7.

21. Forster and de Gayangos classify all of the artillery mentioned in James's chronicle as «nevroballistic». No structural description is given of any of the artillery; only the derivation of «nevroballistic» is provided: «from *nevron* (cord) and *balló* (I throw)» (John FORSTER [trans.], *The Chronicle of James I*, vol. 1, p. 139, n. 1; Pascual de GAYANGOS, «Siege Engines in the Thirteenth Century», p. 679). Forster adds that the distinction between all of these machines «appears to have consisted principally in their size and the weight of the stones they threw. Possibly there was some difference in the way of stretching and discharging them» (John FORSTER [trans.], *The Chronicle of James I*, vol. 1, p. 139, n. 1). Since νευρα (*nevra*) is used in Greek to refer to the sinew-rope of the springs of torsion catapults or the bowstring of these machines, both Forster and de Gayangos seem to imply that all the artillery cited by James were torsion powered. F. Darwin Swift, in his biography of James I, *The Life and Times of James the First*, pp. 273-274, likewise uses the term «nevrobalistic» to describe all artillery mentioned by King James, even those machines which he considers to be gravity-powered: the trebuchet, *fenèvol*, and *manganell*. He describes the *algarrada* as a machine powered by both tension and human energy. Several works identify the *algarrada* as «a kind of *manganell*», which in turn is described as a counterweight trebuchet (Jordi BRUGUERA, «Vocabulari», p. 50; *DCVB*, vol. 1, p. 487). Giese contends that the *algarrada* was a huge engine, analogous to the *trabuquet*, which utilized a counterweight to launch missiles (Wilhelm GIESE, «Altprov. *algarrada*», p. 251). Monreal y Tejada likewise believes that the *algarrada* was a counterweight trebuchet. He suggests that it was a light machine that could be easily set up. He also believes that it discharged its missiles in a flat trajectory and could be operated without a sling (Luis MONREAL Y TEJADA, *Ingeniería militar en las crónicas catalanas*, pp. 13, 21). Bruhn de Hoffmeyer states that the *algarrada* «usually signified the light stone-thrower and very probably of the old type with pulling ropes and man [sic]. ... The *algarrada* probably is the engine represented in the manuscript of Petrus de Eboli, in Stadt. Bibl. Bern and in the famous manuscript of Matthew Paris from about 1250 in Pierpont Morgan Library, New York, in a Biblical scene» (Ada BRUHN DE HOFFMEYER, *Arms and Armour in Spain*, p. 106). The machine illustrated in Peter of Eboli's manuscript is a pole-framed traction trebuchet (*Liber ad honorem Augusti*, fol. 109*r*, MS 120, Burgerbibliotek, Bern), but the other manuscript mentioned by Bruhn de Hoffmeyer is incorrectly cited. This is not a manuscript of Matthew Paris, but the Morgan Crusader Bible of King Louis IX (1214-1270) produced in Paris around 1250, in the Pierpont Morgan Library in New York (MS M.638). On fols. 23*v* and 43*v* of this manuscript two trestle-framed traction trebuchets are depicted.

22. JAMES I, *Llibre dels fets*, 191.14 (*algarreda*). The Catalan term *pertxa* is used to denote the pivoting beam of a trebuchet (*Llibre dels fets*, 191.13, 191.15, 461.7, 461.13, 462.6; PETER IV, *Crònica de Pere el Cerimoniós*, ch. 134).

23. JAMES I, *Llibre dels fets*, 69.15, 69.16, 69.28.

24. JAMES I, *Llibre dels fets*, 159.7, 159.9, 160.7, 160.16, 162.3, 162.13, 163.5, 163.8.

of *algarrades* at his siege of Majorca city,[25] and al-Azraq used *algarrades* in his abortive siege of Peñacadel or Benicadell castle.[26]

The *almajanech* (also *almagenech* and *almanjanech*), like *algarrada*, comes from Arabic. The Arabic term *manjanīq* (pl. *majāniq, manājīq, manājanīq,* and *majanīqāt*) refers to a trestle-framed trebuchet,[27] so it is quite likely that James's *almajanech* does as well. James cites this machine as being used ten times in six siege operations,[28] but he provides no structural details. At the siege of Majorca city in 1229, James recalls that he had the head of a Muslim leader put into the sling (*fonda*) of an *almajanech* and launched into the town, so there is no doubt that this machine is a trebuchet.[29] James sometimes uses the term *almajanech* interchangeably with *fenèvol*, suggesting that there is little or no difference between these machines.[30] If the *almajanech* and the *fenèvol* are indeed the same machine, the use of the Arabic term, *almajanech*, to designate this siege engine may indicate that it is of Islamic design. If so, this machine may correspond to the «Arab» trebuchet, described and illustrated in the famous military treatise written for Saladin in 1187 by Murḍī ibn ʿAlī ibn Murḍī al-Ṭarsūsī.[31] On the other hand, various models of traction trebuchets were used during the Middle Ages, and it would not be odd for military engineers or chroniclers to distinguish between them, as al-Ṭarsūsī does.

The *manganel* (or *almanganel*) is a mystery. James cites this machine as being used in one siege (Burriana),[32] but provides no details on it. The *manganel* may either be a generic term for any type of trestle-framed traction trebuchet, or be a specific model of this type of machine. If the later, then it may be identical with al-Ṭarsūsī's «Christian» or «Frankish» trebuchet.[33] The *manganel turquès* appears only once in James's memoirs, at the siege of Majorca city,[34] but again James is silent on structural particulars. However, there is good reason to suggest that James's *manganel turquès* is al-Ṭarsūsī's «Persian» or «Turkish» trebuchet, since the designation is the same.[35]

The *fenèvol* was the most widely used of all of James's artillery. James refers to this machine sixty-two times in his memoirs, and he speaks of it as being employed in sixteen siege operations, including Majorca city (Palma de Mallorca) (1229), Burriana (1233), Valencia (1238), and Biar (1244-45).[36]

25. James I, *Llibre dels fets*, 69.5 (*alcarrades*).

26. James I, *Llibre dels fets*, 370.3.

27. On the Arabic term *manjanīq* denoting a trestle-framed trebuchet, see Paul E. Chevedden, «Artillery of King James I», pp. 59-61.

28. James I, *Llibre dels fets*, 16.6, 16.28, 28.22, 29.1, 69.3, 70.19, 200.12 (*almagenech*), 311.4. It is twice cited in a discussion of a possible siege of Alhama: *Llibre dels fets*, 429.15 (*almagenech*), 430.5 (*almagenech*).

29. James I, *Llibre dels fets*, 70.19.

30. James I, *Llibre dels fets*, 16.8, 16.32, 16.37, 202.5, 202.7, 202.11, 202.12, 311.7, 315.3.

31. al-Ṭarsūsī, *Tabṣirah fī al-Ḥurūb* (MS. Bodl.), 136*r*-137*r*; Paul E. Chevedden *et al.*, «Traction Trebuchet», pp. 460-461, 480, fig. 20.

32. James I, *Llibre dels fets*, 156.5, 163.12 (*almanganel*).

33. al-Ṭarsūsī, *Tabṣirah fī al-Ḥurūb* (MS. Bodl.), fols. 133*r*, 138*v*; Paul E. Chevedden *et al.*, «Traction Trebuchet», pp. 461, 482, fig. 22.

34. James I, *Llibre dels fets*, 69.14.

35. al-Ṭarsūsī, *Tabṣirah fī al-Ḥurūb* (MS. Bodl.), 137*v*, 138*r*; Paul E. Chevedden *et al.*, «Traction Trebuchet», pp. 461, 481, fig. 21.

36. James I, *Llibre dels fets*, 15.17, 15.19 (Albero de Suso); 15.25, 15.25, 15.31, 15.32, 15.37, 15.38 (Lizana); 16.8, 16.32, 16.37 (Albarracín); 40.2, 41.2, 41.10, 41.22, 41.28 (Balaguer); 69.12, 69.14, 69.43 (Majorca city); 125.11, 126.4, 126.6 (Ibiza); 130.15, 156.5, 159.6, 159.8, 159.10, 162.2, 163.10, 163.12, 174.4, 175.7, 176.17 (Burriana); 192.9, 192.11, 193.2, 193.10, 193.11, 194.7 (Cullera); 197.4, 197.6, 202.5, 202.7, 202.11, 202.12 (Tower of Montcada); 203.3, 203.6, 203.10 (Tower of Museros); 262.5 (Valencia); 263.1 (Silla); 311.7, 315.3 (Villena), 357.5 (Biar); 401.11, 401.13 (Pomar); 460.1, 461.1, 461.8, 462.1, 462.2, 462.3, 463.1 (Lizana). For information on James's sieges and his employment of the hybrid trebuchet (*fenèvol*), see Paul E. Chevedden, «Artillery of King James I», pp. 81-94; Paul E. Chevedden, «Hybrid Trebuchet», p. 212; Paul E. Chevedden *et al.*, «Traction

Other trebuchets receive far less attention. What type of machine was it? It was certainly a traction-powered machine. At the siege of the Tower of Montcada in 1223, James tells us that a *fenèvol* was set up behind a house, and, during the night, the pulling-ropes (*cordes*) were attached to it.[37] James provides additional details on this machine in his account of the siege of Lizana in May 1218. Here, a single *fenèvol* was set up, which rained down 1500 stone-shot on the stronghold in the course of a twenty-four hour period (500 stones per night and a thousand per day). The rate of discharge of the *fenèvol* was slightly better than one shot per minute, and the damage that this machine inflicted was extensive. James tells us that, «when the hour of vespers arrived, the *fenèvol* had demolished so large a part of the wall that a great breach had appeared».[38] Into the breach an assault was made and the castle was successfully taken. The *fenèvol* was doubtless a very powerful trebuchet to cause such damage. Since this machine had pulling-ropes (*cordes*), it was most certainly a traction machine, but its breaching capability indicates that it was the most powerful version of the traction trebuchet, the hybrid machine.

