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IRON-SMELTING SITES IN EAST- AND NORTH-ESTONIA

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In 1996, archaeological excavations connected with the investigation of ancient iron metallurgy were held in East Virumaa at Ilumäe and Saunakünka, and in North Tartumaa at the Puiatu settlement and iron-smelting sites. During landscape surveys, the 1st—2nd century settlement site of Toolse was discovered; the borders of the Rebu settlement and iron-smelting sites were specified and the mapping of the iron-smelting sites in the area of Tuiu — Pelisoo on Saaremaa proceeded.

At **Ilumäe**, a settlement and an iron-smelting site were studied, located in a field west of the Vihasoo—Viitna road, opposite the sacrificial linden-tree (*Niinepuu*), that grows on the opposite side of the road on the edge of a glint and a spring at the foot of the glint. Traces of a cultural layer were discovered in an area 150 m long and 50 m wide (Fig. 1).

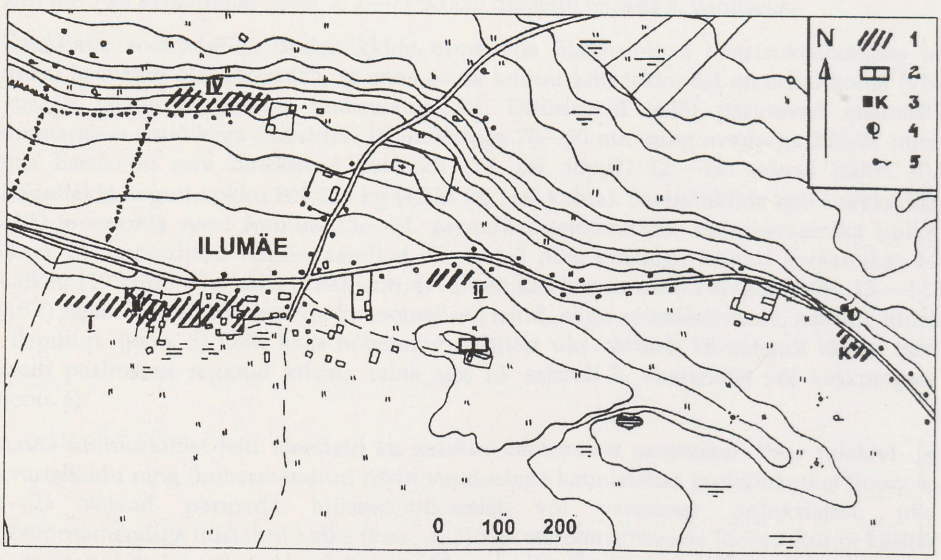

Fig. 1. Settlement sites in the neighbourhood of Ilumäe. 1 — settlement site; 2 — tarand grave; 3 — excavation; 4 — sacrificial linden tree; 5 — spring.

