## Defining the Ninth to Thirteenth Century Fortress Tustan': Building Archaeology of a Log, Cliff-side Structure

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In the Carpathian Mountain village of Urych, Skoliv District, Lviv Oblast of western Ukraine, carved into the rock faces of several large stone outcrops, are found the remains of a settlement dating from the ninth to thirteenth centuries – the cliff-side fortress complex of Tustan' (figs.1, 2). This site, recently designated a historical, archaeological, architectural, and natural preserve by the Ukrainian Ministry of Culture and Tourism, has no known surviving analogs in all of Europe outside of Ukraine. Its uniqueness lies in the opportunity it provides for a highly accurate reconstruction of multi-storied, cliff-side wooden architecture from the ninth to thirteenth centuries. The study of ancient, above-ground wooden structures - fortifications or domestic buildings - based on real, scientifically-measurable physical evidence left by long-removed buildings - has been for all practical purposes an impossibility for architectural historians. This prospect for understanding the details and intricacies of most aspects of wooden architecture in the Kyivan Rus' territories applied to virtually all buildings that existed before the sixteenth and seventeenth centuries. No wooden fortifications from before this date have survived. In fact, there are only five partially preserved and mostly reconstructed wooden towers that exist on several Siberian islands in Russia, the earliest of which date only to the seventeenth century (Opolovnikov, 1978, p.67-74). Among scholars there is a very negative attitude towards the reliability of many of the reconstructions of ancient wooden architecture undertaken to this time. Architectural historian Yuriy Spehalskyj (1972, p.16) stated that

we must acknowledge that archaeological evidence for the reconstruction of even such structures, for which there have been preserved very clear traces in the ground, can never be sufficient, regardless of how carefully they are analyzed and compared, for the creation of full and complete architectural drawings of the original appearance of these buildings. These images must always be understood as more or less of a schematic nature, and for this reason most of them remain merely conjectural reconstructions.

Because of the unique surviving physical evidence at Tustan' - more than 4000 channels chiseled into the face of the stone outcrops by its builders - architectural reconstruction to a degree of reliability of 90% is possible not only of the plan of the buildings in the complex, but also of the vertical extent and arrangement of the structures which formed a nearly impregnable cliff-side fortress. These channels were created to receive the ends of logs and support beams for wooden structures that included defensive walls, galleries, towers, staircases, and living and work spaces (fig.3).



Figure 1. View of the stone outcrop Kamin' (The Rock) forming the primary component of the fortress Tustan'. Urych, Skoliv District, Lviv Oblast, Ukraine. Photograph of Mykhailo Rozhko.



Figure 2. The fortress Tustan' on Kamin' (The Rock), Phase V, twelfth-thirteenth centuries.

The secrets of this remarkable site – and of the phenomenon of cliff-side architecture - were revealed to the international scholarly community through more than thirty years of research and fieldwork by archaeologist Mykhailo Fedorovych Rozhko (1939-2004), who began work on the site in 1971. He quickly realized that there were no surviving analogs in Europe or elsewhere, and thus no established methodology for its study, documentation, and interpretation. Rozhko developed

new methods for the study of cliff-side architecture involving documentary research, traditional archaeology, and building archaeology; tested and perfected them at Tustan'; and then applied them to similar and contemporary sites he identified, documented, and interpreted in the Carpathian Mountains – Bubnishche, Rozhirchi, and Pidkamenem. His work has resulted in a highly regarded and reliable architectural reconstruction of the fortress Tustan' defining five major phases of construction dated between the ninth and thirteenth centuries, and numerous articles and monographs in which he laid out his research methods and findings (Rozhko, 1993a; 1993b; 1994; 1995a; 1995b; 1996a; 1996b; 1996c; 1999a; 2000; 2001; Poturalska, 1999, pp. 308-310).



Figure 3. Channels cut into the rock faces of the stone outcrops to receive logs forming and supporting the buildings of the fortress.

The site of the fortress and settlement of Tustan' is situated in the foothills of the eastern slope of the Carpathian Mountains, at an elevation of 500 m to 900 m. It overlooks the valley of the Urychanka River, which forms a corridor leading to a major pass through the mountains. Along this valley is found a series of natural metamorphosed sandstone outcrops; the largest of these is known as Kamin' (The Rock). It alone is visible from the valley, as it towers nearly 80 m above the surrounding meadows; two smaller nearby outcrops form the larger architectural and defensive complex over an area of several square kilometers: Ostryj Kamin' (Jagged Rock) and Mala Skelya (Small Cliff) (fig.4).