The hybrid trebuchet could launch stone-shot three times as heavy as that of the most powerful traction trebuchets, and it could do so at a very rapid rate of discharge, better than four shots per minute, with the rotation of pulling-crews. At the siege of Keysun (Kaysūm) in 824, ʿAbd Allāh ibn Ṭāhir used hybrid trebuchets that hurled stones each large enough to form an ass's load.[39] Kalervo Huuri estimates the weight of these stones to be between 50 and 100 kilograms.[40] At the siege of Amorion in 223/838 by the ʿAbbasid caliph al-Muʾtaṣim, sheep skins stuffed with earth were hurled by «big» trebuchets (*majānīq kibār*) into the ditch surrounding the town in order to fill it up so that digging-mantlets (*dabbābāt*) could be moved up to the wall.[41] The weight of these earth-filled sheepskins must have been quite heavy, probably in the range of 100 to 150 kilograms. During the Byzantine reconquest of Crete by Nikephoros Phokas in 961, a live ass is said to have been hurled over the walls of Chandax (Heraklion) to the starving Muslim inhabitants inside. The animal may not have been full-grown (an adult Asian ass can weigh up to 290 kilograms), but the launching of such an animal does indicate a very high standard of performance. Huuri estimates that the ass might have weighed between 120 and 200 kilograms.[42] At the siege of Manzikert in 1054, the Saljuq sultan Ṭoghrïl Beg Muḥammad employed a powerful Byzantine-built traction trebuchet identified as a *baban* (Ar. *ghaḍbān* = «The Furious One») that was obtained from the citadel of Bitlis. This machine —operated

Trebuchet», p. 458; Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures: Bilingual Surrender Treaties in Muslim-Crusader Spain under James the Conqueror*, Leiden, 1999, p. 223.

37. James I, *Llibre dels fets*, 202.8.

38. James I, *Llibre dels fets*, 15.25-28: «E param-hi .I. fenèvol; e açò fo e·l temps de mayg. E tirà·l fenèvol, can fo parat, .D. pedres de nuyt e .M. de dia. E quan vench entorn d'ora de vespers, hac tant derrocat del mur, que gran portel hi hac feyt.»

39. Gregory Abū al-Faraj Bar Hebraeus, *Chronicon Syriacum*, ed. Paul Bedjan, Paris, 1890, p. 141, and *The Chronography of Gregory Abū'l Faraj, the Son of Aaron, the Hebrew Physician, Commonly Known as Bar Hebraeus*, I, *English Translation*, II, *Facsimiles of the Syriac Texts in the Bodleian Ms. Hunt. No. 52*, trans. Ernest A. W. Budge , London, 1932, vol. 1, pp. 129-130.

40. Kalervo Huuri, «Zur Geschichte des mittelalterlichen Geschützwesens», p. 150.

41. Abū Jaʿfar Muḥammad ibn Jarīr al-Ṭabarī, *Taʾrīkh al-Rusul wa-al-Mulūk (Annales)*, ed. M. J de Goeje *et al.*, 15 vols., Leiden, 1879-1901, part 3, pp. 1247-1248. See also al-Ṭabarī, *Taʾrīkh*, part 3, pp. 1238, 1245; Anonymous, *Kitāb al-ʿUyūn wa-al-Ḥadāʾiq*, ed. M. J. de Goeje, Leiden, 1871, p. 491.

42. Theodosios Diaconos, *Theodosii Diaconi de Creta capta*, ed. Hugo Criscuolo, Bibliotheca scriptorum Graecorum et Romanorum Teubneriana, Leipzig, 1979, p. 28, lines 718 ff; Kalervo Huuri, «Zur Geschichte des mittelalterlichen Geschützwesens», p. 91; Ada Bruhn Hoffmeyer, «Military Equipment in the Byzantine Manuscript of Scylitzes in the Biblioteca Nacional in Madrid», *Gladius*, no. 5 (1966), pp. 1-194, at p. 134; Vassilios Christides, *The Conquest of Crete by the Arabs (ca. 824): A Turning Point in the Struggle between Byzantium and Islam*, Athens, 1984, p. 175; George T. Dennis, «Byzantine Heavy Artillery», p. 106.

by a pulling-crew of 400 men— launched stone-shot weighing between 111 and 200 kilograms.[43] In 1071, just prior to the battle of Manzikert, Arabic accounts report a very large trebuchet in the siege train of the Byzantine emperor Romanos IV Diogenes. It is described as having a composite beam of eight spars and being capable of launching stone-shot weighing 96.0 kilograms. To transport the machine, one hundred carts were employed, pulled by 1,200 men.[44] In 1185, Philip II Augustus employed a trestle-framed trebuchet (*petraria*) at the siege of Boves that was reported to have discharged stone-shot so heavy that four men could hardly lift the projectiles. J.-F. Finó estimates that the missiles discharged by this machine weighed at least 200 kilograms.[45] In 1218, the Crusaders besieging Damietta, in Egypt, utilized a trebuchet with a pulling-crew of 600 men that launched stone-shot weighing 185 kilograms.[46]

Because of its ability to deliver continuous bombardment at a fairly rapid rate with blows destructive enough to breach walls, the hybrid trebuchet continued to be used for breaching purposes during the thirteenth century, long after the counterweight machine had made its appearance. At the successful Crusader siege of Lisbon in 1147, the Germans and Flemings «undertook to shatter the walls and the towers of the enemy with five 'Balearic' trebuchets (*fundis Balearicis*)» in the first major assault on the city in early August. The Anglo-Norman forces erected two «Balearic» trebuchets (*funde Balearice*) against the city walls between the Porta del Ferro and the south-western corner tower. These «Balearic» machines were wall-breaching hybrid trebuchets that were capable of an

43. Matthew of Edessa, *Patmutʿiwn*, Jerusalem, 1869, pp. 142-145; and *Armenia and the Crusades, Tenth to Twelfth Centuries: The Chronicle of Matthew of Edessa*, Armenian Heritage Series, Lanham (MD), 1993, pp. 87-88; Aristakēs Lastivertcʿi, *Patmutʿiwn Aristakisi Lastivertcʿwoy*, ed. K. N. Huzbashyan, Yerevan, 1963, pp. 92-93; and *Aristakes Lastivertcʿi's History*, trans. Robert Bedrosian, New York, 1985, pp. 103-105. Aristakēs states that the *baban* launched stone-shot weighing 60 *litra*s. If the unit of weight used by Aristakēs is equivalent to the Byzantine *litra* of roughly a third of a kilogram, the weight of the stone-shot comes to about 20.0 kilograms, far too light for such an enormous piece of artillery. The *litra* employed by this author may not be a Byzantine measure of weight. The eleventh-century *litra* used by Armenians in eastern Anatolia may be related to the Arabic *raṭl*, not the Byzantine *litra*. In regions that had regular contact with Islamic lands, such as Cyprus and Trebizond, «a special *argyrike* (silver) *litra* of 12.5 *logarikai oungiai* (= 333 grams) existed alongside the other units. It was apparently related to the Arab *raṭl* of 337.60 grams. In the later period various 'pounds' of local circulation were in use, partly of Arab, Italian, or Turkish origin» (*The Oxford Dictionary of Byzantium*, ed. Alexander P. Kazhdan, 3 vols. [New York, 1991], s.v. *litra*). Aristakēs's *litra* cannot be related to the heavier *argyrike* (silver) *litra*, since the weight of the stone-shot would still be too light (20.25 kilograms). It could be related to a larger Arabic *raṭl*; the Syrian *raṭl*, for example is equivalent to 1.85 kilograms (Walther Hinz, *Islamische Masse und Gewichte umgerechnet ins metrische System*, Handbuch der Orientalistik, Ergänzungsband 1, Heft 1, Leiden, 1970, p. 30). If it were related to the Syrian *raṭl*, the weight of the 60-*litra* stone-shot would be 111 kilograms, a weight that a large hybrid trebuchet could manage. Ernest A. W. Budge noted in his translation of *The Chronography of Bar Hebraeus* that six *lîtrê* Syrian was equivalent to one *lîtrâ* Babylonian (Bar Hebraeus, *Chronography*, vol. 1, p. 394). If we assume that the Syrian *lîtrê* was roughly equivalent to the Byzantine *litra* (a third of a kilogram), then a Babylonian *lîtrâ* would be roughly equivalent to a Syrian *raṭl* (1.85 kilograms). An alternative interpretation is scribal or editorial error: 60 *litra*s should be read as 600 *litra*s. This is exactly how Huuri interpreted the text and came to an approximate weight of 200 kilograms for 600 *litra*s (Kalervo Huuri, «Zur Geschichte des mittelalterlichen Geschützwesens», p. 170). Stone-shot of such enormous weight could be launched by hybrid trebuchets. The hybrid machine used by the Crusaders against Damietta in 1218 launched stone-shot weighing one Syrian *qinṭār* (185 kilograms). See below, nn. 46 and 49 and text.

44. The stone-shot projected by this trebuchet weighed one large Khilāṭī *qinṭār* or 96.21 kilograms. Al-Fatḥ ibn ʿAlī al-Bundārī, *Zubdat al-Nuṣrah wa-Nukhbat al-ʿUṣrah*, ed. M. T. Houtsma, Recueil de textes relatifs à l'histoire des Seljoucides, vol. 2, Leiden, 1889, p. 42.

45. William the Breton, *Philippidos*, in *Oeuvres de Rigord et de Guillaume le Breton*, ed. H.-F. Delaborde, vol. 2, Paris, 1885, p. 54; José Frederico Finó, «Machines de jet médiévales», pp. 35-36.