The settlement and iron-smelting sites were discovered in 1990 when trial pits were dug in the neighbourhood of the *Niinepuu* and in the field at the foot of the glint, where A. Lauringson had found lumps of slag and a few potsherds. Immediately around the sacrificial tree the soil was untouched; under the sod and mold layer, natural yellow sand was denuded. The mixed layer, evidently formed by tillage, containing some small fragments of slag and charcoal was thickest (70—80 cm) towards the West of the tree, between the road and the edge of the glint. In the field below the glint, cultural layer was not discovered, unlike in the field on the top of the glint where some bigger slag lumps, evidently originating from iron producing, a small fragment of a tuyère made of clay and some sherds of wheel pottery were found. Probably the tilling had carried the settlement finds into the field below. In 1996, the field was left to lay fallow, so the possibility occurred to investigate the settlement and iron-smelting sites closer. The range of the settlement was determined and a trial pit of 32 sq.m. was dug on a hummock 35 m to the west of the road and 80 m SW of the linden-tree, where the mixed layer was the thickest, reaching 30—40 cm. Immediately after removing the sod layer the opinion was confirmed that the whole cultural layer had been mixed during soil improvement. This was indicated by lumps of gault and fragments of drainpipes brought to the surface by subsoil ploughing. The thickness of the mixed layer was 30—35 cm on average. The unmixed cultural layer was preserved only in two depressions, 50 cm in diameter and 30 cm deep, in the southern part and around the big unmoved granite boulder in the central part of the excavation. The find material (wheel and stone pottery, two bronze buttons, an iron ring, a calk, etc.) belonged mostly to the 16th—18th c. Dating was aided by swedish copper coins, $^1/_6$-öre from 1666 and 2-öre from 1751 (Fig. 2, *1, 4*). Animal bones were few and very fragmentary. Only pig (3 fragments) and cattle (5 fragments) were represented. Local iron-producing was indicated by a few slag lumps and two fragments of tuyères. These are similar to the tuyères found from other iron-smelting sites of East and North-East Estonia. They were used to admit air into the iron-smelting furnaces and, evidently, also into the smithy forges. The tuyères were pipes of baked clay, with an external diameter of 60—80 mm and an internal diameter of 20—30 mm. At the bellow end, the channel widened into a funnel shape while the exterior diameter and cylindrical form remained unchanged. Sometimes the tuyères also had rectangular cross-sections. In Estonia, such tuyères have been found e.g. from the Tartumaa iron-smelting site (Fig. 3). Since no wholly preserved tuyère has been found, we can only presume that their length must have been 25—30 cm (Lavi & Peets, 1985, 365—366, fig. 5). Similar tuyères and their fragments have been found from Isuri Plateau, Russia, and other regions of the Votic Fifth of the former Novgorod Land, and also