Figure 4. Plan of the stone outcrops forming the fortress Tustan'.

The fortress was first established in the ninth century as a defensive and duty-collection point controlling three key mountain passes along an important trade route through the Carpathian Mountains, a segment of the larger trans-continental route between Portugal and China. This was also an important segment of the salt transportation route from Drohobych on the east slope of the Carpathian Mountains through the mountain passes into central Europe, and a place where traders could find a protected refuge on their long and dangerous journey through the mountains. The site was also the central fortress of a system of fortifications and observation posts in the Carpathian Mountains that protected the western boundary of the Halych-Volyn Rus' Principate. It is noteworthy that the Mongol invaders of the early thirteenth century, who conquered much of Kyivan Rus' and Halych-Volyn Rus' territories, never even attempted to take Tustan' (fig.5)

The fortress takes its name from a contraction of the words "tut stan" – "stop here". All travelers who passed by the fortress were required to stop and pay duties, and only then could they proceed. By the thirteenth century settlement had expanded around the cliff-side fortress complex and into the valley on the site of the modern village of Urych (fig.6).



Figure 5. Extent of the Halych-Volyn Principate, IX-XIII centuries.



Figure 6. Plan of the expansion of settlement at Tustan'.

Archaeological evidence has shown that the log structures of the cliff-side fortress suffered several fires during the four centuries that it existed, but the fortress was rebuilt and enlarged several times, resulting in five major construction phases. The complex continued its defensive and duties-collection function through the thirteenth century, but the ascendancy of the authority of the Lithuanian Empire over the Halych-Volyn Principate lands and the discovery of salt deposits in the Alps ended the primary functions of the site and its eventual abandonment.

The research methodology developed by Rozhko involved the following steps: a review of the literature of wooden architecture of the early medieval Kyivan Rus' period (ninth to thirteenth centuries); ethno-historical study and evaluation of extant wooden architecture in the region on the basis of the historical literature and previous archaeological investigations; a review of the previous research efforts at Tustan'; study of the geographical relationship of Tustan' to other defensive sites in the Carpathian Mountains; geodesic survey of the territory of the Tustan' complex and preparation of plans at scales of 1:100, 1:200, 1:500, and 1:2 000; analysis of the physical relationship of the various components of the complex and how they were exploited to create the defensive fortifications; photographic documentation of the stone outcrops and physical evidence using photogrammetry and detailed photography; detailed measurements of the chiseled channels and traces of construction left on the rock faces of the three stone outcrop groups; archaeological excavations on and around the stone outcrops, settlement areas, and outlying defensive walls; analysis of the recovered archaeological materials; interpretation of the collected data and preparation of phased architectural drawings - plans, elevations, sections, details - of the cliff-side fortress Tustan'; interpretation of the collected data to place the fortress Tustan' into the chronological and cultural context of medieval Europe and the Kyivan Rus' empire.

Analyses of the combined documentary, archaeological, and architectural investigations at Tustan' identified five major phases of construction and alteration of the wooden structure from the ninth to the thirteenth centuries (fig.7); in the thirteenth century masonry construction was first employed to fill several of the gaps between the stone outcrops formerly occupied by log and earth construction. In its most developed form, achieved by the late twelfth century, the main fortress and garrison at Kamin' (The Rock) reached an area of three hectares. On the east, it was protected by three rows of ditches and fortification walls; along the south side, a dam created a large pond, effectively blocking access from that side. A sunken, paved roadway, 1.5 to 2 meters wide, ran in a circuitous manner along the south and east sides of the fortress within log fortification walls, with the inner wall galleried to provide perches for defenders to fire upon intruders. As it approached the fortress, the roadway became elevated and access to the inner courtyard of the fortress was controlled by a drawbridge (fig.2).

The documentation and interpretation of the physical architectural evidence left on the rock faces of the stone outcrops – the thousands of chiseled channels cut into the stone to receive the ends of logs, braces, posts, etc. – and the archaeological evidence on the various levels of the stone

outcrops, required the development of entirely new and untried methods of investigation and documentation which combined, adapted, stretched, and expanded existing archaeological and architectural research methods (Rozhko, 1995b, pp. 82-84; 2000, pp. 213-221). For the work on the upper reaches of the stone outcrops, alpine techniques were used to gain access and to safely secure researchers from falling (**fig. 8**). Techniques of documentation included long-range photography utilizing 500 mm and 1000 mm lenses to minimize distortion from a fixed grid of points laid out around the stone outcrops ; photogrammetry; measurement with tapes; and the use of a theodolite and transit for accurate geodesic survey combined with a system of triangulation (**fig.9**).



