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2000. aasta kaevamised

ARHEOLOOGILISED VÄLITÖÖD EESTIS

ARCHAEOLOGICAL FIELD WORKS IN ESTONIA

2000

Koostanud ja toimetanud
Ülle Tamla

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Esikaas: hõbetatud naast Viljandi Pähklimäelt
Cover: plaque decorated with silver from Pähklimägi in Viljandi

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BESIEGING CONSTRUCTIONS FROM 1223 IN VILJANDI

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In the summer of 2000 archaeological excavations were continued in Viljandi, in the area south of the ruins of the Order Castle on a hillock called *Pähklikmägi* (Chestnut Hill) – a round hillock with a diameter of ca. 10 m (Valk 2000; Fig. 1: C). The excavation plot of the previous year (42 m²) was extended to the south, east and north. At first, the new areas were dug to the same level that the excavations in the central part of the hill had reached the previous year. Then the whole excavation plot (97 m²; Figs. 1–3) was dug down to the intact natural ground – a clayish sand. As in 1999, the excavated soil consisted of a disturbed cultural layer of a Late Iron Age settlement, which contained granite stones of different sizes (diameter up to 50–60 cm), big pieces of spring lime and brick fragments. The excavation results of 2000 confirmed the previous impression that the settlement cultural layer on the hilltop did not lie in the place of its formation: finds from different periods occurred mixed both in the top and bottom layers. In the centre of the hilltop the fill layer had a thickness of ca. 0.7–0.8 m from the original ground surface, while at the edges of the excavation plot it was 40–60 cm thick (Fig. 2, rows O–T). The number and density of stones was, as in 1999, highest on the eastern slope of the hill where a dense cluster of fallen stones could be observed (Fig. 2, rows N–R; Fig. 16).

The disturbed cultural layer contained different kinds of artefacts (VM 10811: 1–1722). Most numerous were sherds of wheel and hand-made pottery. The wheel pottery was sometimes decorated with wavy and linear ornamentation. The profile fragments (Fig. 4: 10–12) were represented mainly by the same types found in 1999 (Valk 2000, Figs. 8 and 9) but the finds included also some bowl fragments (Fig. 4: 10). The oldest sherds among the hand-made pottery were one with textile impressions and 12 with scabbled surface. Most of the hand-made pottery dates from the Viking Age, probably from the 10th–11th centuries (Fig. 4: 1–9). The sherds have mostly an uneven or coarse surface, but 27 fragments of smoothed vessels were also found. 16 sherds are from vessels with small holes at the edge (the “Röuge type pottery”) (Fig. 4: 1, 2, 5, 6). Among the finds there were also some sherds from vessels with a rim (Fig. 4: 3, 7–9).

The finds included numerous tools and utensils: 9 knives or knife fragments, 3 needles of bone and one of iron, a whetstone, an oval strike-a-light, 2 grinding stones, a big key (Fig. 5: 4) and a spoon-like iron artefact. Many iron objects were represented by smaller fragments and could not be identified. As a rare find, a