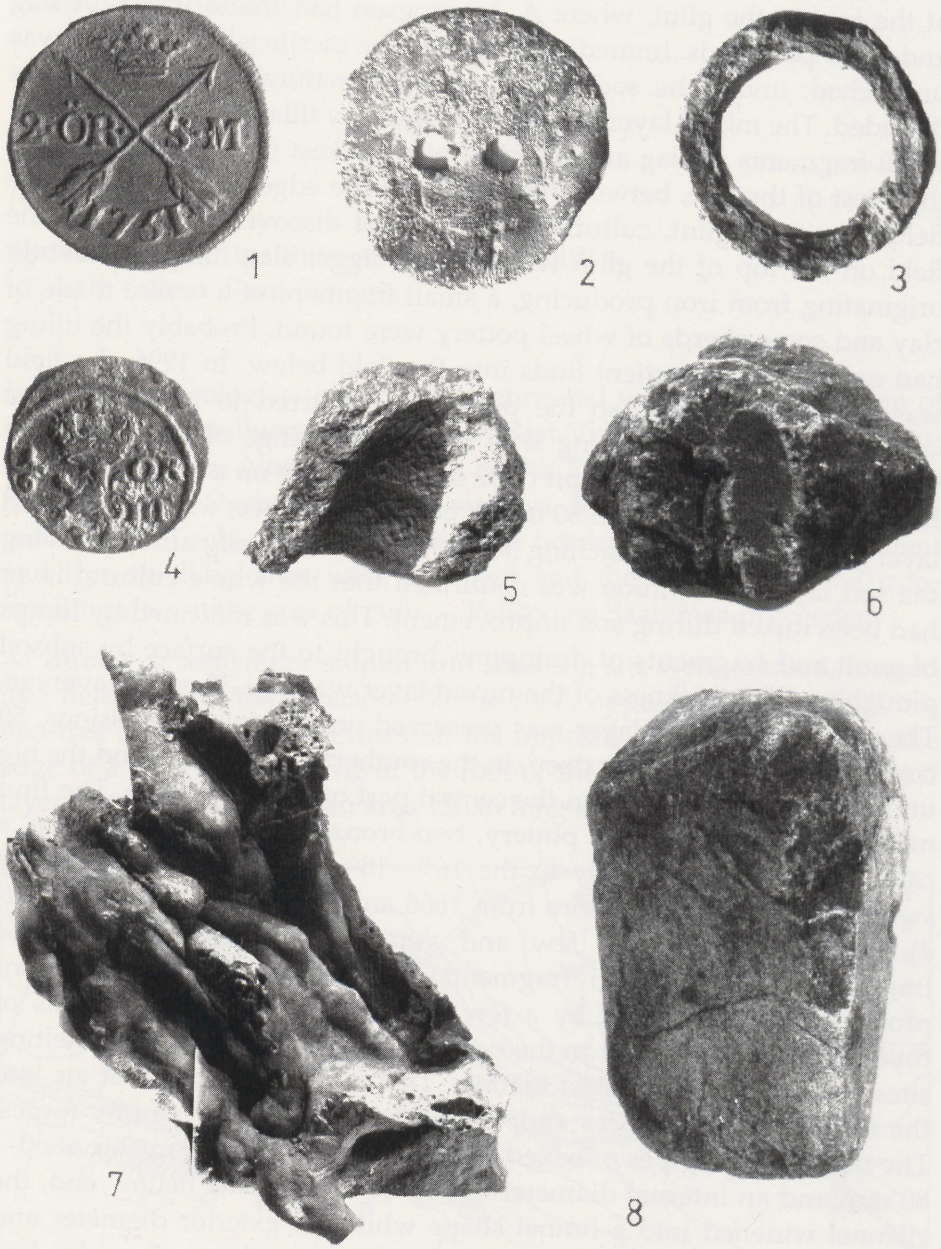

Fig. 2. Finds from the settlement and iron-smelting site of Ilumäe III (1—6) and Saunakünka (7, 8). 1 — Swedish 2-öre; 2 — bronze button; 3 — iron ring; 4 — Swedish 1/6-öre; 5, 6 — fragments of clay tuyères; 7 — slag lump with traces of flowing; 8 — whetting-stone of sandstone. (AI 6207; 6206.1-4 1:1; 5-8 2:3).

from ancient Rjazan, North Ukraine (Колчин, 1953, 33—34), Central Europe, Czechia and Austria, and the Rhine region of Germany. In Finland and Scandinavian countries, such finds are missing. Thus far in Estonia 6 iron-smelting sites have been investigated where fragments of such tuyères have been found. These are all located in East- and North-East Estonia and are dated to the 12th—14th c. (Fig. 3; Tab. 1). They are considerably different by shape and making from the massive, mostly rectangular block tuyères, made of unburned clay, which were used at the same period in North Saaremaa, in the iron-smelting area of Tuiu — Pelisoo — Tõrise and which have analogies from Scandinavia (see also Lavi & Peets, 1985, 365—366; Peets & Visnap, 1987, 402; Peets, 1988). Considering the aforementioned and also the datings of the settlement and iron-smelting site of Ilumäe, studied by V. Lang (see Lang, this volume), the finds relating to the iron-producing from the Ilumäe III settlement can also be dated to the same period, i.e. 12th—13th c. The oldest datable find from the settlement site appears to be a brim fragment of a thin-walled, hand-moulded clay vessel from the Late Iron Age, found from a patch of unmixed cultural layer in the northern part of the excavation. Unfortunately, the III settlement and iron-smelting site of Ilumäe have been almost completely destroyed by melioration;, thus, further investigations of the site are unpromising.