46. The Crusader hybrid trebuchet launched stone-shot weighing one Syrian *qinṭār* or 185 kilograms; the counterbalance fixed to the butt-end of the beam of this machine weighed two Syrian *qinṭārs* or 370 kilograms. Sawīrus ibn al-Muqaffaʿ, *History of the Patriarchs of the Egyptian Church*, ed. and trans. Yassā ʿAbd al-Masīḥ and O. H. E. Khs-Burmester, 4 vols., Publications de la Société d'archéologie copte, Textes et documents, Cairo, 1942-1974, vol. 3, pt. 2, pp. 218 (trans.), 129 (Arabic text).

extremely rapid rate of discharge. The two operated by the Anglo-Normans, which used alternating pulling crews of 100 men each, discharged 5,000 stone projectiles in ten hours. Since each machine hurled 250 missiles in an hour, the sequence of discharge for both machines was slightly better than four shots per minute.[47]

The hybrid trebuchet continued to be used in the thirteenth century. During the Albigensian Crusade, the hybrid machine, identified under the term *calabre*, is cited as being used in most of the major sieges. At the siege of Carcassonne in August of 1209, the Crusaders «battered the length and breath of the ramparts day and night» with traction and hybrid trebuchets and took the city after a two-week siege. In 1210, Simon of Montfort employed hybrid trebuchets to breach the walls of Minerve, and, in the following year, he used the same artillery in his successful siege of Lavaur. At the siege of Beaucaire in 1216, Simon of Montfort broke down one of the city gates and its forewall with a hybrid trebuchet, and, at the siege of Toulouse in 1218, he bombarded a tower in the middle of the Garonne River on the western side of the city with hybrid machines. These stone-projectors discharged «squared stones and rounded boulders» and unleashed such devastating blows that «the whole rampart was shattered and its mortar knocked out, wall, gateways, vaults, quoins and all».[48] The year 1218 also witnessed the Crusader assault on Damietta in which the besiegers employed the most powerful hybrid trebuchet ever recorded in a historical source. It was operated by a pulling-crew of 600 men and discharged stone-shot weighing 185 kilograms.[49]

Later in the thirteenth century, King James used the hybrid trebuchet to spearhead his conquests of the Balearic Islands and the extensive region of *Sharq al-Andalus*. James employed the hybrid trebuchet as the workhorse of his siege arsenal, generally using one or two of these breaching machines in his numerous sieges. The hybrid trebuchet, like all traction engines, could be discharged as fast as loaders could shove stone-shot into the slings of the machines. This feature greatly recommended the use of hybrid trebuchets because a rapid rate of discharge made them far less vulnerable to counter-battery than was the case with counterweight trebuchets. While a hybrid machine was capable of a relatively rapid sequence of discharge (four shots per minute at Lisbon and one shot per minute at Lazana), the discharge rate of the counterweight trebuchet was quite slow, due to the tedious process of winching down the beam of the machine after each launch. At the siege of the Cathar stronghold of Montségur in 1244, a trebuchet designed by Bishop Durand of Albi discharged stone-shot weighing 40.0 kilograms both day and night for a period of weeks at intervals of twenty minutes.[50] At the siege of Holyrood Abbey by King Edward I in 1296, three counterweight trebuchets discharged 158 rounds of large stone-shot in three days.[51] Can we then conclude that each machine was only capable of launching

47. *De expugnatione Lyxbonensi*, ed. and trans. Charles W. David, Records of Civilization – Sources and Studies, vol. 24, New York, 1936, pp. 134-137, 142-143; Paul E. Chevedden, «Hybrid Trebuchet», pp. 207-209; Paul E. Chevedden *et al.*, «Traction Trebuchet», p. 443; Joseph F. O'Callaghan, *Reconquest and Crusade in Medieval Spain*, Philadelphia, 2003, p. 139.

48. William of Tudela and Anonymous, *La Chanson de la croisade Albigeoise*, ed. Eugène Martin-Chabot, 3 vols., Paris, 1931-1961, vol. 1, p. 66 (Carcassonne); 114 (Minerve); 162 (Lavaur); vol. 2, pp. 148, 152, 168, 180 (Beaucaire); vol. 3, pp. 58, 104, 130, 136, 300 (Toulouse), and *The Song of the Cathar Wars: A History of the Albigensian Crusade*, trans. Janet Shirley, Aldershot (UK), 1996, pp. 23 (Carcassonne); 33 (Minerve); 41 (Lavaur), 95, 96, 99, 102 (Beaucaire); 141, 151, 156, 191 (Toulouse). For an assessment of the use of the hybrid trebuchet during the Albigensian Crusade, see Paul E. Chevedden, «Hybrid Trebuchet», p. 211.

49. See above, n. 46 and text.

50. Fernand Niel, *Montségur: Le site, son histoire*, Grenoble, 1962, pp. 221, 305, n. 72.

51. A. Z. Freeman, «Wall-Breakers and River-Bridges: Military Engineers in the Scottish Wars of Edward I», *Journal of British Studies*, no. 10 (May 1971), pp. 1-16, at p. 4.

one shot every hour and twenty-two minutes?[52] Edward may simply have been low on ammunition and was obliged to husband his stone-shot. Whatever the case, there is no doubt that gravity-powered trebuchets had a much slower sequence of discharge than hybrid trebuchets, and this factor favored the use hybrid machines, provided their wall-breaching capability was up to the task.

King James had great success with the hybrid trebuchet, but when the need arose for a more powerful form of artillery, he employed the counterweight trebuchet. The *trabuquet* (or *trebuquet*) and the *brigola* are the two types of counterweight trebuchets identified by King James. The *trabuquet* was a large trestle-framed machine. It may have had either a fixed or a mobile counterweight attached to the short end of the rotating beam.[53] The *Cantigas de Santa Maria* in the Biblioteca de San Lorenzo el Real at the El Escorial palace depicts this type of machine with a fixed counterweight.[54] The *Cantigas*

52. Paul E. Chevedden *et al.*, «Traction Trebuchet», p. 457.

53. Giese does not give any structural details on the *trabuquet*. He considers the *trebuch* or *trabuch* (the alternative spelling of *trabuquet* in other Catalan sources) and *trabuquet* to be essentially identical, but he believes that the *trabuquet* was a smaller machine. He does consider the range of the *trebuch* to have been greater than that of the *fenèvol* (Wilhelm Giese, «Waffen nach den katalanischen Chroniken des XII. Jahrhunderts», p. 147 and n. 257). Monreal y Tejada also omits structural details in his discussion of the trebuchet and simply states that the *trabuch* and the *trabuquet* were powerful machines capable of shooting large missiles a long distance (Luis Monreal y Tejada, *Ingeniería militar en las crónicas catalanas*, p. 20). Other scholars have likened the *trabuquet* to the *fenèvol* and consider both to be counterweight machines (*DCVB*, vol. 10, p. 411; Feran Soldevila [ed.], *Llibre dels feits*, ch. 69, n. 3). Of those scholars who have attempted to identify the structural components of the *trabuquet*, some argue that it had a suspended counterweight (Joseph Goday y Casals, «Medis d'atach», p. 803; Jordi Bruguera, «Vocabulari», pp. 54-55), while Bruhn de Hoffmeyer contends that it had a fixed counterweight (*Arms and Armour in Spain*, pp. 102, 106, 112). The suspended-counterweight proponents can find justification for their view in Villard de Honnecourt's thirteenth-century description of a trestle-framed trebuchet with a suspended counterweight that is specifically identified as a *trebucet* (fol. 30*r*, MS. fr. 19093, Bibl. Nat., Paris). Viollet-le-Duc, in his reconstruction of Villard's machine, was the first to propose that the trebuchet proper had a suspended, rather than a fixed, counterweight. He believed that the term *mangonel* was applied to the machine with a fixed counterweight (*Dictionnaire raisonné de l'architecture du XI^e^ au XVI^e^ siècles*, vol. 5, p. 233). Largely on the basis of the very exact descriptions of different types of trebuchets given by Giles of Rome (Aegidius Colonna) in his *De regimine principum libre tres*, produced in Italy around 1275, Bruhn de Hoffmeyer has argued that the trebuchet with a fixed counterweight was the machine designated as the *trabuquet*. Giles of Rome identifies three different types of counterweight trebuchets: the machine with a fixed counterweight he calls a *trabucium*, the one with a suspended or mobile counterweight a *biffa*, and the machine with both a fixed and a mobile counterweight he terms a *tripantium* (*De regimine principum libre tres*, extracted in Rudolf Schneider, *Artillerie*, pp. 163-164; translated in John Hewitt, *Ancient Armour and Weapons in Europe from the Iron Period of the Northern Nations to the End of the Thirteenth Century*, 3 vols., Oxford, 1855-60, vol. 1, pp. 349-350). His classification of counterweight trebuchets may be relevant to Italy in the late thirteenth century, but it is not pertinent to the Catalan classification of counterweight trebuchets, which knows no distinction between the trestle-framed trebuchet with a fixed counterweight and the one with a suspended counterweight. The evidence gleaned from medieval and Renaissance illustrations of trebuchets indicates that the term *trebuchet* may refer to both versions of the trestle-framed counterweight machine. A crude illustration of a trebuchet with a counterweight in the form of a box, indicating that it is meant to be suspended from the short arm of the beam, appears in an early thirteenth-century manuscript of Wolfram von Eschenbach's *Willehalm* and is referred to as a *tripochen* (fol. 4*v*, MS. Cod. germ. 193 III, Bayerische Staatsbibliothek, Munich); reproduced in Karl von Amira, *Die Bruchstücke der grossen Bilderhandschrift von Wolframs Willehalm*, Munich, 1921, p. 20 and pl. 10). A later manuscript of the same text has two corrupt illustrations of a trebuchet, both of which have a suspended counterweight, and the second machine is identified as a *driboch* (fols. 33*v* and 81*v*, MS. Cod. 2670, Österreichische Nationalbibliothek, Vienna; reproduced in Wolfram von Eschenbach, *Willehalm mit der Vorgeschichte des Ulrich von dem Türlin und der Fortsetzung des Ulrich von Türheim*, Graz, 1974, fols. 33*v* and 81*v*). The description accompanying the illustration of Villard de Honnecourt's *trebucet*, referred to above, indicates that this machine also had a suspended counterweight. Francesco di Giorgio Martini, however, identifies both the trebuchet with a suspended counterweight and the one with a fixed counterweight as a *traboccho* (Francesco di Giorgio Martini, *Trattati di architettura, ingegneria e arte militare*, ed. Corrado Maltese, 2 vols., Trattati di architettura, vol. 3, Milan, 1967, pp. 272-273; fols. 60*r*, 61*v*, 62*r*; pls. 111, 114, 115).

54. El Escorial, Biblioteca de San Lorenzo el Real, MS T.I.1, *Cantigas de Santa Maria*, fol. 43*r* (cantiga 28*c* and 28*d*). Cantiga 28*c* shows a gravity-powered trebuchet as its main beam is being mounted on its journal bearings. Cantiga 28*d* shows the same machine fully assembled and ready for discharge.

de Santa Maria in the Biblioteca Nazionale in Florence shows this type of machine with a mobile counterweight.[55] During the siege of Majorca city in 1229, King James employed at least four *trabuquets* and a minimum of three traction trebuchets.[56] At Ibiza in 1235, he used one *trabuquet* and one *fenèvol*.[57] At Valencia in 1238, one *trabuquet* and two *fenèvols* were used.[58]

The *brigola* was a large pole-framed counterweight trebuchet.[59] It provided all the destructive power of the *trabuquet* but at a considerable savings in materials and probably costs. Even so, it was not an inexpensive machine. In one of the documents from James's registers dating from 1267, the king acknowledges a debt 2,320 Jaca sueldos to the Jew Astruc Jacob Shashón, crown bailiff of Morella and Peñíscola, «because of the *bricola* that you made at Tortosa for us and at our order and for reason of the galena lead ore [Catalan *alcofol*] and other equipment of the aforesaid *bricola*».[60] Galena, a lead sulfide (PbS), is the commonest ore of lead and was most likely extracted from the galena mines of Tortosa. It was used here as ballast in the two counterweight boxes of the *bricola*.[61] James's trestle-framed trebuchets doubtless used galena ore ballast as well. The skill that went into the making of the *bricola* is reflected in the high price of the machine.

