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Reviewed Article:

Testing a Reconstruction: A Frosty Week in a Viking Age House

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In the summers of 2010 and 2011, an archaeologically inspired Viking Age horizontal log house with a two-layer split plank roof, clay floor and a dry-stone stove without a chimney was built in Rõuge, Estonia. In the winter of 2012 (30 January 2012 - 05 February 2012) a one-week living-experiment was organised to test the building. The purpose of this paper is to introduce the experiment and present the results achieved.

> “For the first three days we had a swarm of journalists waiting at the door when we woke up. Since one of the aims of the project as a whole was to make archaeology more visible to the public, it was favourable, even though it was a huge surprise to us.

The experiment was initiated and led by Viire Pajuste in the framework of her master's thesis. Theobjective of building a full-scale reconstruction of a Viking Age log house was to find answers toseveral technical construction questions. Based on archaeological evidence it is known that in theViking Age (800–1050AD in Estonia) the predominant dwelling place was a horizontal log houseconstructed with saddle notches and heated by a chimneyless open rock stove called a *kerisahi*,which is a dry-stone construction with a pile of heating stones on top of it. The buildings of thattype - called *smoke cottages* - were relatively small and mostly one-roomed. There were severalquestions that the experiment sought to answer (Pajuste 2012, 5): how long a time would it take today tobuild such a house using only authentic tools? what kind of working techniques might have been used? is themodest choice of tools represented in archaeological material - axes, knives, chisels and timbershaves - enough to build a house?

The purpose of the living-experiment was to test the quality of the finished building and get a more illustrative picture of living conditions in the Viking Age. For the purpose of veracity it was attempted to conduct the experiment in the best possible, authentic way. That meant using clothing, tools and household equipment appropriate to the time and, if possible, made directly after the examples of archaeological finds. For instance, for cooking in front of the stove on hot embers we used copies of archaeological clay vessels from Rõuge. The menu also consisted of authentic foods: grains, meat, fish, legumes and homemade beer for drinking. Sheepskins, woollen blankets and hay kept participants warm during sleeping.

Building the house

The reconstruction was built in the vicinity of where Rõuge hillfort used to stand. In use from the middle of the first millennium until the 11th century with the most intensive time of use in the last quarter of the first millennium, its inhabitants were active in the fur trade and metal work, notably bronze casting (Moora 1955, 59; Tõnisson 2008, 117). A village area on the foot of the hillfort, inhabited from the first half of the first millennium until the end of the 11th century, is also close by (Tõnisson 2008, 326).

An outline of a 6 × 5 m clay floor from the hillfort was chosen as the basis for the measurements of the reconstruction (Pajuste 2012, 26). All of the known archaeological information was also taken into account. The most problematic part turned out to be the roof, both construction and materialwise, since no information about it has been found in the archaeological record. Therefore, ethnographic information came to be used. For roofing material, split planks were used, and birch bark for hydro-isolation (Pajuste 2012, 7) (See

Figures 1–3). Some constructional solutions were discovered during the experiment, such as using rawhide for securing rafters and purlins.

As with roofs, information about house doors and windows is also almost non-existent in Estonian archaeological material. Only rarely is it possible to determine the wall in which the door was located (Lavi 1997, 106). Ethnographic data of farm buildings with the threshold as high as the second to the forth log from the ground allow for the assumption that it might have been so much earlier; that could also be the reason door locations are not visible archaeologically (Lavi 1997, 107; Lavi 2003, 152). Windows as such most likely did not exist at all, mortises - small openings in the walls for better movement of air - probably acted their part during warmer months of the year (See Figure 4).

Archaeological evidence shows that in Rõuge, the location of the stove in the house varied - some were in the middle of the room, some near the wall. It was decided to build the stove in the corner next to the door so as to have it between the sleeping bunk in the back part of the room and the door, the place with the greatest heat loss. The stove construction is simple - cobblestones were laid on top of each other in what looks from outside like a pile of stones. In front of the stove, there is an indent in the floor for cooking on hot embers (See Figure 5).