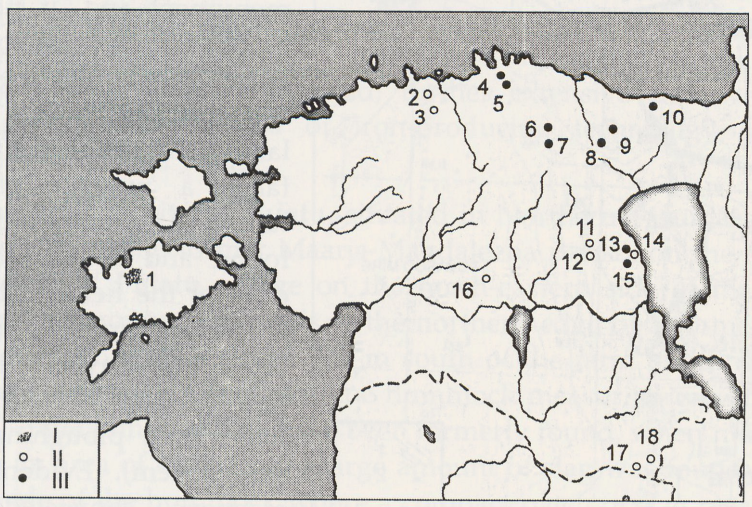

Fig. 3. Archaeologically investigated iron-smelting sites in Estonia. 1 — Tuiu—Pelisoo—Järise iron-smelting area; 2 — Jüri; 3 — Rae; 4, 5 — Ilumäe; 6 — Palasi; 7 — Saunakünka; 8 — Rebu; 9 — Tarumaa; 10 — Päite; 11 — Tindimuru; 12 — Puiatu; 13, 14 — Raatvere; 15 — Punikvere; 16 — Olustvere; 17 — Siksali; 18 — Kalatsova; I — with tuyère fragments; II — without tuyère fragments.

At **Saunakünka**, an ancient iron-smelting site was investigated, located at the edge of the Punasoo marsh, on a low sand esker on the land of a former gamekeeper's farm (Fig. 4). The nearest settlement, the village of Palasi, where an archaeologically investigated iron-smelting site of the 12th—13th c. lies, (Peets & Visnap, 1986), is located 2.5 km towards the North-East. Half a kilometre east of the village, near the road leading to Saunakünka, lie the Palasi barrows of the 12th—14th c., with Votic find material, that were investigated in 1958 and 1985 (Лиги & Тамла, 1986). The iron-smelting site of Saunakünka is one of the earliest monuments of its kind. In connection with the 1887 investigation of Kunda Lammasmägi and its surroundings, C. Grewingk mentions the iron-smelting site in his report. He points out the possibility that the abundance of iron slag in the Saunakünka meadow might be the result of producing iron there from the bog ore from the Punasoo marsh (Grewingk, 1887, 164). Information about an iron-smelting site near Roela village, Viru-Jaagupi parish, was also filed by J. Jung, the initiator of the systematic enlistment of Estonian archaeological monuments, in 1886. The monument was rediscovered by A. Lauringson (Lauringson, 1990, 136—138).

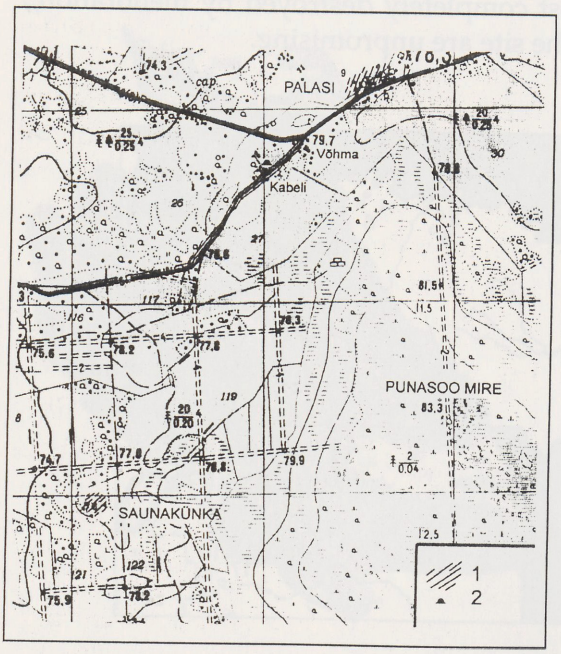

Fig. 4. Iron-smelting sites of Saunakünka and Palasi. 1 — settlement and iron-smelting site; 2 — burial ground with barrows.

The aim of the archaeological investigations was to determine the character of the monument and, if possible, to obtain some datable material. Surveying the field, lying on the former grassland of the Saunakünka farm, a number of slag-lumps of different size were found and at the northern edge of the field, a sherd of wheel pottery came to light. The cultural layer in the field was thin and mostly confined to a ploughing layer (15—20 cm). Evidently the erections connected with iron working had stood on an E—W directed esker, 200 m long, in the southern part of the field. The cultural layer, 30—40 cm thick, contained soot, fragments of slag, burned clay and pieces of charcoal, and could be traced over the whole length of the