The Catalan chronicles refer to the *brigola* a number of times. King James mentions this machine a dozen times in his accounts of three siege operations.[62] At the siege of Cullera, when faced with a lack of stone-shot for his two *fenèvol*s, King James suggested that stones be quarried on the site into shapes for *brigoles* and *trabuquets*.[63] In 1253, when a *fenèvol* could not be brought up within striking range of Pomar, because of the deadly discharge of a *brigola* operated by rebel defenders, James sent

55. Florence, Biblioteca Nazionale, MS Banco Rari 20, *Cantigas de Santa Maria*, fol. 8*r*.

56. James I, *Llibre dels fets*, chs. 69, 70.

57. James I, *Llibre dels fets*, 125.10, 125.11, 126.5, 126.13.

58. James I, *Llibre dels fets*, 262.4, 262.5.

59. Giese and Soldevila believe that the *brigola* was a trestle-framed counterweight trebuchet (Wilhelm Giese, «Waffen nach den katalanischen Chroniken des XII. Jahrhunderts», p. 148 and fig. 2; and Ferran Soldevila [ed.], *Llibre dels feits*, ch. 461, n. 7). Bruhn de Hoffmeyer identifies it as «a light engine on wheels», but later, when describing James's siege of Lizana in 1267, she mentions that the king's *fenèvol* hit the *brigola* operated by the rebel barons inside the city and smashed the counterweight of the machine (*Arms and Armour in Spain*, p. 109). Since Bruhn de Hoffmeyer identifies the *brigola* both as a light engine and a counterweight engine, David Nicolle defines it as a «light and mobile counterweight mangonel mounted on a cart» (David C. Nicolle, *Arms and Armour of the Crusading Era, 1050-1350*, 2 vols., White Plains [NY], 1988, vol. 2, p. 589). Monreal y Tejada reproduces two illustrations of *bricola*s from Valturio's *De re militari* (*Ingeniería militar en las crónicas catalanas*, pp. 8 ff.), but he is unable to describe the machine properly. He states that it has a «box» (i.e., a counterweight), not two counterweights, and a «sling». He considers it to be a small machine that did not need a winch to lower its beam prior to discharge, and, since it could be turned in any direction, its base, he believes, was not massive (*Ingeniería militar*, pp. 20-21). The diminutive of *brigola*, *brigolete*, was also used in Catalan (*DCVB*, vol. 2, p. 602).

60. Archivo de la Corona de Aragón, James I, Reg. Canc. 14, fol. 90*r* (Huesca, 10 June 1267); Robert I. Burns, *Diplomatarium of the Crusader Kingdom of Valencia: The Registered Charters of Its Conqueror, Jaume I, 1257-1276*, 4 vols., Princeton, 1985-2007, vol. 3, p. 282 (doc. 729): «Recognoscimus et confitemur nos debere vobis, Astrugo Iacob Xixo baiulo Morelle et Peniscole, duo mille trece°[n]tos et viginti solidos iaccenses, racione bricole quam pro nobis et de mandato nostro fecistis apud Dertusam, et racione alcofolli, et racione aliorum aparamentorum perdicte bricole.» James requested that this *bricola* be sent to Pomar to aid in his siege of the city in 1265, but the siege was raised before the machine arrived (James I, *Llibre dels fets*, 401-403; Paul E. Chevedden, «Artillery of King James I», pp. 75, 79, 84. On Astruc Jacob Shashón, see Robert I. Burns, *Medieval Colonialism: Postcrusade Exploitation of Islamic Valencia*, Princeton, 1975, p. 285.

61. Ian Blanchard, *Mining, Metallurgy, and Minting in the Middle Ages*, Stuttgart, 2001, p. 527. Burns correctly translates *alcofol* as «lead-sulfide» but conjectures that it may have been used in varnish for «the aforesaid artillery» (Robert I. Burns, *Diplomatarium*, vol. 3, p. 282, n. *c*).

62. James I, *Llibre dels fets*, 194.25, 401.12, 401.15, 401.16, 460.2, 461.5, 461.7, 461.13, 462.2, 462.3, 462.4, 462.6.

63. James I, *Llibre dels fets*, ch. 194.

to Tortosa for his own *brigola*.[64] Before the *brigola* could see action, however, the siege was raised. In 1267 James brought up two *fenèvols* against Lizana. One of these was set up against the rebel defenders and put their single *brigola* out of action.[65] Desclot recounts at the siege of Balaguer in 1280 that Peter III had five very large *brigoles* constructed with which he bombarded the town.[66] Peter IV refers to this machine in a number of different ways. He makes direct use of the term *brigola*[67] or appends the phrase *de dues caixes* («of two boxes») after a specific term for artillery: *manganel*,[68] *giny*,[69] or *brigola*.[70]

King James's trebuchet duel at Lizana is instructive for the information it provides on the components of the *brigola*. The rebel *brigola*, being more powerful than James's traction machines, kept his two *fenèvols* out of range until the rope (*corda*) of its sling got entangled around the rotating beam (*pertxa*) of the machine.[71] As the rebels were trying to untangle the cord of the sling (*fona*) in order to lower the beam (*pertxa*) and prepare it for another discharge,[72] James brought up one of his *fenèvols* to strike at the enemy machine. When the first shot missed, James personally took charge of the machine and launched a shot that hit the *brigola* so hard that its box (*caxa*), or counterweight, was broken. After that blow the machine could no longer be used. That evening the *fenèvol* discharged another deadly shot and «broke a beam (*pertxa*) of the one 'cheek' (*guauta*) of the *brigola*» (*trencat .I. pertxa de la una guauta de la brigola*). Just what component of the *brigola* was demolished by the shot that was loosed during the night has been the subject of debate. Both Wilhelm Giese and Ferran Soldevila believe that the «cheek» (*guauta*) refers to one of the two sides, or uprights, of the *brigola*. This appears unlikely because the *brigola* is a pole-framed, rather than a trestle-framed, machine, and has only one, not two, uprights. I had once thought that the expression *una pertxa de la una guauta de la brigola* referred to the single pole-frame of the machine, but this too appears to be mistaken. The *brigola* had a distinct design that provides the key to understanding James's remarks about this machine. The forked end of the pivoting beam (*pertxa*) of the *brigola* was made of two pieces of wood that might easily have been identified in Catalan as «beams» or «cheeks». Just as the cheeks form the lateral walls of the mouth, the «cheeks» of the *brigola* form the lateral branches of the Y-shaped terminus of the pivoting beam of the *brigola*. Having determined what the «cheeks» of the *brigola* are, we can now assess the damage inflicted upon the *brigola* at Lizana. James's shot broke one of the counterweight boxes of the machine, and the shot launched in the evening broke one of the forked ends of the pivoting beam of the machine.[73]

64. James I, *Llibre dels fets*, 401.15.
65. James I, *Llibre dels fets*, chs. 460, 461.
66. Bernat Desclot, *Crònica: Llibre del rei En Pere*, in *Les quatre grans cròniques*, p. 462 (ch. 75).
67. Peter IV, *Crònica*, ch. 3.138.
68. Peter IV, *Crònica*, ch. 3.112.
69. Peter IV, *Crònica*, ch. 3.127.
70. Peter IV, *Crònica*, ch. 6.22.
71. James I, *Llibre dels fets*, 461.7.
72. James I, *Llibre dels fets*, 461.13.
73. James I, *Llibre dels fets*, 462: «E en tant faem lo fenèvol tant aenant, que poc aconseguir en la brigola; e tirà la primera pedra lo maestre del fenèvol e errà la brigola; e nós anam pendre lo fenèvol e tiram e donam tal en aquela brigola, que la caxa li obrim: e d'aquel treyt aenant no se'n pogren ajudar. E en aquel vespre, ans que fos nuyt, aquel qui fonejava ach-los trencat .I. pertxa de la una guauta de la brigola.» Wilhelm Giese, «Waffen nach den katalanischen Chroniken des XII. Jahrhunderts», p. 148; Ferran Soldevila (ed.), *Llibre dels feits*, ch. 461, n. 7; Paul E. Chevedden, «Artillery of King James I», p. 76. The «cheeks» of the *brigola* are easily discernable in Taccola's illustration of the *brichola* (*bricola*), dating from 1433. See Mariano di Jacopo Taccola, *Liber Tertius de ingeneis ac edifitiis non usitatis*, Florence, Biblioteca Nazionale Centrale, Cod. palat. 766, fol. 41*r*; reproduced in Paul E. Chevedden, «Invention of the Counterweight Trebuchet», fig. 5; Paul E. Chevedden, «Black Camels», p. 271, fig. 6.

No account of the artillery of James the Conqueror would be complete without an analysis of the all of the pieces of artillery that his memoirs fail to mention. James, for the most part, reports on the use of heavy artillery. He does not provide much information on light artillery. A few details on the *algarrada* are offered, but otherwise James is silent, even though light artillery enjoyed a ubiquitous presence in siege operations throughout the Middle Ages. Besieging armies often massed large quantities of small trebuchets in batteries. Such an array of artillery could deliver a concentrated hail of missiles that was capable of neutralizing counter-battery. With the protection provided by light artillery, heavy artillery could be discharged with virtual impunity, making it possible for attackers to advance siege-engines and assault-works against fortified positions. Given the slow sequence of discharge of the counterweight trebuchet, its effective use in siege operations required the deployment of sufficient numbers of light traction-powered trebuchets capable of delivering sustained volleys of small shot that would send defenders diving for cover. By putting down a heavy barrage against defending forces, light artillery enabled heavy artillery to carry out its work.

