

## MEDIEVAL CRANES IN QAL'AT AL-MARQAB, SYRIA

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*The crusades of the 12<sup>th</sup> and 13<sup>th</sup> centuries resulted in the formerly unprecedented development of medieval warfare, especially in the field of military architecture. While the still standing magnificent ruins of the massive castles reveal much about the architecture itself, far less is known about the military and mechanical infrastructure inside these stone-built military centres. Thus, the stone device brought to light during the excavations of the Syro-Hungarian Archaeological Mission in the Hospitaller castle of Qal'at al-Marqab in 2007 is of particular importance. The stone find was probably the base of a treadwheel crane, used for lifting military equipment from the castle courtyard to the main fighting platforms on the adjacent rooftops. This piece is possibly one of the earliest finds of this technical innovation that became widespread in contemporary Europe.*

### QAL'AT AL-MARQAB – MARGAT

Founded in 1062, Qal'at al-Marqab had local Muslim tribes, Byzantines and Crusader nobles as its owners until Bertrand de Mazoir, its last lord, sold it to the Order of St. John.<sup>1</sup> The Hospitallers completely redesigned the fortifications on the huge mountain plateau and constructed one of the largest Crusader castles of the



*Fig. 1: The “stone circle” during excavation as seen from the chapel roof, with the castle courtyard in the background*

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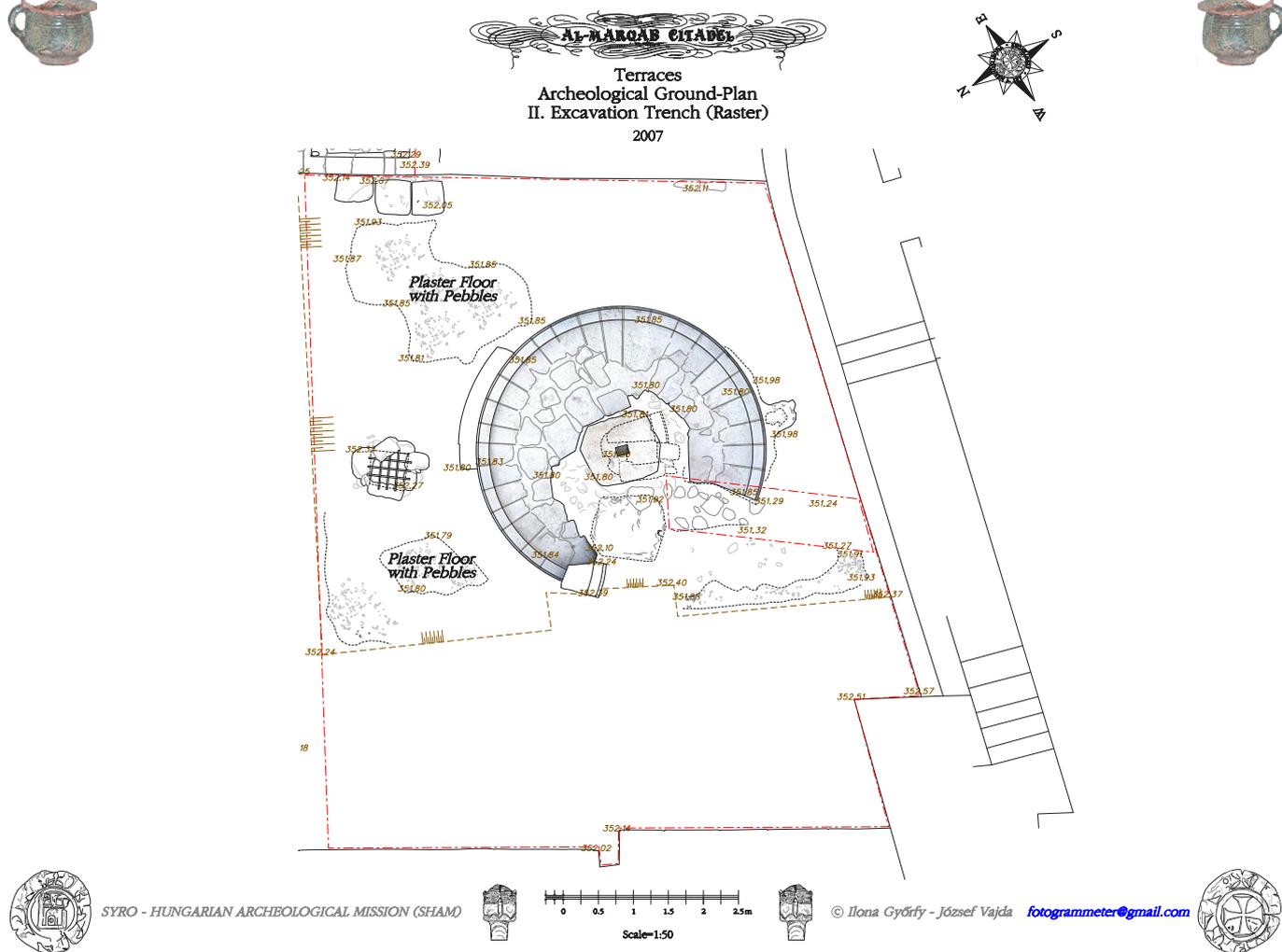