esker. In the eastern part of the esker, the cultural layer has been mostly destroyed by farm buildings (cellars, house foundations, etc.); however, in the western part, it has preserved virtually unharmed. A trial excavation (16 sq.m.) was dug 15 m west of the caved-in stone cellar, at the top of the ridge. Besides slag and burnt lumps of clay, the topmost layer with a thickness of ca 10 cm contained artefacts connected with the farm household (nails, sherds of glazed pottery, etc.) Below that followed an unmixed layer, intensively sooty, rich in slag, the thickness of which was 30—40 cm in the area of the excavation. The investigation of the northern part of the excavation, where at a depth of 15 cm, big patches of burned and unburned clay mixed with sand occurred (remains of an iron-smelting furnace?), remained unfinished due to the limited time of the expedition. Finds were few. In the southern part of the excavation, 2 small sherds of hand-moulded pottery and a wedge-shaped whetting-stone (Fig. 2, *8*) were found. Different-sized pieces of iron blooms and fragments of an iron-smelting furnace or a smithy forge of sandy clay were numerous. The soil contained many magnetized ore particles and fine bits of slag. Hammerslag pointing to smithery was rare. Fragments of clay tuyères, so numerous at the Late Iron Age and Early Medieval iron-smelting sites of East and North-East Estonia, were completely missing. This, and the found potsherds point to the possibility that the monument might belong to an earlier period. The ^{14}C analysis of a small piece of coniferous wood, found in the south-eastern part of the excavation on the original sandy soil, dated the excavation to the 7th—9th c. (Tab.) Since the investigations at the Saunakünka iron-smelting site were not completed, further extensive field-work for studying the earlier phase of iron-producing technology appears inevitable in the near future.

The iron-smelting site of **Puiatu**, situated in Northern Tarumaa, in the northern part of the former Maarja-Magdaleena parish, on the land of Ansipi farm of Puiatu village on the north-eastern side of the Jõuga drumlin. The monument stands at the northern edge of a former field, now overgrown with a forest, 250 m south of the farm buildings near the village road on a small moraine hummock measuring ca. 30x50 m. Though single lumps of slag have been formerly found, when tilling the land, on an area of ca. 0.5 ha, a large amount of slag was found on the eastern side of the hummock where a compact patch of slag measuring 5x10 m, 20—30 cm thick, was discovered. Two excavations were dug to study the object; one of these was a searching trench 10 m long and 1 m wide, the other, 8 m east of the first one, was a trial pit measuring 2x2 m, at the western edge of the patch. From the trench ca. 50 kg of slag were gathered; finds were missing. It appeared also that the whole area had been mixed by ploughing down to the original sand. The thickness of

the mixed layer was 15 cm. A coal sample was gathered from a depression, 40 cm in diameter and 20—25 cm deep. In the trial pit a compact unmixed layer containing slag lumps of various sizes was denuded immediately under the sod layer. In the north-eastern part of this excavation a larger mass of strongly burnt clay was discovered. The soil contained many magnetized ore particles and bits of slag that usually refer to the location of an iron-smelting furnace nearby. In the western part of the excavation, where the slag layer was thinner, a charcoal sample was gathered at a depth of 20 cm, immediately on top of the original sand. Besides a number of iron blooms of different sizes and slag, other finds (fragments of clay tuyères among them) were missing — again indicating the possibility of an earlier date of the monument. The supposition was confirmed by the ^{14}C analyses of the coal samples which dated the monument to the 1st—2nd c. AD (Tab.).

Summary

As a result of former investigations, we can assert that the monuments containing tuyère fragments among the finds can be dated on this basis alone with great probability to the 12th—14th c. This is confirmed by the studies at the settlements and iron-smelting sites of Palasi, Tarumaa, Punikvere, Ilumäe I and Raatvere (Tab.). On the other hand, the absence of the tuyère fragments among the finds from an iron-smelting site seems to point at an earlier date for the monument (mostly the 1st half of the 1st millennium). This is supported by the datings, both ^{14}C and on the basis of the find material, of Tindimuru, Olustvere, Siksali, Kalatsova, Rae, Jüri and the Raatvere grave (Tab.). This assertion was also confirmed by the archaeological excavations at Ilumäe I and III settlement sites and Saunakünka and Puiatu iron-smelting sites in 1996.