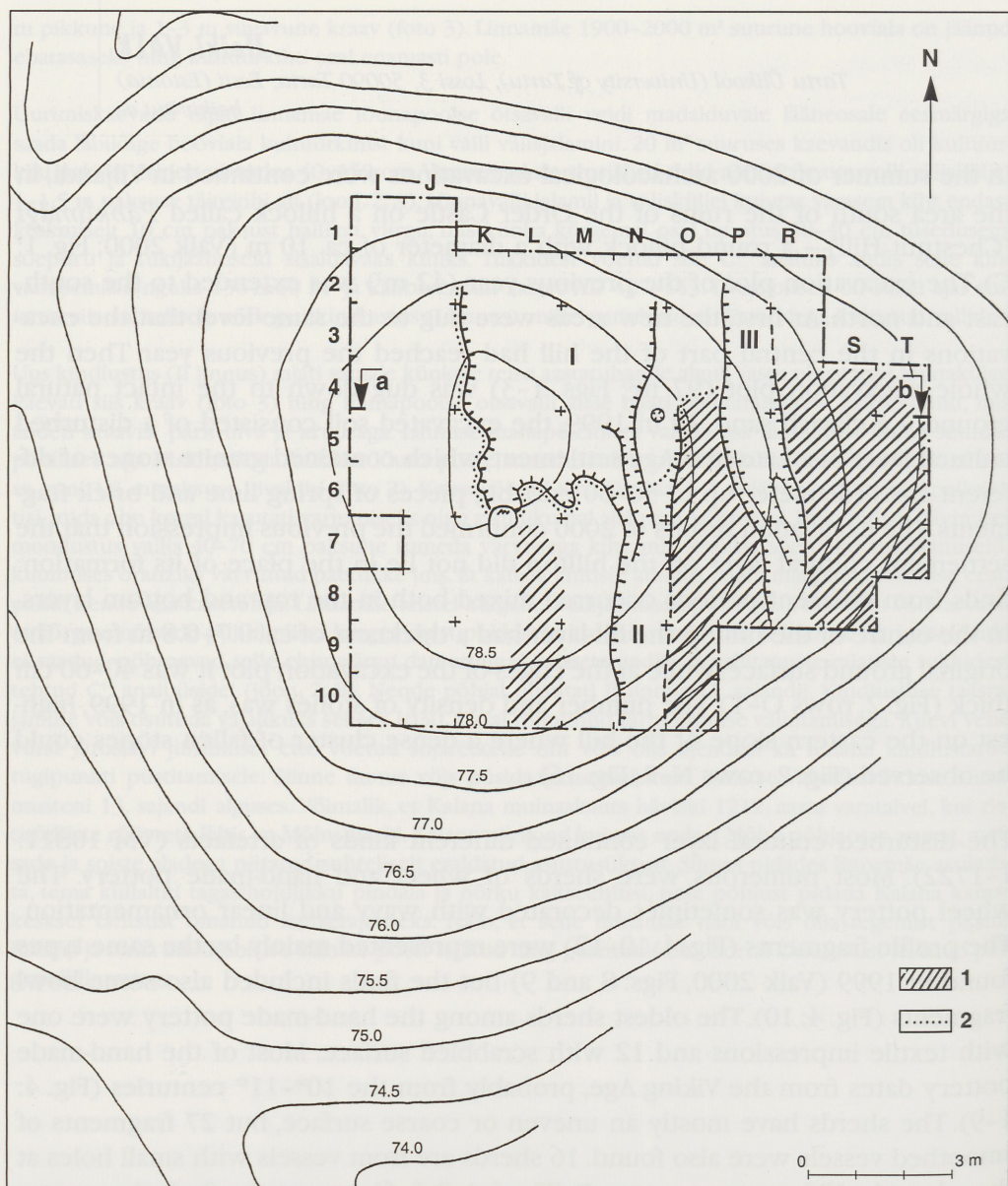


Fig. 1. Bottom of the excavation plot on Pähklimägi hillock. 1 - grey intact soil with remains of Viking Age cultural layer; 2 - border of the pit dug by the besiegers in 1223 for heaping up Musumägi; I - pit from which soil was used for heaping up Musumägi; II and III - ditches connected with besieging construction of 1223.

Joon. 1. Kaevandi põhi Pähklimäel. 1 - segamata looduslik alusmuld viikingaegse kultuurikihi jäänustega; 2 - pinnase äravedamisel tekkinud süvendi piir; I - süvend, millest võetud pinnast kasutati Musumäe kõrgendamiseks; II ja III - 1223. a. piiramisrajatisega seotud kraavitaolised sissekaevud.

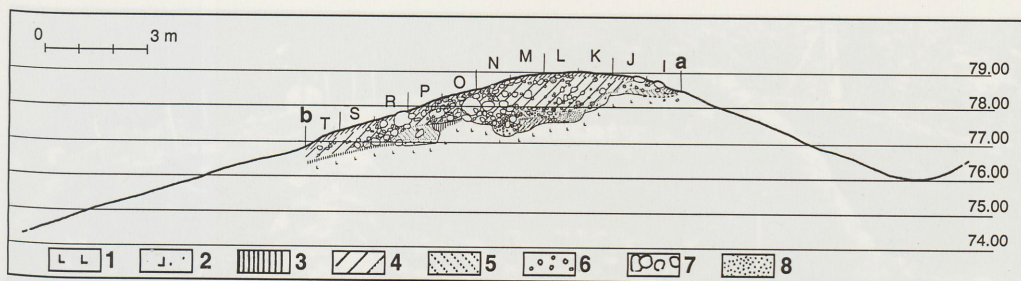


Fig. 2. Profile of Pähklimägi hillock: view from the north. 1 - intact natural mineral soil (sandy loam/Devonian sand); 2 - disturbed natural soil; 3 - intact grey natural soil; 4 - mixed cultural layer of Late Iron Age settlement; 5 - disturbed red sand; 6 - gravel, 7 - disturbed clayish sand; 8 - stones.

Joon. 2. Pähklimäe profiil, vaade põhjast. 1 - puutumata looduslik aluspinnas (saviliiv ja devoni liiv); 2 - segatud looduslik aluspinnas; 3 - puutumatu looduslik alusmuld; 4 - segatud asulakiht, 5 - segatud punane liivmuld; 6 - kruus; 7 - segatud savikas liiv; 8 - kivid.

ploughshare (Fig. 6) must be noted. Associated with handicraft activities are a fragment of antler with traces of elaboration, fragments of a crucible, a fragment of iron bar (Fig. 5: 5) and pieces of iron slag. Horse harnessing equipment is represented by 2 bridle fragments, and possibly also 2 iron rings. Two unique ornamented iron plaques decorated with silver (Fig. 7) belong apparently to a horse harness as well. Among the finds there were also 2 horseshoe nails. A fragment of a bronze artefact (Fig. 8) gives evidence of the technology of joining thin bronze sheets.

Ornaments are represented by fragments of at least 3 spiral rings, 2 bells with a slit (Fig. 9), 3 needles of penannular brooches (Fig. 10), a fragment of a round brooch of tin/bronze alloy, 2 fragments of flat thin bracelets (Fig. 11), a temple ring of wire (Fig. 13: 7) and a fragment of a stone pendant (or whetstone). Of the 4 beads found one was of clay (Fig. 12: 4), one of yellow (Fig. 12: 2), one of green and one of grey glass with white wavy decoration (Fig. 12: 3). The finds included also a fragment of a bronze chain (Fig. 13: 3), 11 single links of similar chains, a bundle of bronze spirals (Fig. 13: 1), 3 single bronze spirals (Fig. 13: 2, 4), a tiny rivet (Fig. 13: 5) and a plaque (Fig. 13: 6).

The most numerous group of finds next to the potsherds, however, consisted of crossbow bolts, arrowheads and their fragments, 33 items in all. Together with the 8 finds of 1999, their number from the hill is 41. All the crossbow bolts date from the conquest period of the early 13th century and have parallels from other Estonian hill-forts besieged by the German crusaders. Most common (15) are bolts with a tube and a massive head with a quadrate section (Fig. 14: 4). Their length was usually 7-8 cm but the biggest one was 10,5 cm long. Similar bolts



Fig. 3. A view of excavation plot on Pähklimägi from the east. On the hilltop oblong pit filled with stones and mixed cultural layer.

Joon. 3. Vaade kaevandile Pähklimäel idast. Mäelael kivide ja segatud kultuurkibiga täidetud süvend.

with a shaft (Fig. 14: 2) were represented by 7 finds. 5 narrow thin arrowheads with a short shaft were of flat rhomboid (Fig. 14: 3) and one of almost quadratic (Fig. 14: 5) section. One of the arrowheads was 11,9 cm long and very thin – apparently meant for penetrating the hauberk armour (Fig. 14: 1), and one fragment is from an arrowhead with a broad blade (Fig. 14: 6). The bolts and arrowheads occurred at different depths: both in the upper and lower part of the cultural layer, some of them even at its very bottom, just on the intact natural soil. Among weapons also a broken spearhead (Fig. 5: 1) and 2 javelin spearheads (Fig. 5: 2 and 3) were found.