As there is no chimney, the smoke from heating exits the building through the door. Additional openings in the walls - mortises - were hewn for more effective movement of air. One of these was in the same wall as the door, close to the stove, the other one diagonally across the room. The height of the mortises was about 2 m from the floor. Such a choice was based on Estonian ethnographic data. Among the ample evidence on chimneyless smoke cottages there is no information about other types of openings for the exiting of smoke. Nothing attests, for example, to using an open latch in roof for draught - a common solution in many other areas.

People taking part in the building experiment were mainly students or friends and acquaintances of the project leader. It was common that their closest experience to working with an axe was chopping firewood. Time needed for acquiring the skills necessary for working on the house was not long, usually two to three days (See Figure 6). Considering that many participants could contribute only a few days, during which they were just learning the necessary skills, adding our different physical resilience and motivation from people in actual need of a home, it is obvious that the time it took us to build the house - in total about 4000 hours - cannot be directly comparable to what it might have taken an Iron Age family (Pajuste 2012, 70).

Even though our time-related results cannot be projected onto the past, it became certain that the tools represented in archaeological material are enough for building a house such as this, with one exception: among archaeological finds from Estonia there is no proof about the use of the log scribe (*vararaud*). This tool is necessary for marking on the logs the lengthwise

groove that needs to be hewn to closely fit the logs on top of each other. It became clear at the start of the experiment that it is quite difficult to proceed without the tool and in the absence of any better alternatives a log scribe was made using a willow branch, string and a pencil (Pajuste 2012, 97–98). Made from simple organic materials, it performed its function perfectly, although would undoubtedly be lost from archaeological record due to decomposition.

The living-experiment

The testing of the house was planned to take place during the coldest time of the year - in February. During the experiment, temperatures outside stayed constantly around -25° C, the ground and the roof of our house were covered in a thick layer of snow. Our aim was to test the building's ability to maintain temperatures obtained by heating, make observations about thermal leakages, see how successfully the stove worked and observe the movement of smoke during heating. Overall, the goal was to see if the house would be fit to live in during days and nights that cold.

There were five of us: Maarja Lainevoog, Anti Lillak, Kristin Otti, Robert Rootslane and Kristiina Paavel. All students of archaeology and all having contributed to the building of the house, we were interested to see how it had turned out. During the experiment, daytime was short - the sun was up from about 8.00 until almost 17.00, which meant we had about eight and a half hours for any chores needed to be done outside. Of course, since we did not live in a fully reconstructed farm, did not have animals to tend to or a multitude of other household chores to do, that amount of time was enough. We used it to gather firewood from the nearby woodland area (See Figure 7). Probably this would not have been the thing to do for Viking Age people - likely they had stored plenty of it during warmer months of the year so as not to have trouble during extreme cold. As a side note, we did not observe any difference between the smoke from firewood gathered from the forest and a bit snow-moist, and from dry logs we were given as a gift later during the week - it was bad either way.

For the first three days we had a swarm of journalists waiting at the door when we woke up. Since one of the aims of the project as a whole was to make archaeology more visible to the public, it was favourable, even though it was a huge surprise to us. But, since they wanted to see us going about our daily activities from early on in the morning, it had a negative effect on the warmth still left in the house. With people bustling about in and out the door, us and visitors alike, it was a question of minutes before it became too cold inside to feel comfortable, necessitating lighting the fire. That also meant dealing with smoke. Mostly, the time with no smoke inside was limited to nights only. Needless to say, we were greatly relieved when the media interest somewhat lessened so that we could have a couple of mornings to enjoy our precious warmth a little bit longer. We soon realised that the most comfortable time of the day was while staying in bed, and we did that as much as possible,

sometimes even 12 hours a day - again something people with an actual household to maintain would be less likely to do.