Figure 7. Five major phases of construction and alteration of the wooden fortress. Tustan' from the ninth to the thirteenth centuries.



Figure 8. Alpine techniques were necessary to gain access and to safely secure researchers during surveying, architectural recording of the channels in the rock faces, and archaeological excavations.



Figure 9. Surveying with theodolite and transit were used for accurate geodesic survey and to locate the critical points of the channels cut into the rock faces.

Initial attempts at architectural reconstruction based on the more than 4000 chiselled channels found on the central stone outcrop, Kamin (The Rock), were made prior to undertaking archaeological excavations on and around the stone outcrops. It was quickly realized that there were far too many channels for the structural elements of only one building; it was clear that some of the channels would have clearly been obscured or covered with the walls or floors represented by other channels, thus leading to the conclusion that multiple phases of construction must have been involved. Careful re-examination of the evidence led to the logical conclusion that the channels had been cut into the faces of the stone outcrops only to the extent that they were needed for the current building project. Upon the enlargement of the structure, existing channels may have been reused as they were, enlarged, or extended to fit the new building materials and structure. This assumption, that succeeding phases of construction enlarged the building to its maximum size, guided the process of differentiating and interpreting the evidence into multiple phases of construction. In contrast to the ever-expanding construction process, the analysis and interpretation of the evidence had to proceed from the last and largest phase of construction to the smallest and earliest phase -a process of reduction, in which channels used in the later phases were successively removed from consideration (unless they were determined to have been extended through reuse or enlargement) in reconstruction of the earlier phases.

Archaeological investigations on the cultural horizons on the stone outcrops were carried out at heights up to 68 m above the level of the surrounding meadows, and to a depth of 14 m and 30 m within the shafts of the cisterns and well chiseled into the solid rock (fig.10). A grid of one-meter squares was used in the fortress courtyard and on the upper platforms; two-meter squares were utilized in the excavation areas around the stone outcrops and in the area of the surrounding settlements and defensive walls. The archaeological investigations were initially carried out to provide a chronological context for the various site components. However, the information recovered went far beyond mere chronology, significantly enhancing the understanding of the site's function and use, as well as providing new information regarding the actual appearance of the structures.

As discussed above, the physical evidence recovered from the cliff walls and floors, architectural and archaeological, gives the unique opportunity for an unambiguous reconstruction of the wooden cliff-side architecture in all three dimensions, including overall building height of more than 25 meters above the courtyard (or 68 meters above the adjacent meadow level), the profile of rooflines, height of individual stories, and the height of log and earth fortification walls ranging from 13 to 15 meters above courtyard ground level. The channels were chiselled into the stone walls and floors of the outcrops to the thickness of the logs, as much as .70 m to .97 m in diameter. Logs employed in the exterior fortification walls had diameters of .32 m - .42 m. In places the vertical channels were interrupted by horizontal channels which marked the height of the stories and offset vertical walls, in some cases indicating overhanging galleries (**fig.11**). This definition of the number and height of the individual stories on the basis of concrete evidence at Tustan', the surviving channels chiselled

into the stone walls of the outcrop, was a first in the study of the wooden architecture of the pre-Mongol period. In the early phases of construction and alteration during the ninth and tenth centuries, the height of the stories was 2.16 meters; by the fifth phase in the thirteenth century the height of the stories had reached 3.5 m to 3.7 m. The cliff-side evidence also gave the first concrete evidence for an unambiguous reconstruction of overhanging galleries as part of fortification walls; two sets of parallel vertical channels, with clear evidence of the overhanging gallery, were found on two opposing cliff walls. Physical evidence in the form of post holes chiselled into the solid rock floor of the stone outcrop of Kamin at Tustan' (fig.12) provided further evidence that the residential structures facing onto the inner courtyard within the defensive walls also had overhanging galleries, but these were supported on wooden posts. Similar evidence was also found at the nearby cliff-side sites of Rozhirche and Bubnishche; at the latter site there was also clear evidence cut into the stone of a gable roof over a two-story structure (fig.13). Thus, the long folk tradition of building with wide overhanging roofs supported by timber–framed galleries common in the Carpathian Mountain Hutsul and Boyko regions into the mid-twentieth century can be connected to a building tradition that dates back at least to the ninth century, if not earlier.