The animal bones from the cultural layer were represented mostly by remains of big (28,9%) and small (29,9%) cattle and pig (17,8%). Also some hen (6,9%), dog (5,5%), horse (2,8%), beaver (2,4%), wild bird (2,2%), elk (1,4%), hare (1,4%) and bison (0,4%) bones were found (identified by Eha Järv and Paul Saks, Estonian Agricultural University). Of the fish bones and scales, most belonged to cyprinids, perch and pike. There were also some bream, roach, lavaret, ide and tench bones (identified by Lembi Lõugas, Institute of History).

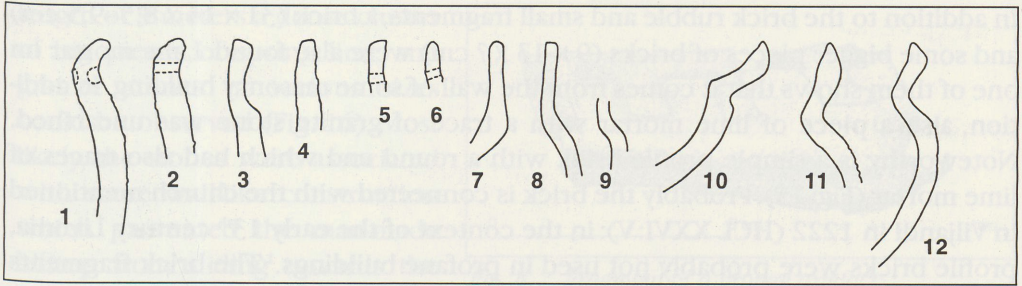


Fig. 4. Pottery profiles from Pähklimägi. 1-9 - hand-made pottery; 10-12 - wheel pottery.
Joon. 4. Keraamikaprofiilid Pähklimäelt. 1-9 käsitsikeraamika; 10-12 kedrakeraamika
(VM 10811: 1512, 1093, 809, 1589, 1022, 1031, 1341, 1219, 1288, 385, 1580, 883.).

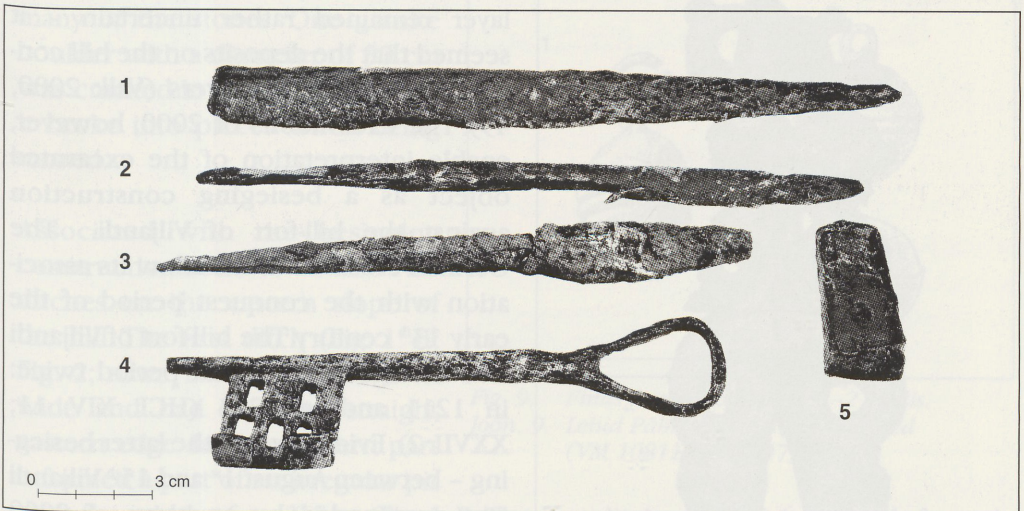


Fig. 5. Finds from Pähklimägi: 1 - spearhead fragment, 2-3 - javelin spearheads; 4 - key;
5 - fragment of iron bar.

Joon. 5. Leiud Pähklimäelt. 1 - odaotsa katke; 2-3 - viskeodaotsad; 4 - võti; 5 - rauakangi katke
(VM 10811: 603, 1271, 1636, 325, 1627).



Fig. 6. Ploughshare from Pähklimägi.

Joon. 6. Adratera Pähklimäelt (VM 10811: 562).

In addition to the brick rubble and small fragments, a brick ($31 \times 14 \times 8,5\text{--}9,5$ cm) and some bigger pieces of bricks ($9 \times 13 \times ?$ cm) were also found. Lime mortar on one of them shows that it comes from the wall of some masonry building. In addition, also a piece of lime mortar with a trace of granite stone was unearthed. Noteworthy is a simple profile brick with a round end which had also traces of lime mortar (Fig. 15). Probably the brick is connected with the church mentioned in Viljandi in 1222 (HCL XXVI:V): in the context of the early 13th century Livonia, profile bricks were probably not used in profane buildings.¹ The brick fragments from Viljandi are the oldest that are archaeologically datable in Estonia.



Fig. 7. Plaques decorated with silver from Pähklimägi.

Joon. 7. Hõbedaga kaunistatud naastud Pähklimäelt (VM 10811: 204, 302).

After the first year of excavation, the reasons for piling up the disturbed cultural layer remained rather uncertain – it seemed that the deposits on the hill consisted of 2 different layers (Valk 2000, 49). The excavations of 2000, however, enable interpretation of the excavated object as a besieging construction against the hill-fort of Viljandi. The German crossbow bolts allow its association with the conquest period of the early 13th century. The hill-fort of Viljandi was besieged during that period twice: in 1211 and in 1223 (HCL XIV: 11; XXVII: 2). Evidently, just the latter besieging – between August 1st and 15th Viljandi was surrounded by an army of 8000 Germans, Latgals and Livonians – must be considered here, since it is unlikely that the cultural layer of the Estonian settlement might have contained brick rubble in 1211 already.

The excavation results offer, however, no specific direct data about the nature of the besieging construction. From constructional elements, only the fallen stones along the whole eastern slope of the hill must be noted: here (together with the area excavated in 1999) for a

¹Oral comment by Kaur Alitoa (University of Tartu).

length of 9 meters a dense cluster of big pieces of spring lime and granite stones of various sizes could be observed (Fig. 16). Most likely, the stones were associated with some wall-like construction which prevented the man-made hilltop from sliding towards the lake and was supported by some timber framework. The use of timber as a construction material is indicated by traces of fire on many of the stones. One granite boulder with a diameter of 50 cm was cracked in heat so much that it broke into pieces when being moved.