Table

Radiocarbon dates from iron smelting sites in Eastern- and North-Eastern Estonia

Lab. No.	Site	^{14}C years BP Calibr. ±	Stand. dev.
Tln-2121*	Ilumäe I, 1	803 ± 63	1177—1286
Tln-1009*	Palasi	800 ± 35	1160—1280
Tln-2135	Puiatu 1	1812 ± 50	125—325
Tln-2138	Puiatu 2	1861 ± 53	75—250
Tln-691*	Punikvere	660 ± 30	1290—1390
Tln-633	Raatvere 1	1070 ± 40	900—1020
Tln-694*	Raatvere 2	940 ± 40	1020—1220

Tln-1546*	Rebu	487 ± 56	1300—1512
Tln-2122	Saunakünka	1235 ± 44	687—890
Tln-1543*	Tarumaa 1	678 ± 36	1266—1390
Tln-1544*	Tarumaa 2	790 ± 38	1174—1273
Tln-1008	Tindimuru 1	1985 ± 35	BC 70—AD 70
Tln-1071	Tindimuru 2	1925 ± 35	BC 20—AD 130

* settlements and iron-smelting sites where fragments of pipe-shaped tuyères have been found.

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Rauasulatuskohad Ida- ja Kirde-Eestis (Puiatu, Ilumäe, Saunakünka)

Jüri Peets

Muistse rauametallurgia uurimisega seotud arheoloogilised kaevamised toimusid 1996. aastal Lääne-Virumaal Ilumäe ja Saunakünka ning Põhja-Tartumaal Puiatu asula- ja rauasulatuskohtades (joon. 1).

Ilumäel uuriti asula- ja rauasulatuskohta, mis asub Vihasoo—Viitna maanteest lääne pool põllul, enam-vähem kohakuti teisel pool teed klindi serval kasvava ohvripärna (Niinepuu) ja samas, klindi jalamil paikneva allikaga. Asulakihi jälgi leiti u. 150 x 50 m alal (joon. 2). Kahjuks osutus peaaegu kogu kultuurkiht maaparandusega segatuks ning suures osas hävinuks. Kaevand (32 m²) rajati teest 35 m lääne- ja Niinepuust 80 m edela pool asuvale madalale künkale, kus segatud (kultuur)kihi paksus oli tüsedaim, küündides laiguti 30—40 cm. Kaevamisel selgus, et segamata kultuurkihti oli säilinud vaid kahes u. 50 cm läbimõõduga ja 30 cm sügavuses lohus ning paigast nihutamata suure raudkivi ümbruses. Leiumaterjal (kedra- ja kivikeraamika, 2 pronksnööpi, raudrõngas, jäänael jms.) kuulub 17.—18. saj. Dateeringut täpsustasid 2 Rootsi vaskraha — $^1/_6$-öörine 1666. ja 2-öörine 1751. a. (joon. 2, *1, 4*). Loomaluid leti vähe ning need olid väga fragmentaarsed. Liigiliselt olid esindatud siga (3 fragmenti) ja veis (5 fragmenti). Kohalikule rauatootmisele osutasid räbutükid ning 2 savist õhutusdüüsi fragmenti. Seni on Eestis uuritud kuut rauasulatuskohta, kus leiti taoliste põletatud savist düüsitorude fragmente. Kõik nad asuvad Ida- ja Kirde-Eestis ning on dateeritud 12.—14. saj. (joon. 1; tabel). Arvestades eeltoodut ning V. Langi uuritud Ilumäe I asula- ja rauasulatuskoha dateeringuid (vt. V. Langi artiklit samas kogumikus) võib ka Ilumäe III asula rauatootmisega seotud leiud dateerida samasse perioodi, s.o. 12.—13. sajandisse.