Figure 10. Archaeological excavations on the upper reaches of Kamin' (The Rock).

Tustan' was the first site to definitively confirm, through the surviving chiselled channels in the cliff-side walls, the construction of outwardly-curved exterior fortification walls in log structures, known during this time in European masonry fortifications as talus walls. The exterior surfaces of

the log fortification walls were also covered with up to 20 cm of clay, which hardened into a protective coating from fire. Excavations down slope from the fortification walls found sections of this clay coating with exact impressions of the log walls allowing the identification of tree species used, log diameter, and joinery types used in the construction of the fortress walls.



Figure 11. Stone channels cut into the rock faces provided evidence for the height of stories.



Figure 12. (Left) Post holes chiseled into the floor of the inner courtyard provided evidence that residential structures had overhanging galleries. (Right) Reconstructed view of inner courtyard.

The two cisterns and a deep well excavated at the site yielded remarkable information (fig.14). One cistern was chiselled through solid stone of the outcrop to a depth of 14 meters. The earliest of the remarkably well-preserved wooden architectural elements recovered from this cistern have been dated through C-14 dating and dendrochronology to the ninth-tenth centuries. Items recovered include door and window frames, riven shingles with rounded, decorative ends; tools; and wooden vessels such as buckets and mugs (fig.15). A second cistern built of mortared stone and dated to the

twelfth – thirteenth centuries was located on a platform high above the courtyard and a full 60 meters above the surrounding meadow level. A well 30 meters deep and 2 meters wide was also excavated – the lower 8 meters were also filled with wooden architectural elements, utensils, and tools discarded during the period of settlement and ultimate demolition of the structures on the site.



Figure 13. Evidence for cliff-side buildings at Bubnishche in the Carpathian Mtns.



Figure 14. Plan of a cistern and well excavated at Tustan'.



Figure 15. Reconstruction drawings of wooden architectural elements recovered from the well and cistern (the shaded portions were found preserved in the well).

The investigations also revealed the use of a traditional system of measurement during construction: fathoms (the distance between the fingertips of outstretched arms); ells (from fingertip to elbow); and span (the distance between the outstretched thumb and little finger). This system of measurement was widespread throughout the Kyivan Rus' territories and was mentioned in the Patericon as the system used during the construction of the Cathedral of the Assumption in Kyiv in the 11<sup>th</sup> century (Rozhko, 1996b, pp. 37-47; Abramovich, 1991, p.3).

The study of the building history of Tustan' has brought to the attention of the scholarly community new information about a very high level of complexity and sophistication in log building that existed in the Kyivan Rus' empire between the ninth and thirteenth centuries, when the buildings at Tustan' reached a height of more than five stories. A search for analogous forms of cliff-side wooden architecture in Western, Central, and Southern Europe showed that these regions also erected fortified sites on stone outcrops and cliff-sides, but all surviving and known sites indicate masonry construction of walls and structures – no evidence for wooden architecture, tied to the cliff-sides through chiselled channels for the log ends, is known. Of all known Kyivan Rus' period architectural and archaeological monuments – approximately 250 such monuments, including churches, are known – the majority were built in masonry. The earliest surviving wooden buildings on the former territory of Kyivan Rus' date only to the sixteenth century; the earliest surviving wooden fortification structures date to the seventeenth century. Thus the sites of Tustan', Bubnishche, and Rozhirche in the Carpathian Mountain region of south-western Ukraine are unique in all of Europe for the type of architecture they demonstrate and for the quality of the physical evidence that is preserved and has been documented and interpreted.

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This paper is based on the path-breaking work of Mykhailo Fedorovych Rozhko (b. 1939), who passed away on December 22, 2005. He had spend 34 years of his life working on the excavation,

documentation, analyses, and interpretation of Tustan' and other fortifications of the Kyivan Rus' period in the Carpathian Mountains and throughout Ukraine. His untimely death cut short a remarkable career before he was able to present his findings to a wider world now that the Soviet Union was no longer in existence and its former residents could travel freely and exchange information with their international colleagues without fear of persecution. We are fortunate to have known him and to have had the opportunity to collaborate with him, albeit briefly, on the interpretation of the fortress Tustan'. Mykhailo Rozhko's work is being continued by his son, Vasyl, an architect, who was recently appointed director of the Tustan' National Historical, Archaeological, Architectural, and Natural Preserve.

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