Associated with the besieging construction seem to be also two ditches on the eastern slope of the hill. The first ditch (Fig. 1: II; Fig. 2; rows N-O) was 1.5–2 m wide and had a rather straight eastern edge. In its northern part it formed a part of an irregular pit

with the width of ca. 3.5 m (Fig. 1: I). The first ditch of 0.4–0.6 m depth from the hilltop was filled with a disturbed cultural layer, gravel and sand (Figs. 2 and 3). At both ends its depth approached zero because of the round and sloping shape of

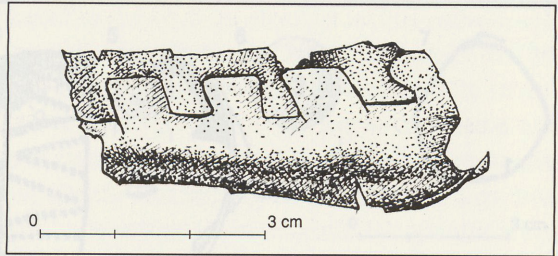


Fig. 8. Fragment of a bronze artefact.

Joon. 8. Pronkseseme katke, kus plekk on ühendatud hammasjätkega (VM 10811: 100).

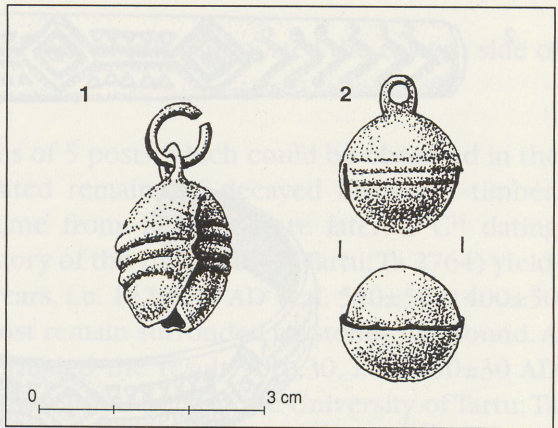


Fig. 9. Finds from Pähklimägi. 1–2 - bells.

Joon. 9. Leiud Pähklimäelt. 1–2 - kuljused (VM 10811: 181, 1473).

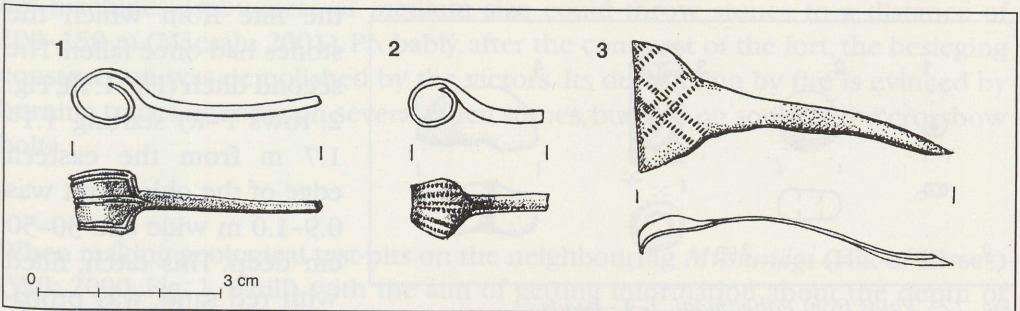


Fig. 10. Finds from Pähklimägi. 1–3 - needles of penannular brooches.

Joon. 10. Leiud Pähklimäelt. 1–3 - hoburaudsõlggede nõelad (VM 10811: 970, 1270, 1283).

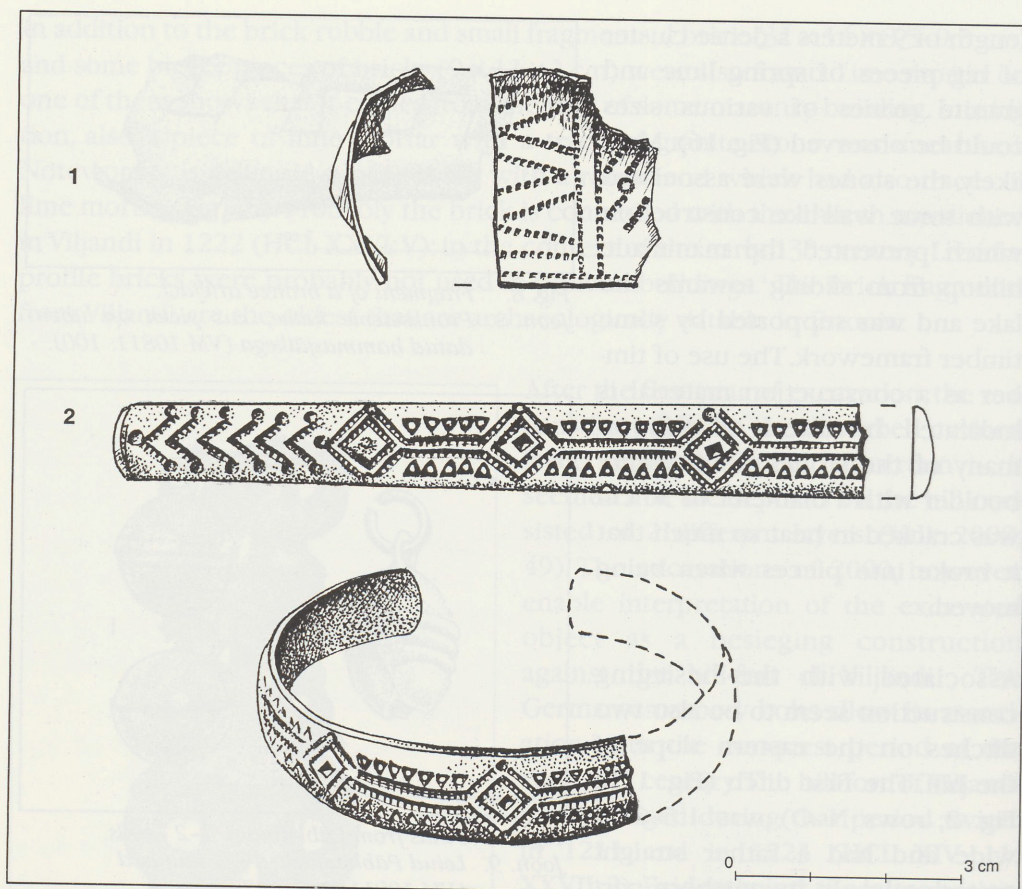


Fig. 11. Bracelet fragments from Pähklimägi.