When a fire was lit in the stove, it was impossible to stay inside for about half an hour – there was smoke everywhere. After that it started to clear up, with smoke rising up and leaving fresh air to the layer below, about 1 m high from the floor (See Figures 8–10). For maintaining the smoke level the door and the mortises had to stay open, whereas disturbing it was annoyingly simple - even walking with a heavily hunched back was out of the question, as it mixed the air layers. Under the smoke it was possible, although cold, to sit, as the fresh air coming in through the open door was freezing. In the smoke above our heads it was warm, but impossible to breathe. Even though it was uncomfortable sitting on the floor, it was still warmer than outside. So, mostly we spent our time inside, doing a bit of handicraft, cooking and telling stories. We also tried keeping busy with some outside activities such as fishing and making new shafts for axes in need, but the temperatures (often near -30° C) drove us quite quickly back into the house. As for the clothes, woollen and linen fabric was used, and it can well be said that the reconstructions of ancient clothes were in no way less effective against the cold than their modern counterparts.

Our task was to take temperature measurements at certain times of day in different locations in the house. It became clear that the building was more warm-proof than expected. Before the experiment it was feared that the size of the stove might not be enough for the building.

In reality, the results were surprisingly good. Heat loss was noticeable but not as great as feared. The temperature difference at different heights was also clearly discernible. Before going to bed the room temperature about 1.5 m above the floor level - after letting out the smoke—was often around 30° C and by morning it had dropped to about 10° C. However, it was more stable on the bunk and ranged between 7º–12º C (See Figure 11). Considering the circumstances (the building has no inserted ceiling, the floor is not separated from the ground and the stove is relatively small) we can be very satisfied with the result (Pajuste 2012, 100). We must also keep in mind that the experiment took place during the coldest week of the year; temperatures like this do not usually last more than a week, and during some winters may not present themselves at all.

The greatest challenge about the experiment was the smoke from heating the chimneyless stove. Before the construction of the building it was assumed that smoke level may be associated with mortises and the height of the upper edge of the door above floor level. During two weeks before the experiment, when the completely unheated house was being slowly preheated by lighting a fire for small amounts of time, the smoke level was not clearly visible *(ibid.*). Due to rigorous heating during the living-experiment the temperature differences between hot smoke and cold outside air helped to form the smoke level more

clearly. Also, it shifted higher than during preheating, when the house was cold and the moisture content inside was high.

What affects the height of the smoke level? Perhaps it does have something to do with the height or placement of the mortises? Perhaps when hewn higher, the smoke level would also shift higher? These questions remain unanswered *(ibid.*).

The experiment of living in this building certainly presented a very unique experience. Some of us kept wondering, “Are we doing it right? We must be missing something!” The main reason for these doubts was the fact that while the stove was being heated it was absolutely impossible to do anything inside that required standing up. And as that was so most of the day, when would people do all the things necessary to be done in a household? One possibility is, of course, that had we not had so many guests letting out all our warmth, it could have been possible to heat the house for a shorter period of time, perhaps even not daily, but every other day, as the stove was usually still warm by the morning.

At the same time, due to the fact that the farm complex was not fully reconstructed, we met some difficulties that would not have been met in an actual working household. For instance, having a barn to use for going to the toilet, or furniture in the house for storing household items and sitting on would have made life a little more comfortable and given a more realistic feel of home. And after all, it is entirely possible we just have no idea of the tricks Viking Age people had for dealing with the hardships of smoke and cold.

In the future, the house is going to be used for educational purposes and for the popularization of archaeology and historical heritage; workshops and excursions that allow for a real-life experience will also be organized.

ALL ILLUSTRATIONS BY: VIIRE PAJUSTE

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fire

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Gallery Image

FIG 1. THE WALLS ARE FINISHED, THE ROOF CONSTRUCTION IS VISIBLE.

FIG 2. BETWEEN THE ROOF PLANKS, BIRCH BARK AND MOSS WAS PUT.

FIG 3. THE FINISHED HOUSE IN THE SUMMER OF 2011.