Saunakünkal uuriti muistset rauasulatuskohta, mis asub Punasoo loodeserval madalal liivaoosil endise metsavahitalu maadel. Lähim asustatud punkt, Palasi küla, kus asub 1985. aastal arheoloogiliselt uuritud 12.— 13. saj. rauasulatuskoht, jääb sellest linnulennult 2,5 km kirde poole (joon. 3). Saunakünka talu kunagisel heinamaal asuva põllu ülevaatusel leiti hulgaliselt erineva suurusega räbutükke ja selle põhjaservast kild kedranõust. Kultuurkiht põllul oli õhuke ja piirdus 15 — 20 cm paksuse künnikihiga. Ilmselt paiknesid rauatööga seotud rajatised metsalagendiku lõunaosas, 200 m pikkusel ida—lääne suunalisel oosil. Seal täheldati šlakitükke, põlenud savi ja söeosakesi sisaldavat 30—40 cm paksust nõgist kultuurkihti. Proovikaevand (16 m²) rajati sissevarisenud kivikeldrist 15 m lääne poole oosi harjale. Kaevandi põhjapoolne osa, kus u. 15 cm sügavusel paljandus suurte laikudena põlenud ja põlemata liivasegust savi (rauaahjujäänused?), jäi piiratud aja tõttu lõpuni uurimata. Leide oli vähe. Kaevandi lõunaosast leiti 2 väikest kildu käsitsi valmistatud savinõudest ja kiilukujuline ihumiskivi (joon 2, *8*). Täielikult puudusid savist õhutusdüüside fragmendid, mida esineb Ida- ja Kirde-Eesti muinasaja lõpu ja keskaegsetes rauasulatuskohtades massiliselt. Kaevandi kaguosast, vahetult looduslikult liivapinnaselt leitud väikese okaspuutuki C^{14} analüüs dateeris kaevandi 7.—9. saj. (vt. tabel).

Puiatu rauasulatuskoht asub Põhja-Tartumaal, endise Maarja-Magdaleena kihelkonna põhjaosas, Jõusa voore kirdeserval, Puiatu külas Ansipi talu maadel (joon. 1). Muistis paikneb metsa kasvanud endise põllu põhjaservas, 250 m taluhoonetest lõuna pool, külatee ääres väikesel umbes 30 x 50 m moreenkünkal. Objekti uurimiseks rajati 2 kaevandit — 10 m pikkune ja 1 m laiune otsimiskraav ning 2 x 2 m proovikaevand. Tranšeest koguti umbes 50 kg räbu, leiud puudusid. Samuti selgus, et kogu ala on kuni

loodusliku liivani künniga segatud. Segatud kihi paksus oli 15 cm. Ühest 20—25 cm sügavusest ja 40 cm läbimõõduga lohust koguti söeproov. Teises kaevandis paljandus vahetult kamarakihi all kompaktne, erineva suurusega räbutükke sisaldav, künnist segamata kiht. Kaevandi kirdeosas avastati suurem kogum tugevasti põlenud savi. Pinnas sisaldas hulgaliselt magnetile reageerivaid maagiterakesi ja puru, mis osutab enamasti lähikonnas asuvale rauasulatusahjule. Kaevandi lääneosast, kus šlakikiht oli õhem, koguti 20 cm sügavuselt looduslikult liivapinnalt söeproov. Peale suure hulga erineva suurusega torrauatükkide ja šlaki muud leiud, s.h. savist düüsifragmendid, puudusid. See osutas taas võimalusele, et tegemist on varasema perioodi muistisega. Oletust kinnitasid ka söeproovide C^{14} analüüsid, mis dateerisid muistise 1.—2. saj. p.Kr. (vt. tabel).

Seniste uuringute tulemusena võib väita, et need muistised, milles esineb õhutusdüüside fragmente, võib suure tõenäosusega dateerida 12.—14. sajandisse. Seda kinnitavad Palasil, Tarumaal, Punikveres , Ilumäe I ja Raatveres uuritud asula- ja rauasulatuskohtade söeproovide C^{14} analüüsid (vt. tabel). Düüsifragmentide puudumine rauasulatuskohtade leiumaterjalis näib osutavat muistise kuulumisele varasemasse perioodi, s.o. põhiliselt I aastatuhande esimesse poolde. Seda oletust kinnitavad taoliste rauasulatuskohtade — Tindimurru, Olustvere, Siksali, Kalatsova, Rae, Jüri ja Raatvere leiuainese dateeringud ning C^{14} analüüsi tulemused (vt. tabel). Ülaltoodud väidet kinnitasid ka 1996 aasta uurimistööd Ilumäe I ja III asulakohas ning Saunakünka ja Puiatu rauasulatuskohtades.