Joon. 11. Käevõrutatked Pähklimäelt (VM 10811: 1028, 1167).

the hilltop. The layer of fallen stones on the original ground surface began immediately to the east of the ditch. The straight eastern side of the ditch may indicate

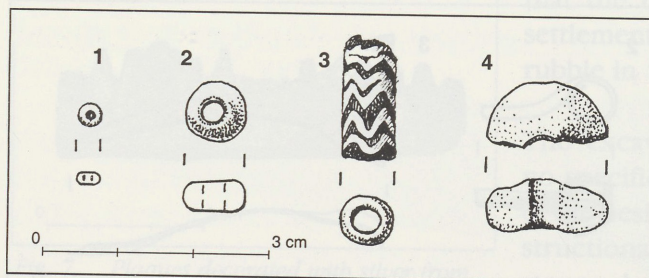


Fig. 12. Finds from Pähklimägi. 1-4 - beads.

Joon. 12. Leiud Pähklimäelt. 1-4 - helmed (VM 10811: 1718, 1351, 238, 192).

the line from which the stones had once fallen. The second ditch (Fig. 1: III; Fig. 2, rows P-R) starting 1.1-1.7 m from the eastern edge of the oblong pit was 0.9-1.0 m wide and 30-50 cm deep. This ditch, filled with red sand, was probably meant to embed some timber construction which

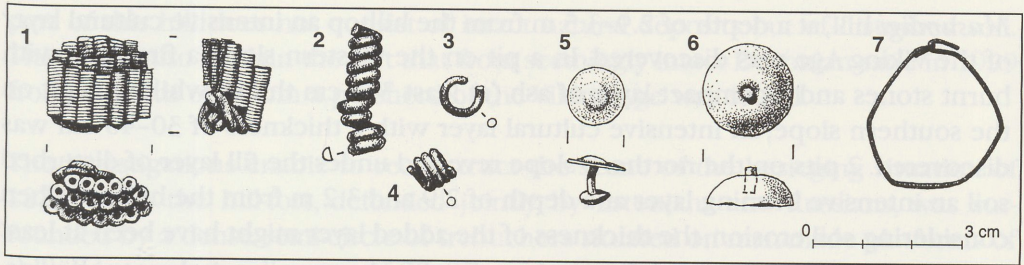


Fig. 13. 1 - bundle of bronze spirals; 2, 3 - bronze spirals; 4 - chain fragment; 5 - rivet; 6 - plaque; 7 - temple ring.

Joon. 13. 1 - pronksspiraalide kogum; 2, 3 - pronksspiraalid; 4 - pronksketi lüli; 5 - neet; 6 - naast; 7 - oimurõngas (VM 10811: 36, 37–39, 57, 401, 1041).

had once, e.g. with the help of slanted logs or piles supported the eastern side of the pile of stones and soil.

Excavations revealed also the remains of 5 posts which could be observed in the fill layer as vertical or slightly slanted remains of decayed brownish timber. Probably, these remains do not come from 1223 but are later: a C^{14} dating (analysed at the Radiocarbon Laboratory of the University of Tartu; Ta 2764) yielded the result 530 ± 40 radiocarbon years, i.e. 1420 ± 40 AD (cal. 550 ± 50 ; 1400 ± 50 AD). In addition, a slanted charred post remain surrounded by stones was found. A C^{14} analysis from this construction yielded the result 900 ± 30 , i.e. 1050 ± 30 AD (cal. 880 ± 40 ; 1070 ± 40 AD) (Radiocarbon Laboratory of the University of Tartu; Ta 2765). One post-hole (diameter 26 cm) included no timber remains and extended 8–10 cm into the intact natural clayish sand.

Probably, the elevation of the hillock was raised to serve as a platform for some besieging machine – most likely a trebucher for throwing stones into the hill-fort. The use of trebuchers in Viljandi in 1223 is mentioned by Henry of Livonia (HCL, XXVII: 2). The distance of 110–120 m can be regarded as optimal for stone-casting machines: trebuchers of medium size could throw stones to a distance of 100–150 m (Mäesalu 2001). Probably, after the conquest of the fort, the besieging construction was demolished by the victors. Its destruction by fire is evinced by burning traces not only on several fallen stones, but also on some of the crossbow bolts.

* *

When making geological test-pits on the neighbouring *Musumägi* (Hill of Kisses) (Valk 2000, Fig. 1, B-hill) with the aim of getting information about the depth of the intact Devonian sand, it became evident that *Pähklimägi* was not the only hill greatly shaped by human activities. From test-pits made on the slopes of

Musumägi hill, at a depth of 2.9–3.5 m from the hilltop an intensive cultural layer of the Viking Age was discovered. In a pit on the western slope a fireplace with burnt stones and a compact layer of ash (at least 3–4 cm thick), while in a pit on the southern slope, an intensive cultural layer with a thickness of 30–40 cm was discovered. 2 pits on the northern slope revealed under the fill layer of disturbed soil an intensive burning layer at a depth of 2.9 and 3.2 m from the hilltop. When considering soil erosion, the thickness of the added layer might have been at least 4 metres. The association of the earthwork with the same period as on *Pähkli-mägi* is evinced by the same “handwriting”: also on *Musumägi* the cultural layer included granite stones and pieces of spring limestone. Most likely, also *Musumägi* hill had served in 1223 as a place for a besieging machine. Taking into consideration the size of the oval plateau, there may have been enough space for even 2 trebuchets.²