A schematic representation of the use of light and heavy artillery in combination is provided in the *Cantigas de Santa Maria*. In an illustration depicting the Muslim siege of Constantinople, a counterweight trebuchet is shown as it is being assembled before the ramparts of the city, while a «hand-trebuchet», operated by a single man, is depicted as it is being discharged, thereby protecting the gravity-powered machine from counter-battery.[74] Only Byzantine and Chinese sources make mention of the «hand-trebuchet» (Gk. χειρομάγγανα [*cheiromangana*]; Chinese *shou pao*).[75] The *Cantigas* provides the only trace of the «hand-trebuchet» in the Latin West, although this machine must have been widely employed in siege operations during the Middle Ages in just the way that the *Cantigas* depicts its use. King James doubtless used the «hand-trebuchet», as well as many other light trebuchets, in his numerous sieges, but he did not think it was important or relevant enough to mention in his memoirs.[76]

Battleground Valencia: The Siege Tactics of James the Conqueror

King James's acquired his military skills on the job. His early career showed little promise. His first attempt to conquer *Sharq al-Andalus* at the age of seventeen ended in dismal failure. He tired to strike directly at the heart of Islamic Valencia via the shortest possible route: a frontal assault down the Mediterranean littoral of Spain. In 1225, James sounded the trumpet and led an attack on the mighty offshore castle of Peñíscola. The direct approach to military strategy brought James military failure and an ignominious retreat. So embarrassed was he by this defeat that he claimed it never happened.[77] James learned the lessons of Peñíscola. He needed no Clausewitz to tell him that of the

74. El Escorial, Biblioteca de San Lorenzo el Real, MS T.I.1, *Cantigas de Santa Maria*, fol. 43*r* (cantiga 28*c*). See above, n. 54 and text. Menendez Pidal correctly identifies the «hand-trebuchet» as a traction machine (Gonzalo Menendez Pidal, *La España del siglo XIII: Leida en imagenes*, Madrid, 1986, p. 268).

75. Paul E. Chevedden, «Invention of the Counterweight Trebuchet», p. 110; Paul E. Chevedden, «Black Camels», pp. 261, 266, fig. 1; Paul E. Chevedden, «Artillery of King James I», fig. 12; Paul E. Chevedden, «Hybrid Trebuchet», fig. 4; Paul E. Chevedden *et al.*, «Traction Trebuchet», p. 463, fig. 1.

76. A schema of sixty-seven sieges conducted by King James during his military career is provided in Paul E. Chevedden, «Artillery of King James I», pp. 81-94.

77. At the siege of Burriana in 1233, James not only ignores his failure at Peñíscola but he also makes the misleading remark, «aquest sia el primer loch del regne de València que jo he assetiat» (James I, *Llibre dels fets*, 164.18-19).

two forms of war, offensive and defensive, defense is the stronger.[78] Defense was certainly the stronger form of war in Islamic Valencia, a land that was crisscrossed with fortifications of all types. It had «forty or fifty» major strongholds spread across a region that stretched «a full seven days' journey in length». This assessment comes from Don Blasco of Alagón, who «knows more about this than any man» having spent several years in *Sharq al-Andalus* as a refugee just prior to James's Valencian Crusade.[79] Given the preponderance of defense in Islamic Valencia, the question for James became: How does one wage a successful offensive campaign? Further, how does one unlock the manifold defenses of the region?

To help him answer these questions, James sought out Don Blasco before launching his Valencian Crusade. It was he who advised James on «the best place ... to commence the conquest of the Kingdom of Valencia». He urged him to strike first at Burriana.[80] James concurred and set about to devise an overall plan for the conduct of the war. James would avoid the most strongly defended approach to *Sharq al-Andalus* and instead enter Islamic Valencia by the steps of its back staircase leading down from the heights of Teruel. At the landing of the staircase was Burriana, and, in May 1233, King James arrived determined to capture this key stronghold.

Eight years after the debacle at Peñíscola, James came to recognize that his original plan for the conquest of Islamic Valencia was not only wrong in its details but also in its essence. Although a direct route may appear to be the most efficient in war, it may not be the most effective. A replay of his 1225 strategy would only invite the same result. A new approach was therefore needed. James understood that the center of gravity of the defenses of *Sharq al-Andalus* lay along the coast. But how could he strike a blow at this center of gravity that would have the greatest effect? «In strategy», as Basil Liddell Hart remarks, «the longest way round is often the shortest way there; a direct approach to the object exhausts the attacker and hardens the resistance by compression, whereas an indirect approach loosens the defender's hold by upsetting his balance».[81] Burriana was the pivot point on which the defenses of *Sharq al-Andalus* rested. A large number of localities in the provinces of Peñíscola and Castellón were dependent on the agricultural production of Burriana and its immediate hinterland.[82] These localities lived in the orbit of Burriana and would be hard pressed to repel an invader without

78. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret, Princeton, 1976, pp. 357-359. On the ascendancy of the defense in medieval warfare, see Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, pp. 222-225.

79. James I, *Llibre dels fets*, 127.11-13: «que Don Blasco hi sap més que nuyl hom del món, e que us dixés d'aquela terra qual loch li semblaria en què vós posquéssets entrar e pendre»; 128.7-8: «e ten bé .VII. jornades de terra de lonch»; 128.10-13: «si jo us conseylava que anàssets assetjar .I. fort castell, dar-vos hia mal conseyl, car bé n'i à .XL. o .L. que, mentre que menjar aguessen, vós ni tot vostre poder no·ls poríets pendre.» The Archbishop of Toledo Jiménez de Rada considered the Kingdom of Valencia «remarkable for the multiplicity of defenses» (*regnum Valencie, quod multis municionibus preminebat*), and Ramòn Muntaner estimated that the total number of castles and strongholds in the kingdom was three times the number given by Don Blasco (Rodrigo Jiménez de Rada, *Roderici Ximenii de Rada Historia de rebus Hispanie, sive, Historia Gothica*, ed. Juan Fernández Valverde, Roderici Ximenii de Rada Opera omnia, part 1; Corpus Christianorum, Continuatio Mediaevalis, vol. 72, Turnhout, 1987, p. 183 [VI.5.26-27]; Ramòn Muntaner, *Crònica*, in *Les quatre grans cròniques*, ch. 9; Robert I. Burns, *Islam under the Crusaders: Colonial Survival in the Thirteenth-Century Kingdom of Valencia,* Princeton, 1973, p. 117).

80. James I, *Llibre dels fets*, 127.15-17: «E nós pregam-lo [Don Blasco] que dixés hon li semblaria que nós primerament poguéssem entrar e·l regne de València»; 128.18-19: «E aquest és lo meylor loch [Borriana] que yo sé per vós començar a conquerir la regne de València.»

81. Basil Henry Liddell Hart, *Strategy: The Indirect Approach*, 4th ed. rev. & further enl., London, 1967, pp. 25-26.

82. James I, *Llibre dels fets*, 130.15-22: «E aquels castells qui són a les espatles, axí con és Paníscola e Cervera e Exivert e Polpis e les coves de Vinromà e Alcayatèn e Morela e Cúyler e Ares, qui viuen del camp de Burriana de conduyt e seran entre nós e terra de christians, tots s'auran a retre, perquè nós serem denant e no poran haver lo conduyt que·ls venia de Borriana.»

the support of this city. A blow directed at Burriana would not simply be a blow against a major city in Islamic Valencia but would be a blow against the entire defensive system of *Sharq al-Andalus* that would have the potential of throwing the Muslim defenses in the region off balance. An attack-in-depth into *Sharq al-Andalus* aimed at Burriana could precipitate the collapse of the great protective shield of Eastern Islamic Spain.

James seems to have been aware of the promise that Burriana held for his invasion plan, even to the extent of seeing beyond Burriana to the first-, second-, and third-order effects of this action. Before his march on Burriana, James knew where he was going and by what roads he would take. Teruel was to lead to Burriana; Burriana to Valencia; and Valencia to Játiva. James would seek the enemy's strongest defensive links in the chain that held Islamic Valencia together and bear upon those links until they broke and the whole chain failed. Robert I. Burns distills the essence James's plan: «His strategy ... was to fasten upon key points, starting with the crucial city of Burriana, so as to isolate subsidiary castles and induce their surrender on terms».[83] To conquer *Sharq al-Andalus*, James would engage in campaigns that sought to capture key enemy strongpoints. The reduction of a key strongpoint reduced the enemy's powers of resistance in the area around it, and these areas could be extensive —the hinterlands of Burriana, Valencia, Alcira, and Játiva, for example. Often, a key strongpoint was targeted because its capture would isolate enemy territory from its base of support. Once a region had been stripped of its source of supply and replenishment —both of manpower and equipment— its subjugation could be achieved more readily either by force or by capitulation.

This plan owes more to expediency than it does to choice. King James was nearly always short of needed resources and supplies during his almost fifteen-year Valencian Crusade,[84] and the number of forces he could count on was subject to wide fluctuations. Robert I. Burns explains James's predicament:

> The crusade against Valencia was no easy undertaking. Even in its disordered state and even with one faction of its civil war aiding the Christians, Valencia bristled with castles and was far too strong to be taken by assault. King James had only an erratic force to employ —feudal levies who would

83. Robert I. Burns, *Medieval Colonialism*, p. 6. See also Robert I. Burns, *Islam under the Crusaders*, p. 118: «King James consequently focused his strength against the key positions, forcing their surrender on terms. He bypassed the many defenses dependent upon such a point, trusting that problems of morale and supply would diminish the center's will to resist; meanwhile he subjected its countryside to a plague of unsettling raids. This general strategy, when carried to successful conclusion, resulted in a multiplicity of formal agreements as the outmaneuvered castles yielded conditionally. So brilliant and swift were the campaigns —despite intervening *longueurs* which drew the war out to a total of fifteen years— that it was adduced as 'miraculous' in a seventeenth-century appeal for the king's canonization.»

84. The chronology of the Valencian Crusade varies according to how one determines the *terminus post quem* and the *terminus ante quem* of the war. Robert Burns elucidates the problem: «From the siege of Peñíscola [in 1225] to that of Biar [in 1245], it took James two decades to reduce the people of Mediterranean al-Andalus. The traditional span of the conquest, 1232 to 1245, still extends to some thirteen years. As we have seen, however, 1245 marked only a truce with al-Azraq despite the king's announcement to Christendom of total victory. War broke out again in 1247, a formal crusade was again wrung from the papacy, and a decade passed until a treaty in 1258. The Murcian war of the 1260s encouraged Valencia's Muslims to take up arms in yet another revolt. King James would die, an old man, still fighting to regain and retain his Valencian conquests in 1276. His heir Peter the Great, according to the memoirs of the junior contemporary Ramon Muntaner, had to 'conquer part of the kingdom of Valencia a second time,' postponing both his father's official burial and his own coronation. At each renewal of the war the Christians mounted serious campaigns, while the final war in 1275-1278 amounted to a Muslim countercrusade. Thus the full trajectory of the Valencian conquest extends from 1225 into 1278, over a half-century. Even if we excuse James from his Peñíscola fiasco and take up the conquest from the time he slipped into the chaotic turmoil of Islamic Valencia as an ally of Abū Zayd in the civil wars there, the span is still impressive at 45 years» (Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, pp. 221-222).