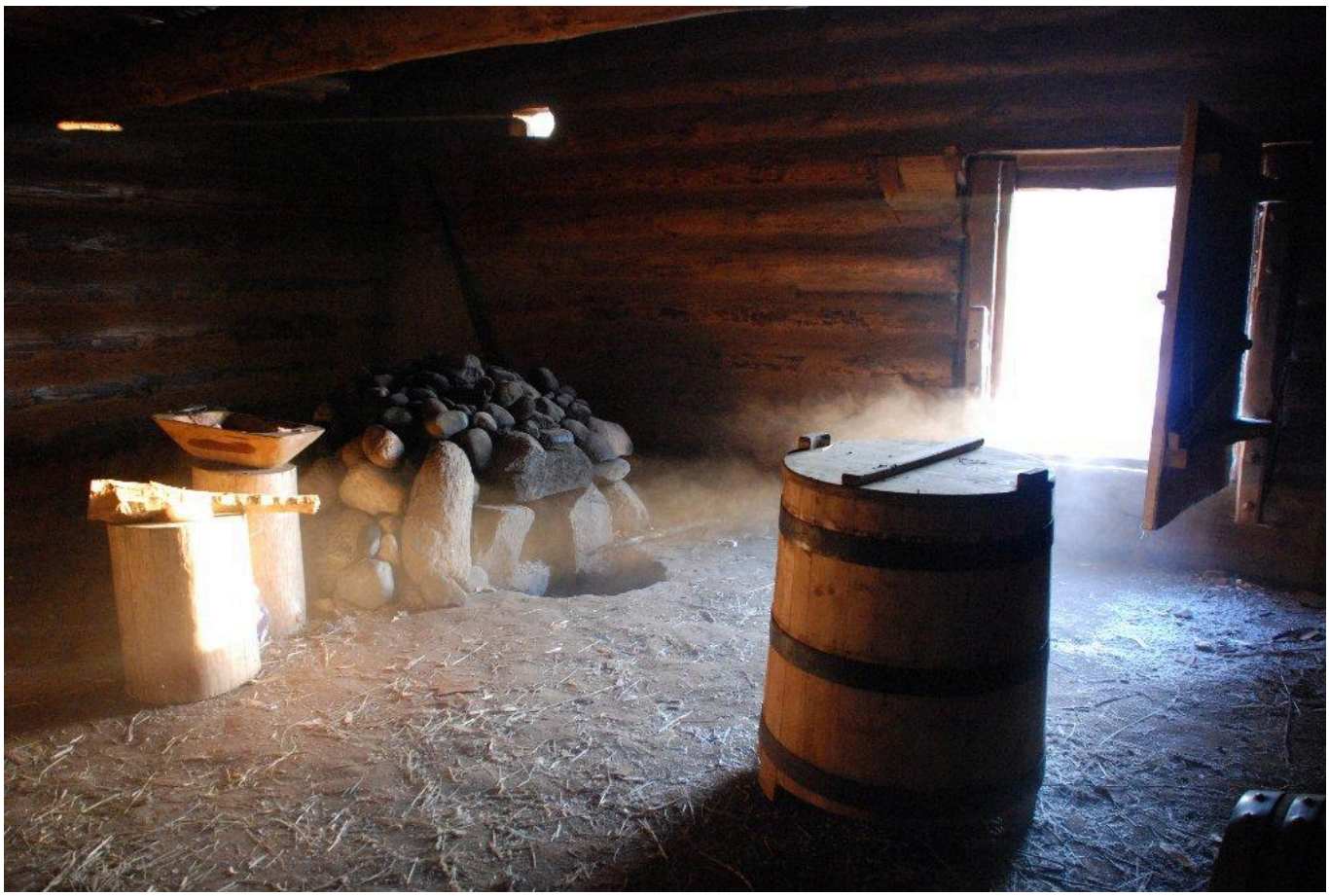

FIG 4. INSIDE VIEW OF THE HOUSE. IN THE WALL BEHIND THE STOVE, ONE OF THE MORTISES CAN BE SEEN. THE FREEZING AIR IS FLOWING IN THROUGH THE OPEN DOOR.

FIG 5. BUILDING THE STOVE. THE BIG PLATE ON TOP HAD TO BE REPLACED, AS IT BROKE IN HALF DURING THE FIRST FIRE.

FIG 6. HEWING THE ROOF PLANKS STRAIGHT.

FIG 7. GATHERING FIREWOOD.