With such background, also the third hill on the southern end of the park plateau, 80 m north-west of *Musumägi* (Fig. 17: D) – there a trial pit was made there in spring 2000 (Valk 2000; Fig. 1, D-hill) – can be regarded as a besieging construction from the conquest period: the pit showed that also the upper part of this hill consisted of a mixed cultural layer. From this pit from a depth of 0.9 m a cross-bow bolt, similar to those from *Pähkli-mägi*, was found. Probably also the lower

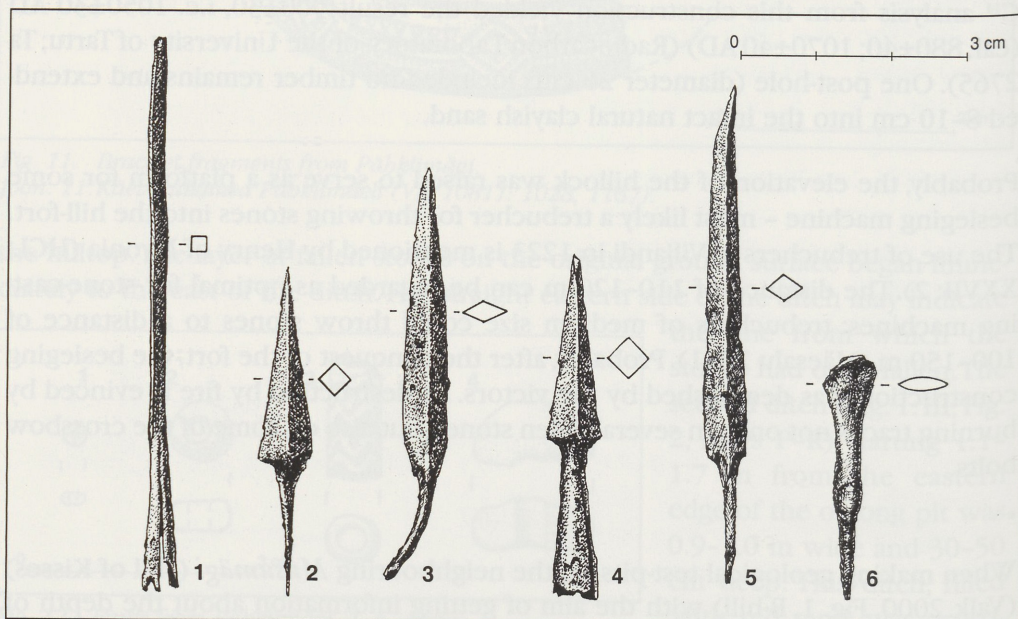


Fig. 14. Arrowheads from *Pähkli-mägi*.

Joon. 14. Nooleotsi *Pähkli-mäelt* (VM 10811: 303, 1632, 1101, 261, 788).

²Personal comment by Ain Mäesalu (University of Tartu).

part of this hill does not consist of intact natural deposits but of disturbed soil. This could also explain the fact that from seemingly intact Devonian sand in 1999 from a depth of 50 cm a potsherd of the Viking Age was found.

The investigations enable to reconstruct the scene of the besieging situation of 1223 when the hill-fort, defended jointly by Estonians and Russians, was surrounded by a dense semi-circle of trebuchers situated on man-made platforms of soil and stones at a distance of 30–80 m from each other (Fig. 17). A similar density of such machines can be suggested also in other areas of the park plateau around the hill-fort where visible traces of their presence are presently missing.

The investigation results show that the number of trebuchers was increased in the course of besieging: on *Musumägi* with better natural conditions the machine(s) was/were erected earlier than on *Pähklikmägi*. Such a history is indicated by the fact that on *Pähklikmägi* the layer of intact natural soil from the time before the besieging with some finds of Viking Age hand-made pottery was preserved only in limited areas. Apparently, the removed layer, also that takes from the pit on the hilltop (Fig. 1: D) had been used for making a besieging construction on the neighbouring *Musumägi* hill. Only later a decision was made to place an additional trebucher (or even 2) on the site of the future *Pähklikmägi* hill – a place initially rather unfavourable for this purpose because of the strong sloping towards the lake. Most likely the gap between the two hills on the same east-west-directional natural ridge is of man-made origin: the soil taken from there might have been used for building a trebucher platform on *Musumägi*.

For heaping up the hill now known as *Pähklikmägi*, soil from the cultural layer of an adjacent Iron Age settlement was used. The reasons for using the cultural layer were apparently simple and practical: the latter was easier to dig than the intact natural soil – a hard sandy loam. Difficulties in digging the moraine ground with hot weather were experienced also during the excavations. Although the original location of the removed cultural layer is not conclusively established yet, it might originate from the immediate

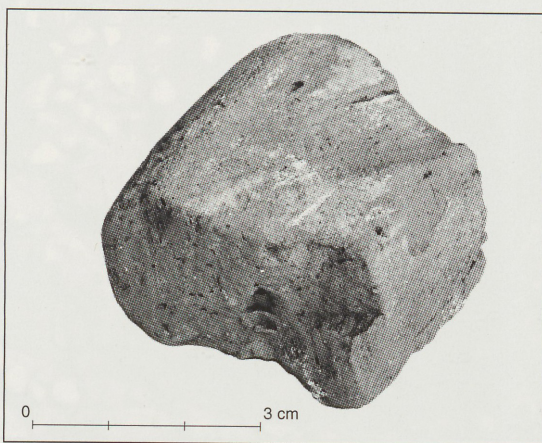


Fig. 15. Profile brick from *Pähklikmägi*.
Joon. 15. Profiiltellis Pähklikmäelt (VM 10811: 1710).

vicinity – the area south of *Pähklikmägi* and a small plateau south-east of it. This area was also somewhat sheltered by landscape conditions from the arrows shot by the defenders of the hill-fort.