Fig. 2: Plan of the circular platform

Near East in less than fifteen years.<sup>2</sup> Its importance was clearly reflected in the fact that sometime between 1204 and 1206, Margat was home to the Order's chapter general. The site survived the terrible earthquake of May 1202 and several sieges, including the one in 1204/1205, only to fall to the Mamluk forces of Sultan Qalawun in the spring of 1285 after a five weeks long siege.

### THE "STONE CIRCLE"

The rescue excavations conducted on top of the vaulted halls (I.1) framing the main courtyard of the citadel from the east brought to light the broken remains of a circular structure that could be reassembled on the spot. The elements of the circular platform with a diameter of 4.10 m were carved of basalt stone set in a foundation of strong mortar and stone rubble reaching down to the curve of the vaults. The only architectural details of the structure were the 18 cm wide and few centimetres high raised rim, and the rectangular pivot hole measuring 0.17 m by 0.11 m in the stone slab in the structure's centre. The perfect horizontal levelling and fine execution of the robust structure indicated that it was designed to support a rather heavy, fixed structure that left no abrasion on its surface, and thus an economic function such as an olive press or mill

<sup>2</sup> Kázmér, Miklós – Major, Balázs: Distinguishing Damages from Two Earthquakes – Archaeoseismology of a Crusader Castle (al-Marqab Citadel, Syria). *The Geological Society of America*. Special Paper 471 (2010), 185–198.



Fig. 3: Reconstruction of the courtyard corner adjacent to the chapel with the crane

can be excluded.<sup>3</sup> At the same time, it was apparent from the very beginning that the stone circle was in the most suitable location for serving as the support of a crane that lifted heavy weights onto the top of the vaults and the adjacent buildings.

The end of the 12<sup>th</sup> century witnessed a military revolution precipitated by the invention and spread of the counterweight trebuchet,<sup>4</sup> and as a result, artillery battles became the decisive factors in sieges by the late 12<sup>th</sup> century and during the 13<sup>th</sup> century. While there is a consensus that the trebuchets used by the defenders were operated from the highest locations in the castles to achieve a wider shooting range,<sup>5</sup> less attention has been paid to the question of how the machines and their projectiles made it onto the rooftops. This question is all the more important in al-Marqab because the best shooting platforms are the roofs of the chapel and the donjon, but both can only be approached via narrow staircases, less than 1 m wide, with several right angle turns, which makes them absolutely unsuitable for carrying heavy loads or long catapult beams.

<sup>3</sup> A similar stone circle has recently been identified as a mill: Zimmer, John – Meyer, Werner – Boscardin, Letizia: *Krak des Chevaliers in Syrien. Archäologie und Bauforschung 2003–2007*. (Deutsche Burgenvereinigung, Koblenz 2011), 322. However, there are many facts that refute an interpretation along these lines. Disregarding the fact that there was not enough space for the movement of humans or animals around the stone circle, it is obvious that the high rooftop could not be accessed by animals via the narrow and winding staircase, and neither it would have made much sense to carry the grain to the rooftop for grinding. Wind power can also be excluded because the area is wholly sheltered from the wind by the chapel. Finally, there is no reason to assume that grain would have been grinded on top of a barely accessible area of a military base, when there were more suitable locations inside the fortified inner *suburbium* covering almost five hectares. For a genuine Hospitaller grinding mill from the same period, see Rosser, John: Excavations at Saranda Kolones, Paphos, Cyprus, 1981–1983. *Dumbarton Oaks Papers* 39 (1985), 81–97. The possibility of an olive grinding mill or press can also be excluded because olive processing needs built-in tanks and immense quantities of water and, incidentally, has a very foul-smelling by-product.

<sup>4</sup> Chevedden, Paul E: The Invention of the Counterweight Trebuchet: A Study in Cultural Diffusion. *Dumbarton Oaks Papers* 54 (2000), 71–116.

<sup>5</sup> Chevedden, Paul E: Fortifications and the Development of Defensive Planning during the Crusader Period. In: *The Circle of War in the Middle Ages*, eds Kagay, Donald, J. – Villalon, Andrew L.J. (Woodbridge: Boydell Press, 1999), 38, 41–42.