FIG 8. LIGHTING A FIRE.

FIG 9. THE SMOKE LEVEL IS CLEARLY VISIBLE AFTER SOME TIME OF HEATING.

FIG 10. DURING HEATING, THE SMOKE EXITED THROUGH THE DOOR AND MORTISES.

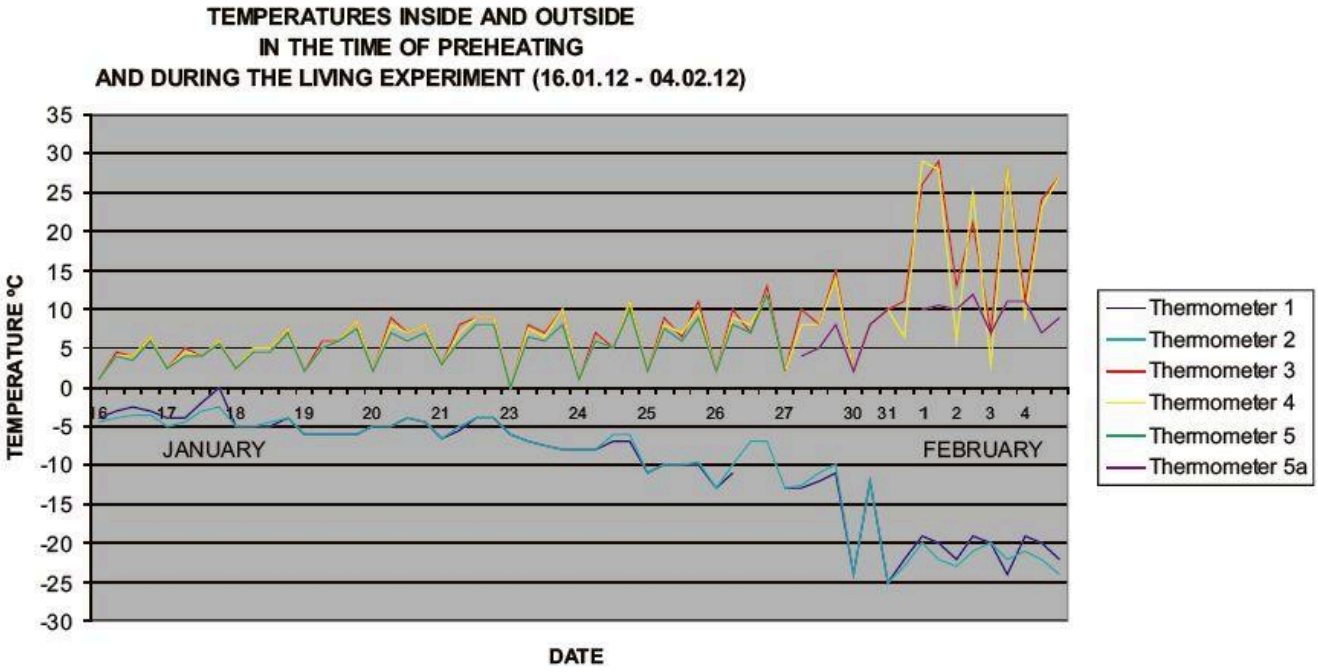

FIG 11. TEMPERATURES INSIDE AND OUTSIDE DURING PREHEATING AND THE LIVING-EXPERIMENT. PLACEMENT OF THERMOMETERS: TWO OUTSIDE – (1) AT THE SOUTHERN WALL, (2) AT THE NORTHERN WALL; AND 3 INSIDE – (3) AT THE FIRST RAFTER FROM THE DOOR ABOUT 1,6 M FROM THE GROUND, (4) NEXT TO THE DOOR, (5) AT THE FURTHEST RAFTER FROM THE DOOR. SHORTLY BEFORE THE LIVING-EXPERIMENT, THERMOMETER 5 WAS PLACED ON THE BUNK (5A) (ABOUT 0,5 M FROM THE FLOOR), TWICE THE TEMPERATURE ON THE FLOOR WAS MEASURED (5B).