The numerous crossbow bolts in the cultural layer give evidence that people digging and carrying the soil were working under flying arrows. As mentioned above, crossbow bolts were found also at the bottom of the pits, dug before heaping up the hill from a settlement cultural layer. From the gravel in the bottom of big pit on the hilltop a small yellow biser bead (Fig. 12: 1) was found. The irregularity of the pits on *Pähklikmägi* suggests that digging occurred in a great hurry. Rushing with the works is indicated also by the find of an iron spade from the soil heaped upon *Pähklikmägi* (Fig. 18): probably the tool was abandoned when its handle got broken. Most likely, the work had been carried out in dim light or in darkness – in order to obscure the aiming from the hill-fort. An extremely high



Fig. 16. Fallen stones on the eastern slope of *Pähklikmägi*.
Joon. 16. Varisenud kivide lasu *Pähklikmäe* idanõlval.

intensity of shooting at the besiegers, both people carrying the soil and the men at the stone-casting machines – a trebucher of medium size needs the power of 15–20 men for drawing³ – is evinced by the large concentration of crossbow bolts: 41 items from 97 m². This number is, however, only a faint reflection of the actual reality: in the course of and after the battle the arrows and bolts that could be found were undoubtedly gathered up for repeated use. The number of bolts is extremely large also in comparison with other excavated sites of the Conquest Period. Thus, from the *Otepää* hill-fort, extensively excavated in

³Personal comment by Ain Mäesalu.

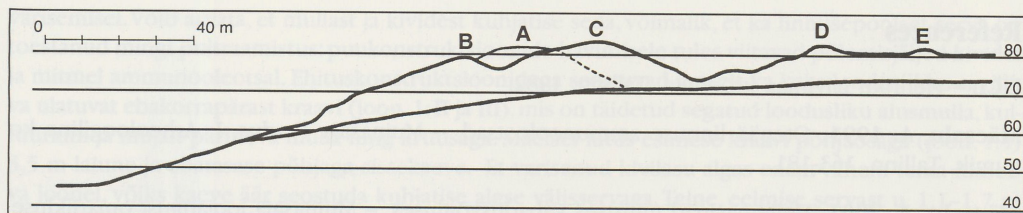


Fig. 17. A view from Viljandi hillfort (from the north) to the remains of besieging constructions. A - skijump hill, B - Pähklimägi, C - Musumägi, D - hill at the end of park plateau, E - suggested former hill.

Joon. 17. Vaade Viljandi linnuselt (põhjast) piiramisrajatiste jäänustele. A - suusabüppemägi, B - Pähklimägi, C - Musumägi, D - pargiplatool asuv mägi, E - oletatav endine mägi.

21 sessions 1950–1974 (in all ca. 2300 m²)⁴, a total of 49 crossbow bolts dating from the first quarter of the 13th century (Mäesalu 1991, 163, 174; types AI: 1, 2; C: I, II), from the hill-fort of Lõhavere (besieged with crossbows in 1223; investigated area of ca. 1000 m²) 46 and from Soontagana (besieged in 1211 and 1216; investigated area ca. 400 m²) 11 crossbow bolts were found (Mäesalu 1991, 170, 174). Consequently, the find density of crossbow bolts in Viljandi is about 1 per 3 m², in Otepää 1 per 47 m², in Soontagana 1 per 36 m² and in Lõhavere 1 per 28 m². Finds from the hillfort and urban cultural layers of Tartu have yielded only 5 crossbow bolts from the conquest period (Tvauri 2001).

The remains of the besieging constructions of the early 13th century in Viljandi are a unique monument of military history. The preservation of the remains has been conditioned by their location in an extraordinary landscape situation: an area splintered by valleys has been suitable neither for later construction activities nor for agricultural use. Finds from Viljandi enable to suggest that similar heaped-up besieging constructions might have existed also in the nearest surroundings of other forts attacked by the Germans in the first half of the 13th century.

Acknowledgements

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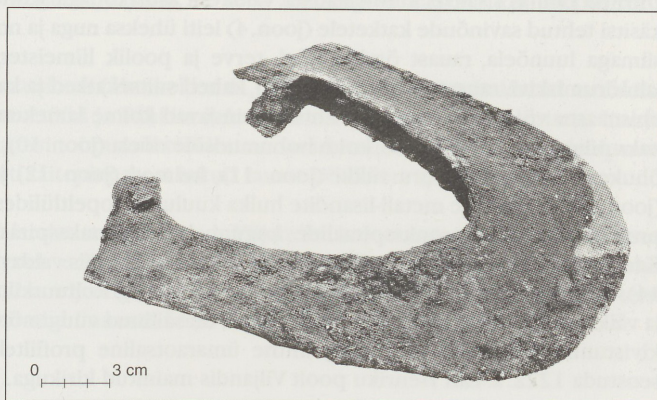


Fig. 18. Iron spade of the besiegers from Pähklimägi.

Joon. 18. Piirajate raudlabidas Pähklimäelt (VM 10811: 1242).

⁴Data from Ain Mäesalu.

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1223. AASTA PIIRAMISRAJATISED VILJANDIS

Heiki VALK

2000. aasta suvel jätkusid kaevamised Viljandi Lossimägedes, ordulinnuse varemetega Kaevumäest 110–120 m lõuna pool Pähklimäe-nimelisel künkal. 1999. a. kaevandit laiendati kolmes suunas, nii et see (97 m²) hõlmas enamuse künkalaest (joon. 1–3); põhjani kaevati läbi ka eelmisel aastal avatud pinna sügavamad korridid. Pinnas koosnes endiselt noorema rauaaja asulakoha segatud kultuurkihist, mis sisaldas eri suuruses raudkive ja allikalubja tükke. Kaevamistulemused kinnitasid 1999. a. kujunenud muljet, et tegemist pole kohapeal moodustunud, vaid täielikult segatud ning künkale kantud kultuurkihiga: eriaegseid leide esines läbisegi selle kõigis ladestustes, sh. ka alumistes korridides.