Fig. 4: Fragments of another “stone circle” in a secondary position



Fig. 5: Remains of the “stone circle” in Crac des Chevalier

## THE CRANE

The main fighting platforms could be reached with ease from the location of the stone circle excavated in al-Marqab. A wooden crane structure centred around the vertical wooden beam, whose pivot hole was in the centre of the “stone circle” would have been ideally placed to lift loads from the castle courtyard onto the platforms above. That this machine was probably equipped with a treadwheel attached to this central shaft is indicated by the absence of any additional structures or holes on the rooftop and by the lack of space for any horizontal human or animal rotation. It is also possible that this same crane was used to deliver cargoes from the top of the vault on which it stood to the top of the chapel, a possibility supported by the doorway in the chapel’s crenellation overlooking the terrace of the crane. The broken fragments of robust basalt stone slabs lay below this opening – these once functioned as a platform jutting out from the wall to where the loads (such stone projectiles for the trebuchets) could be hoisted and then rolled to their final place. Surviving examples of treadwheel cranes have a similar circular base constructed of carved stones with a raised rim<sup>6</sup> to prevent the sliding of the sleepers that form the base of the crane.

Treadwheels seem to have re-appeared among the mechanical equipment used by medieval builders by the 12<sup>th</sup> century, although the earliest certain reference to this device (*magna rota*) occurs in a French source dating from around 1225.<sup>7</sup> Although Vault I.1 is rather difficult to date, we have reason to assume that it was constructed around the turn of the 13<sup>th</sup> century, and probably cannot be later than the great reconstruction and construction projects following the earthquake of 1202 and the building activities in 1204–1206, before the erection of the chapter general. As the construction of the “stone circle” sealed a former ventilation shaft of the vault, it was obviously built in a later construction phase. One possible date might be the siege of 1204–1205: it was either built as part of the preparations made for the siege or during the reconstruction following the siege, to strengthen the castle’s defences. In any case, it seems to have existed by the time of the chapter general, meaning that it is a very early example of a structure of this kind.<sup>8</sup>

Subsequent excavations and the assessment of the carved stone relics indicated that the “stone circle” on top of Vault I.1 was not the only such structure in al-Marqab. Three fragments of another stone circle,

<sup>6</sup> Dienel, Hans-Liudger – Meighörner, Wolfgang: *Der Tretradkran*. Technikgeschichte, Modelle und Rekonstruktionen. (München: Deutsches Museum, 1997), 22.

<sup>7</sup> Matthies, Andrea: Medieval Treadwheels. Artists’ Views of Building Construction. *Technology and Culture* 33, No. 3. (July 1992), 515.

<sup>8</sup> The two crusader silver bullion deniers recovered from the debris covering the area too suggest a date before the mid-13<sup>th</sup> century for the “stone circle”. The first is a “star denier” of Bohemond IV (1187–1233), the second is a “gateway denier” of Henry I (1218–1253). For the “star denier” of Tripoli, see Malloy, Alex G. – Preston, Irene F. – Seltman, A.J.: *Coins of the Crusader States 1098–1291* (New York, Attic Books: 1994), 171, and Metcalf, Donald. M.: *Coinage of the Crusades and the*

apparently part of the same stone platform, were found the following year in three different locations, all three in a secondary position. This circle with a diameter of 4.65 m had a semi-circular raised rim. It is also possible that the fragments of a third one with a slightly different design were found, also in a secondary position, in the pavement of the first floor of the inner gate tower. It had an estimated diameter of 5.18 m and a 21 cm thick rim. The stone circle excavated in al-Marqab and the parallels suggest that a similar, but much larger<sup>9</sup> structure on top of the vaulted esplanade bordering the inner courtyard of the nearby Hospitaller fortress at Crac des Chevaliers does not represent the remnants of a mill, but of a crane platform, much needed in the war machinery of the Hospitaller castles along the Syrian coast.

## RECOMMENDED READING

DESCHAMPS, PAUL

*Les châteaux des croisés en Terre Sainte III. La défense du comté de Tripoli et de la principauté d'Antioche.* Paris: Geuthner, 1973.

DIENEL, HANS-LIUDGER – MEIGHÖRNER, WOLFGANG

*Der Tretradkran.* Technikgeschichte, Modelle und Rekonstruktionen. München: Deutsches Museum, 1997.

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The Master Plan of al-Marqab Citadel. Historical Background. In: Project Defence System on the Mediterranean Coast. Euromed Heritage II. Project. (Spain 2008), 162–174.

MATTHIES, ANDREA

Medieval Treadwheels. Artists' Views of Building Construction. *Technology and Culture* 33, No. 3. (July 1992), 510–547.

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*Latin East in the Ashmolean Museum Oxford.* (London, Royal Numismatic Society: 1995), 165 and Plate 21. no. 530. For the “gateway denier” of Cyprus, see Malloy 1994: 274 and Metcalf 1995: 194; Plate 25, no. 640. Treadwheel cranes were principally used in Western and Northern Europe. Matheus, Michael: Mittelalterliche Hafenkranen. In: *Europäische Technik im Mittelalter. 800–1400*, ed. Lindgren, U. (Berlin, Gebr. Mann Verlag: 1996), 345–348.

<sup>9</sup> The diameter of the stone circle of Crac is 7.45 m and has a rim thickness of 20 cm.