> disappear when their brief term of service ended, a small corps of faithful enthusiasts, an always unpredictable quantity of crusade volunteers, and the town militias. The crown was chronically embarrassed for supplies, and often preoccupied with domestic or baronial turmoil and with problems in Navarre or southern France.[85]

In such circumstances, James was forced to resort to a war of movement and maneuver in which the strong links in the defensive chain of Islamic Valencia were targeted, in the hope that the failure of these links would cause the whole chain to collapse. In James's war, the psychological element played as important a role as the military element. With his assets of manpower and materials in limited supply, James succeeded by wits as much as by weapons, by bluff and bluster as much as by actual menace and military might. Human and material factors had dictated to James the type of war he could wage. His genius lay in fashioning the means of victory out of the resources that were available to him.[86]

James's campaigns in *Sharq al-Andalus* centered on three major strongpoints: Burriana in the north (province of Castellón), Valencia in the center, and Játiva in the south. Strongpoints, of course, had been the focus of James's old strategy as well (e.g., Peñíscola), but James's new strategy was fundamentally different from the old. The old strategy had selected the route into Islamic Valencia that offered the greatest possible resistance to James's invading army, whereas the new strategy had chosen the route that would offer the least possible resistance to his army. The old strategy had relied on brute force; the new strategy would rely on maneuver and daring. The invading army would enter *Sharq al-Andalus* from the western flank of James's Kingdom at Teruel. James would avoid attacking into the teeth of the enemy's fixed defenses along the coast and instead maneuver around and behind them to strike at Burriana. A bold drive on Burianna from Teruel would put the invading army in the heart of Islamic Valencia within striking distance of its capital.

To James, Burriana was the key to the northern realms of the Kingdom of Valencia if not the entire kingdom. James articulates his overarching strategic vision just prior to the onset of the Valencian Crusade:

> Now I shall tell you how I will take Valencia and all the rest of that land. I will go to Burriana, and I will take to that place what provisions can be carried on mules from Teruel. I will also have provisions transported there from another place by sea, in order that sufficient supplies reach the army. I will also take two *fenèvols* there. And when Burriana is taken, I will have the queen, my wife, go there, so that people will see how determined I am to remain there. Then those castles that are at the back of Valencia —such as Peñíscola, Cervera, Xivert, Poplís, les Coves de Vinromà, Alcalatén, Morella, Culla, and Ares, which live on the supplies from the plain of Burriana— will be so shut in

85. Robert I. Burns, *The Crusader Kingdom of Valencia: Reconstruction on a Thirteenth-Century Frontier,* 2 vols., Cambridge (MA), 1967, pp. 3-4. See also Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, p. 223.

86. Just as «military necessity dictated a peculiar pattern of action» designed to subjugate Islamic Valencia, «this strategy in turn determined the later structure of political and personal relationships between victor and vanquished» (Robert I. Burns, *Islam under the Crusaders*, p. 117). Military necessity and the pattern of war that flowed from it explains the precarious nature of James's conquests, the post-1245 Muslim resurgence and wave revolts in «conquered» Valencia, as well as «Valencia's peculiar maximum Mudejarism», which left the vanquished society «in a mosque-filled milieu unchanged to the careless eye [with] laws and religion available, juridical officials and farming rounds much the same, language and landscapes and many social habits as before» (Robert I. Burns, «Immigrants from Islam: The Crusaders' Use of Muslims as Settlers in Thirteenth-Century Spain», *American Historical Review*, 80 [February 1975], pp. 21-42, at p. 40; Robert I. Burns, *Muslims, Christians, and Jews in the Crusader Kingdom of Valencia: Societies in Symbiosis*, Cambridge Iberian and Latin American Studies, Cambridge [UK], 1984, p. 284).

> between me and my Christian lands, that all will have to surrender, for I will be in front of them, and they will not be able to get supplies from Burriana.

Burriana would be an ideal base for James's subsequent drive south to the city of Valencia. A logistical network would be established there to support his army, and, after his rear had been secured from attack, he would be able to continue his advance south. A forward bridgehead would then be established near Valencia and the city put under siege.

> When that has been done, and I have those castles [«that are at the back of Valencia»], I will go to a place that the Christians call Puig de Cebolla (Onion Hill), only two leagues from Valencia. From there I will make raids on Valencia and ravage and plunder the land wherever I go, as a strategy to weaken them by afflicting them with the ravages of hunger. Then I will attack them before they can gather in the harvest again; and I will besiege them, so that, by the will of God, I will triumph over them.[87]

James's war council with Don Blasco and the detailed plan of action that issued from this meeting are clear indications that the Valencian Crusade proceeded from a carefully laid operational plan.[88] Only detailed planning beforehand ensured victory over Islamic Valencia. Burriana was to be the southernmost bridgehead for James's forces and provide a springboard for the drive on Valencia city and beyond. James's formula for success was simple: at Burriana the war would achieve its breakthrough; after Valencia it would be won: «When Valencia is taken, all the kingdom as far as Játiva, will be ours».[89] James would finish off the war in two blows (e.g., at Burriana and Valencia). He envisioned the war ending on his own terms with no revolts or counter-Crusades to threaten his conquests. After a few major sieges, it would all be flags and parades. In the event, the struggle for *Sharq al-Andalus* would extend beyond James's own death in 1276 into 1278. It was not quite the war James had in mind when he rode out of Teruel in 1233, but his strategic vision and his careful planning were the foundations of its ultimate success.[90]

87. James I, *Llibre dels fets*, 130.11-22; 131.1-7: «Ara us direm con pendrem València, e tota la altra terra. Nós nos n'irem a Borriana e haurem conduyt, aquel que levar puxam en azembles de Terol, e farem venir, d'altra part, per mar conduyt per raó que abast en la ost; e levar-hi em .II. fenèvols. E, quan hajam presa Burriana, ferem-hi venir la reyna, nostra muyler, per tal que entenen les gents que mayor cor hi havem d'estar. E aquels castells qui són a les espatles, axí con és Paníscola e Cervera e Exivert e Polpis e les coves de Vinromà e Alcayatèn e Morela e Cúyler e Ares, qui viuen del camp de Burriana de conduyt e seran entre nós e terra de christians, tots s'auran a retre, perquè nós serem denant e no poran haver lo conduyt que·ls venia de Borriana. E quan açó sia feyt, que nós hajam aquels castells, mudar-nos em a .I. loch que diem los christians lo Pug de Sebola e és prop de València .II. legües. E d'aquí a cavalcades que farem fer a València, e que la talarem, quan nós venrem e sabrem ardit que seran venguts a gran flaquea e a gran cuyta de fam, metrem-nos sobre éls, enans que cúylan lo pa altra vegada; e assetiar-los em e ab la volentat de Déu pendrem-los.»

88. Others disagree and argue, contrary to the direct evidence, that James acted without «a clear plan of action» for the conquest of Valencia; cf. James I, count and king, Realms of Aragon, *The Book of Deeds of James I of Aragon: A Translation of the Medieval Catalan* Llibre dels fets, trans. Damian Smith and Helena Buffery, Crusade Texts in Translation, vol. 10, Aldershot (UK), 2003, p. 140, n. 12. See a contemporary fresco from the Aguilar Palace, Barcelona, now in the Museu Nacional d'Art de Catalunya, which depicts King James at a war council before Majorca city in 1229 with his chancellor, Bishop Berenguer de Palou; reproduced in Robert I. Burns, *Diplomatarium*, vol. 1, frontispiece.

89. James I, *Llibre dels fets*, 206.35-36: «E, quan València sia presa, tot aquel regne serà pres tro a Xàtiva.» After taking Valencia city, James again states in his memoirs, «that in taking Valencia I had also conquered the rest of the kingdom» (*pus València havíem goanyada, havíem goanyat tot l'atre regne*) (*Llibre dels fets*, 292.10-11).

90. James's strategic vision informs his account of the Valencian Crusade. In his memoirs, James manipulates the realities of the Crusade to conform as closely as possible to his strategic vision. Thus, he brings the Crusade to a triumphant close in

Once plans were made, preparations began. The thorough preparation that went into James's Valencian Crusade was the key to its success at the operational level. The attack on Burriana promised great rewards, but it also invited disaster. James had to strike with sufficient strength to take the city, and he had to be prepared to sustain a long siege. If he succeeded, James would be able to remove the linchpin of the enemy's defensive system in the northern realms of *Sharq al-Andalus*, affording the very real prospect of a collapse of the entire defensive edifice arrayed against his army. Retreat from Burriana, however, would be fatal to James's scheme to conquer Islamic Valencia. James could not count on getting a third chance at conquest. It was all or nothing. James therefore took every precaution to ensure the success of the campaign by diligently attending to the logistics of the expedition. Transportation routes were secured by land and by sea, provisioning of his army was maintained by mule-pack and by ship, and heavy artillery (two *fenèvols*) was transported to Burriana to batter its walls.[91]

The siege of Burriana lasted for two months —from mid May to mid July 1233— and began with bombardment by a *fenèvol* and a *manganel*.[92] Two *algarrades* inside the city were unable to silence the Christian machines. A mobile siege tower was constructed and advanced before the wall where it was put out of action by the bombardment of the *algarrades*. Mines were dug as a number of sallies in force were conducted by the Muslims. Between 100 and 200 men took part in these sallies. When the mines reached the moat, an assault was made on a tower battered down by the *fenèvol*. The attack failed, but the defenders sued for terms and surrendered. The 7,032 inhabitants of this strategic town complied with the terms of surrender and withdrew.[93]

The conquest of Burriana was the turning point of the war. After its fall, James was able to quickly subjugate the entire provinces of Peñíscola and Castellón («those castles that are at the back of Valencia»).[94] He next set about to complete the second stage of his plan: the conquest of Valencia city. He focused first on establishing a bridgehead at Puig, fourteen kilometers north of Valencia.[95] This was completed in 1237. Now, only a vigorous counterattack could forestall James's drive southward and save Valencia. Zayyān, who had snatched Valencia in 1229 from its Almohad governor Abū Zayd, assembled all the forces he could raise «from Játiva to Onda», a full 600 knights and 1,100 men

1245 with the surrender of Játiva and Biar: «And when [the Muslims] saw that I had Játiva and Biar, they surrendered to me all the rest of the kingdom from the Júcar down to the land of Murcia», roughly the bottom third of the kingdom, «according to the agreement that I should keep them in the Kingdom; and thus I had it all» (*E, quan viren que nós havíem Xàtiva e Biar, rendés a nós tot l'altre reyne que era de Xúcar tro en terra de Múrcia, ab covinença que nós los havíem feyta que·ls retinguéssem el regne. E ayxí haguem-ho tot*) (*Libre dels feyts*, 360.12-15). The post-1245 struggle for Islamic Valencia enters James's memoirs as «an inconsequential epilog» to the Crusade, not an integral part of it (Robert I. Burns, *Muslims, Christian, and Jews in the Crusader Kingdom of Valencia*, pp. 280-281).