Uuritud pinnas sisaldas mitmelaadset, valdavalt asulakohaga seonduvat leiumaterjali. Lisaks kedral ja käsitsi tehtud savinõude katketele (joon. 4) leiti üheksa nuga ja noakatket, suur võti (joon. 5: 4), kolm silmaga luunõela, rauast õmblusnõel, terve ja poolik liimeister, luisk, ovaalne tuleraud, kaks viljahõõrumiskivi, rauast adratera (joon. 6), kahed suitsekatted ja kaks hõbedaga kaunistatud ratsmete ehisnaastu või -plaati (joon. 7). Ehteid esindavad kolme lamekumera lõikega spiraalsõrmuse tükid, kaks piluga kuljust (joon. 9), kolm hoburaudsõle nõela (joon. 10), tinapronksist ümarsõle katke, kaks õhukese lameda käevõru tükki (joon. 11), helmed (joon. 12) ja seotud otstega traatimurõngas (joon. 13: 7). Riietuse metall-lisandite hulka kuuluvad topeltlülidest pronksketi jupp, üksteist üksikut pronksist ketilüli, pronksspiraalide kogum, kolm pronksspirali, neet ja naast (joon. 13: 1–6). Kaevamistel leiti kokku kolmkümmend üks nooleotsa, mis valdavalt pärinevad ammuooltest (joon. 14), odaotsa katke ja kaks viskeodaotsa (joon. 5: 1–3). Kultuurkiht sisaldas kogu ulatuses tellisepuru ja väiksemaid tellisetükke; ühe tellise küljes oli säilinud vuugimörti. Leiti ka üks maakivi küljes olnud kivistunud lubimördi tükk ning lihtne ümaraotsaline profiiltellis (joon. 15). Viimane leid võiks seostuda 1222. a. Läti Henriku poolt Viljandis mainitud kirikuga.

Ehitusjäänuseid leiti kaevamistel vähe. Viimaste hulka võib lugeda varisenud kivilasu künka järvepoolsel nõlval (joon. 16): tõenäoliselt on see tekkinud kuhjatise järvepoolses servas olnud kivipiirde

varisemisel. Võib arvata, et mullast ja kividest kuhjatise seda, võimalik, et ka linnusepoolset serva on toestanud mingi puitraamistus: puukonstruksioonide hävimisele tules viitavad põlemisjäljed kivil ja mitmel ammunooleotsal. Ehituskonstruksioonidega seostuvad ilmselt ka kaks looduslikku saviliiva ulatuvat ebakorrapärasest kraavi (joon. 1: II ja III), mis on täidetud segatud loodusliku alusmulla, kultuurikihi ja mujalt pärineva mulla ning kruusaga. Mäelael liitus esimese kraavi põhjaosaga (joon. 1: I) 3,5 m laiune ja ebatasase põhjaga sissekaeve. Et varisenud kivilasu algas enam-vähem tema idaserva joonel, võiks kaeve äär seostuda kuhjatise algse välisservaga. Teine, eelmise servast u. 1,1–1,7 m kaugusel algav kraav künka idanõlval (joon. 1: III) oli u. 0,9–1 m laiune ja 0,3–0,5 m sügavune. Kaevamistel leiti teisaldatud asulakihist viie pehkinud puuposti jäänused, mis pole kultuurikihi teisaldamise aegsed, vaid hilisemad, tõenäoliselt 15. sajandist. Üks puidujäänusteta postiauk ulatus looduslikku aluspinnasesse.

Ilmselt on uuritud muistise puhul tegemist muistse vabadusvõitluse aegse piiramisrajatise, tõenäoliselt kiviheitemasina laskeplatvormi jäänustega: 110–120 meetrilist vahemaad võib pidada katapultdi jaoks optimaalseks paiknemiskauguseks. Tellisetükid ja lubimört teisaldatud kultuurikihi võimaldavad rajatise seostada 1223. a. augustipiiramisega, mida kirjeldatakse Läti Henriku kroonikas.

Ulatuslike mullatööde toimumist tõdeti ka Pähklimeest 30–40 m kaugusel oleval Musumäel, mille nõlvadele tehti prooviauke eesmärgiga välja selgitada puutumata devoniliiva paiknemissügavus. Šurfimisel paljandus künka lõunanõlval praegusest mäelaest u. 3 m sügavusel 30–40 cm paksune nähtavasti segamata viikingiaegne kultuurikiht, mäe idanõlval aga koldease. Musumäe põhjanõlvale tehtud prooviaukudes tuli mäelaest ligi 3 m madalamal segatud moreenpinnase all nähtavale intensiivne põlemiskiht. Musumäest 80 m loodesse jääval künka puhul – seal leiti 1999. a. kevadel 90 cm sügavuselt segatud asulakihist ammunooleots – on ilmselt tegemist tehisrajatise. Nähtavasti kujutavad kõnesolevad künkad endast samuti 1223. a. piiramisrajatiste jäänuseid.

Kaevamistulemuste põhjal on kiviheitemasinate hulka piiramise vältel suurendatud. Piiramisrajatis Musumäel näib olevat varasem Pähklimeel leiduvast: seda kinnitab asjaolu, et Pähklimeelt oli algne looduslik mullakiht enne asulakihi pealekuhjamist valdavas osas eemaldatud. Ilmselt on see pinnas kuhjatud naabruses oleva Musumäe kõrgendamiseks, mistõttu hiljem on Pähklimeele täiendava piiramismasinaga paigaldamiseks tulnud uut pinnast asemele tuua. Tõenäoliselt pärineb Pähklimee lael olev asula kultuurikiht lähikonnast, künka ja suusahüpperaja vaheliselt platoolt. Kultuurikihi täitepinna kasutamist on arvatavasti tinginud asjaolu, et seda oli kergem kaevata kui looduslikku moreenpinnast.

Nooleotste rohkus ja suur kontsentratsioon (ühtekokku 41 leidu 97 m² kohta) teisaldatud asulakihi erinevates ladestustes näitab, et kaevetööd ja Pähklimeele piiramisrajatise ehitamine toimus linnusest langevate noolte sajus. Kiirustamisi toimunud töödest annavad tunnistust Pähklimeel leiduvate sissekaevate ebakorrapärasus, samuti täitepinnasest leitud rauast labidatera (joon. 18).

13. sajandi algusveerandi piiramisrajatiste jäänused Viljandis kujutavad endast ainulaadset ajaloomälestist, mille säilimine tuleneb erilisest maastikusituatsioonist: paiknemisest nii linnaehituseks kui ka maaviljeluseks ebasoodsa reljeefiga alal. Tõenäoliselt võis samaladseid rajatisi olla teistegi muistse vabadusvõitluse ajal piiratud linnuste ümbruses.