91. James I, *Llibre dels fets*, 130.11-17. One of James's most conspicuous command attributes was attention to logistics. See Robert I. Burns, «The Crusade against Murcia: Provisioning the Armies of James the Conqueror, 1264-1267», in *Jews, Muslims and Christians in and Around the Crown of Aragon: Essays in Honour of Professor Elena Lourie*, ed. Harvey Hames, Leiden, 2004, pp. 35-75.

92. The two *fenèvols* mentioned by James in *Llibre dels fets*, 130.15, may be the same machines later referred to as a *fenèvol* and a *manganel* that James had «made» at the siege of Burriana (*Llibre dels fets*, 156.5).

93. James I, *Llibre dels fets*, chs. 130, 156-178; Robert I. Burns, *Islam under the Crusaders*, pp. 140, 160.

94. James provides a representative sampling of the sites that «live on the supplies from the Burriana plain» that would have to surrender to him upon Burriana's fall or that were subsequently won by him after Burriana capitulated: Alcalatén, Ares, Borriol, Castellón de Burriana, les Coves de Vinromà, Cervera, Culla, Morella, Peñíscola, Poplís, Vilafamés, and Xivert. See James I, *Llibre dels fets*, chs. 130, 186; Robert I. Burns, *Islam under the Crusaders*, pp. 126-127.

95. James I, *Llibre dels fets*, chs. 206-209; Robert I. Burns, *Crusader Kingdom of Valencia*, p. 249.

on foot, and launched an assault against Puig in August 1237.[96] James's forces faltered and fell back, but a cry of «Shame, knights, shame!» («Vergonya, cavallers, vergonya!») rallied his soldiers who then counterattacked and put the Muslim army to rout.[97] After this victory, James was able to secure the surrender of a number of castles south of Burriana right up to the outskirts of Valencia: Almenara,[98] Castro,[99] Uxó,[100] Nules,[101] Alfándec,[102] Paterna,[103] Bétera,[104] Bufilla,[105] and Silla.[106]

With the noose tightened, James besieged Valencia. The investment lasted for half a year —from April to late September 1238. The city was subjected to continuous bombardment by one *trabuquet* and two *fenèvols*. James had the artillery set up some distance from the city gates so that the Muslims would not be able to sally out and destroy them. Mining of the outer wall was undertaken as artillery put down a heavy barrage of stone-shot against defending forces. While these operations were being carried out a Hafsid fleet —consisting of twelve galleys and six smaller vessels— attempted to land a relief force. Fearing an ambush upon landing, the fleet turned away without joining battle. Isolated and cut off from outside help, the siege settled down to a routine of bombardment and skirmishing. After a month under siege, the prospects for further resistance looked dismal. Supplies and food were running short because the Valencians had not been able to get in their harvest before James besieged their city. James, on the other hand, was well supplied with provisions and military stores: «As to our camp, I can say of it that I, who have made thirty of them at different times, have never seen one so well supplied as that was with the things that were necessary for man's help».[107] While James entered into negotiations with Zayyān's nephew, jousts were held in front of the city between Muslim and Christian knights. Zayyān agreed to surrender the city in September 1238 on the condition that the Muslims would be able to take away all the effects that they could carry; that they would not be searched; that no harm would be done to them; and that they would go under escort to Cullera.[108] James accepted these terms and made his triumphal entry into Valencia on 9 October. By this conquest, James won Valencia and all of Zayyān's territories down to the Júcar River.

Meanwhile, the rest of *Sharq al-Andalus* was coming apart. Ibn Hūd was assassinated earlier in 1238. The ruler of Játiva, Abū al-Ḥusayn Yaḥyá ibn Aḥmad Ibn ʿĪsá al-Khazrajī al-Anṣārī had died in 1237 and was succeeded by his inexperienced son Abū Bakr. For a time, Abū Bakr supported Zayyān. Zayyān hoped for a comeback. After the surrender of Valencia he fled to Murcia where he attempted to gain the support of the Hafsids as «emir of the East». His bid for power lasted less than

96. James I, *Llibre dels fets*, ch. 217; Robert I. Burns, *Islam under the Crusaders*, pp. 35, 308. James's tally of Zayyān's forces was «six hundred knights and eleven thousand men on foot» (*DC. cavallers e bé .XL. mília hòmens de peu*) (*Llibre dels fets*, 217.10-11). The number of infantry seems greatly exaggerated, perhaps by a factor of ten.

97. James I, *Llibre dels fets*, ch. 218.

98. James I, *Llibre dels fets*, chs. 243-247; Robert I. Burns, *Islam under the Crusaders*, pp. 127, 160-161.

99. James I, *Llibre dels fets*, ch. 249; Robert I. Burns, *Islam under the Crusaders*, p. 127.

100. James I, *Llibre dels fets*, chs. 250-251; Robert I. Burns, *Islam under the Crusaders*, p. 127.

101. James I, *Llibre dels fets*, ch. 252; Robert I. Burns, *Islam under the Crusaders*, p. 127.

102. James I, *Llibre dels fets*, ch. 253; Robert I. Burns, *Islam under the Crusaders*, pp. 131, 336.

103. James I, *Llibre dels fets*, ch. 254; Robert I. Burns, *Islam under the Crusaders*, p. 127.

104. James I, *Llibre dels fets*, ch. 254; Robert I. Burns, *Islam under the Crusaders*, p. 127.

105. James I, *Llibre dels fets*, ch. 254; Robert I. Burns, *Islam under the Crusaders*, p. 127.

106. James I, *Llibre dels fets*, ch. 263; Robert I. Burns, *Islam under the Crusaders*, p. 127.

107. James I, *Llibre dels fets*, 270.7-10: «E aytant podem retraure d'aquela ost, que nós, que n'havem feytes bé .XXX., no vim anch neguna saó ost tam bé bastada con aquela, de les coses que eren mester per ajuda d'ome, sí que·ls malaltes trobaven conseyl d'apoticaris con si fossen en Barcelona o en Leyda.»

108. James I, *Llibre dels fets*, ch. 278.

two months; he then sought refuge in Tunis. By the late 1230s Castile was moving to win Murcia over, and in 1243 Murcia submitted to Castile as a Mudejar kingdom by the treaty of Alcaraz. Castile's designs on Játiva propelled James to act decisively to secure Játiva for his realm. Two siege campaigns against Játiva —summer 1239 and summer 1240— led to a negotiated compromise, while a third siege in 1244 brought about the surrender of the city on 5 June 1244.[109]

The three sieges of Játiva do not appear to have been as hard fought as those of Burriana and Valencia. Játiva's defenses were formidable, far stronger than the fortifications of Burriana and Valencia. Desclot says that James was able to subdue Játiva only by means of clever negotiations. The approach to the castle of Játiva was so narrow that «twenty men could hold off ten thousand». Nowhere else was there «a castle so strong or so regal».[110] James's Hungarian born queen, Violant, called Játiva «the most beautiful castle in the world, and the very best that I or any person has ever seen».[111] James wore the defenders down by systematically laying waste the surrounding countryside. He devastated the watercourses and irrigation canals and destroyed the mills. He cut off water from the townspeople and the surrounding farmlands and raided the network of fortifications in the surrounding area. The treaty of Almirra (Almizra, Almiçra, or Almisra), signed by James and the future King Alfonso X on 26 March 1244, left Játiva isolated.[112] No longer could Abū Bakr play Aragon-Catalonia against Castile. Alfonso now abandoned Castile's plans for Játiva, and a common boundary between Castile's Murcia and Aragon's Valencia was established. The southern boundary of James's realms was fixed along a line running west to east from Biar, the southernmost effective strongpoint in *Sharq al-Andalus*, to Altea on the Mediterranean coast.[113] With no prospect of outside support, Abū Bakr shrewdly sought to win the best terms possible in a negotiated settlement with James.

Abū Bakr agreed to surrender the city and hand over the smaller of the two castles that comprised the principal bulwarks of Játiva's formidable defenses, while retaining the major castle for two years more. At the end of two years, Játiva's major castle would be delivered over to the king and Abū Bakr would be compensated with another castle. Queen Violant urged James «not to delay for one castle or two», since it would be foolish to sacrifice what is possible —wining the strategic prize of Játiva— in search of what is impossible —immediately acquiring the twin citadels of Játiva.[114] James wisely took his wife's advice. The treaty that was ratified on 5 June 1244 secured significant guarantees and privileges for the Jativans. Thirty of the surviving provisions of the treaty concern exemptions, guarantees, and the retention of customary practices; only seven provisions pertain to obligations of the new subject community.[115] Notwithstanding later Muslim revolts that put James's conquest of the Kingdom of Valencia in jeopardy, James's strategic vision had been realized with the capitulation of Játiva.[116]

109. Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, pp. 72-74.

110. Desclot, *Crònica*, ch. 49: «un castell que al món no n'ha tan forts ne tan reial»; «és tan forts que no hi pot hom muntar sinó per un lloc, e aquell lloc guardarien vint hòmens a deu míl·lia.»

111. James I, *Llibre dels fets*, 353.19-20: «que·l pus castell és del món e·l pus rich que jo anch veés ne nuyl hom».

112. Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, pp. 17, 92, 95, 98, 148, 214, 233; Joseph F. O'Callaghan, *Reconquest and Crusade*, p. 106.

113. The towns ceded to James that lay between Biar and Altea included Castalla, Jijona, Relleu, Alarc, Finestrat, and Agües (Aguas de Busot) (James I, *Llibre dels fets*, ch. 349).

114. James I, *Llibre dels fets*, 353.16-19: «Seyor, ¿quiny conseyl vos poria jo donar en aquest feit, ne negú? Conseyl-vos que, pus podets haver Xàtiva, que no u alonguets per .I. castell ni per .II.» As Clausewitz says, «the man who sacrifices the possible in search of the impossible is a fool» (Carl von Clausewitz, *On War*, p. 637).

115. Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, pp. 63-192.

116. On the later Muslim revolts that imperiled James's conquest, see Robert I. Burns, «The Crusade against Al-Azraq: A Thirteenth-Century Mudejar Revolt in International Perspective», *American Historical Review*, no. 93 (February 1988), pp. 80-

Conclusion

King James's military strategy targeted key enemy strongpoints, the conquest of which would either imperil or seriously weaken the enemy's capacity to offer resistance in surrounding regions; or would isolate enemy territory from bases of support, rendering the severed appendage vulnerable to attack and subjugation. This strategy was dictated by the positional nature of medieval warfare that made the acquisition and defense of territory the principal objective of warfare and by the constraints imposed upon James in terms of time, manpower, and resources. The essence of James's strategy for the conquest of *Sharq al-Andalus* was to concentrate maximum strength against the three major strongpoints of the region: Burriana, Valencia, and Játiva. Key to the successful implementation of this strategy was the use of mechanized siegecraft, particularly the employment of heavy artillery.[117]

In his memoirs, James reduces the business of war to a few commonsense precepts, the most famous being «cunning is better than force».[118] Like all maxims, it can only be understood and applied by someone «already possessing a good practical knowledge of the art».[119] A novice, unfamiliar with the art of war, or with James's military career, might regard cunning and force as polar opposites and consider the dictum to mean that James was adverse to the use of force.[120] Nothing could be further from the truth. James simply suggests that cunning is more to strategy than force. In James's mind, the two elements —cunning and force— form a single harmonious whole. Force must be cunningly

106; Robert I. Burns, «La guerra de Al-Azraq de 1249», *Sharq Al-Andalus: Estudios mudejares y moriscos*, no. 4 (1987), pp. 253-256; Robert I. Burns, «A Lost Crusade: Unpublished Bulls of Innocent IV on al-Azraq's Revolt in Thirteenth-Century Spain», *Catholic Historical Review*, no. 74 (July 1988), pp. 440-449; Robert I. Burns and Paul E. Chevedden, «Al-Azraq's Surrender Treaty with Jaume I and Prince Alfonso in 1245: Arabic Text and Valencian Context», *Der Islam*, no. 66 (1989), pp. 1-37; Robert I. Burns, «A Unique Bilingual Surrender Treaty from Muslim-Crusader Spain», *The Historian*, 62 (Spring 2000), pp. 510-534; Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, pp. 3-59, 213-230.

117. For a very different assessment of the role of mechanized siegecraft in James's conquests, see Robert I. Burns and Paul E. Chevedden, *Negotiating Cultures*, p. 223: «Mechanized siegecraft was not *the* critical factor in James's successes (a simple tally of all the bloodless surrenders indicates that); but his ability to conduct effective siege warfare certainly was a major factor in his military achievements.» Mechanized siegecraft certainly was *the* critical factor in James's triumphs, for without it he would not have been able to effect the breakthroughs he did that then permitted him to achieve the piecemeal defeat of Islamic Valencia.

118. James I, *Llibre dels fets*, 43.26: «més val giny que força». James's dictum echoes the sentiment expressed by Prudentius, the fourth-century Christian Latin poet of Spain, in his allegorical poem *Psychomachia*: «nil refert, armis contingat palma dolisue» («What do I care whether I win by force or by cunning?»). Prudentius, *Prudentius*, ed. and trans. H. J. Thomson, 2 vols., Loeb Classical Library, Cambridge (MA), 1961-1962, vol. 1, p. 316, line 550. Among James's other precepts are: «it's better to figure things out beforehand than just to find them out» (*més val qui ho divina que qui ho cerca*); «he who doesn't give what hurts, doesn't get what he wants» (*qui no do ço que vol*); «the sooner one takes counsel on the harm done to him, the better it is for him» (*con habans pren hom conseyl al dan que hom pren, més val*); «overnight the state of things can change, and one should be prepared in advance so that change does not do one harm» (*los temps se cambien, e enans d'ora deu hom guardar que no pusca venir a fer son don*). See James I, *Llibre dels fets*, 193.15, 244.2-3, 361.25-26, 366.20-22; Robert I. Burns, «Spiritual Life of James the Conqueror», pp. 23-24.

119. Michael Polanyi, *Personal Knowledge: Toward a Post Critical Philosophy*, Chicago, 1962, p. 31. «Rules of art», states Polanyi, «can be useful, but they do not determine the practice of an art; they are maxims, which can serve as a guide to an art only if they can be integrated into the practical knowledge of the art» (p. 50).

120. Aversion to force is reflected in the thinking of Basil Liddell Hart: «War is a monstrous fraud ... The more I reflect on the experience of history the more I come to see the instability of solutions achieved by force, and to suspect even those instances where force has had the appearance of resolving difficulties» (quoted in Alex Danchev, «Liddell Hart's Big Idea», *Review of International Studies*, no. 25 [January 1999], pp. 29-48, at p. 36; Alex Danchev, «Liddell Hart and the Indirect Approach», *Journal of Military History*, no. 63 [April 1999], pp. 313-337, at p. 320). «Not believing in force», as Leon Trotsky remarks, «is the same thing as not believing in gravitation» (quoted by Grigorii Petrovich Maksimov, *The Guillotine at Work: Twenty Years of Terror in Russia [Data and Documents]*, Chicago, 1940).

applied, and cunning must be combined with force. But the cunning of reason, or judgment, must guide the use of force, just as the Roman poet Horace understood (*Vis consili expers mole ruit sua*).[121] Force, untempered by judgment, exacts a heavy price in war.

Cunning and force (*la furbizia e la forza*) have been the *materia prima* of war from time immemorial. As Thomas Hobbes observes, «force and fraud are in war the two cardinal virtues».[122] James would have agreed with Hobbes, and he would have found Leon Trotsky's advice on the use of force as compatible with his own views: «Where force is necessary, there it must be applied boldly, decisively and completely. But one must know the limitations of force, one must know when to blend force with a maneuver; a blow with an agreement».[123] When force was necessary to achieve his military strategy, James applied it boldly, decisively, and completely, as he did at Majorca, at Burriana, and at Valencia. When the formidable defenses of Játiva exposed the limitations of force, James blended force with maneuver, a blow with an agreement.

James's cunningly-laid strategy of war did rely on force, and lots of it, in order to overwhelm the key enemy strongpoints that he targeted. The key to the door of *Sharq al-Andalus* was Burriana, and mechanized siegecraft turned the key. The dominant tool of mechanized siegecraft was heavy artillery, and James deftly employed a battery of heavy artillery to breach the walls of Burriana and force its capitulation. With the fall of Burriana the door of *Sharq al-Andalus* swung open, and James made sure —through land-based and sea-based logistic support of his forces— that it would remain open. The conquest of Burriana unhinged the defenses of the Kingdom of Valencia and sealed the fate of its capital city. Valencia, like Burriana, faced the might of James's siege engines. Round-the-clock bombardment by heavy artillery and ongoing mining operations, punctuated by several major assaults on the city walls, finally forced the Muslims to surrender. Játiva eventually succumbed to entreaties for a negotiated settlement, but this was after three sieges and the sack of its surrounding district.

The use of artillery in the war against *Sharq al-Andalus* was decisive in the outcome of the struggle. Despite all the bloodless surrenders that James achieved, such a turn of events could not have been accomplished without the tactical breakthroughs brought about by the conquest of Burriana and Valencia, and these breakthroughs relied heavily upon sustained bombardment from a breaching battery of artillery. To achieve these breakthroughs, James applied a maximum concentration of his forces to overwhelm these strongpoints. Once the objective was obtained (e.g., Burriana, Valencia), and *Sharq al-Andalus* had been effectively subdivided, James was able to expand upon his tactical breakthroughs and create a strategic breakthrough by quickly subjugating other enemy enclaves separately and successively. The relatively bloodless nature of James's conquest of the Kingdom of Valencia was predicated upon his use of maximum force to achieve tactical breakthroughs, which then provided the opportunity of defeating in detail the disconnected Muslim contingents still arrayed against him in the many cities, towns, and castles in the realm.

121. Horace, *Odes*, bk. 3, no. 4, line 65.

122. Thomas Hobbes, *Leviathan, or, The Matter, Forme & Power of a Common-wealth Ecclesiasticall and Civill*, London, 1651, p. 53 (pt. 1, ch. 13, ¶ 13). Sun Tzu expresses the same idea in another way: «All warfare is based on deception. Hence, when able to attack, we must seem unable; when using our forces, we must seem inactive; when we are near, we must make the enemy believe we are far away; when far away, we must make him believe we are near. Hold out baits to entice the enemy. Feign disorder and crush him» (Sun Tzu, in *Roots of Strategy: A Collection of Military Classics*, ed. Thomas R. Phillips, Harrisburg [PA], 1940, p. 23).

123. Leon Trotsky, *What Next? Vital Questions for the German Proletariat*, trans. Joseph Vanzler, New York, 1932, p. 173.

James was able to bring a brilliant strategic plan to a successful operational conclusion. How did he do it? Perhaps the answer lies in a clearly defined goal, a plan to achieve it, and consistent pursuit of that goal. «Firm resolution», observes Field Marshal Count Helmuth von Moltke (1800-1891), «and the persevering implementation of a simple thought are the safest way to achieve the objective».[124] Yet the patient, persevering implementation of a simple thought is not as simple as it sounds. Dwight D. Eisenhower found this to be the most difficult of all tasks: «Nothing is more difficult in war than to adhere to a single strategic plan. Unforeseen and glittering promise on the one hand and unexpected difficulty or risk upon the other present constant temptation to desert the chosen line of action in favor of another one».[125] James exhibited vision and constancy in that vision. He was above all an artist, and his military deeds were the instruments of his art.[126]

124. Quoted in Franz Herre, *Moltke: Der Mann und sein Jahrhundert*, Stuttgart, 1984, p. 7; Roland G. Foerster, «The Operational Thinking of the Elder Moltke and its Consequences», in *Operational Thinking in Clausewitz, Moltke, Schlieffen and Manstein*, ed. Militärgeschichtliches Forschungsamt, 2nd ed., Bonn, 1989, pp. 21-40, at p. 38.

125. Dwight D. Eisenhower, *Crusade in Europe*, Garden City (NY), 1948; reprinted Baltimore, 1997, p. 48.

126. On James as an artist, see Robert I. Burns, «Spiritual Life of James the Conqueror», p. 35.