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Architectural-archaeological research and the hypothesis of the development of pre-local Drohobych in the XII-XIII centuries

Abstract. Architectural and archaeological studies of preserved architectural monuments emphasise the continuity of development, succession, and originality of the culture of each nation. The research aims to highlight the results of architectural and archaeological surveys at the foundations of the wooden architectural monument – the Church of the Exaltation of the Holy Cross in Drohobych, as well as to develop the hypothesis of the city’s urban genesis. According to the analysis of literary sources, seven construction periods have been identified since the church was built in 1613. The sounding method showed that the first foundations were standards, which were installed in pits on the cut surface of the continent, often with stone slabs, and covered with soil. The system of double slabs fixed under the altar crown of the log house is considered archaic. During the third and fourth construction periods, some of the stands were replaced, and a stone foundation supported by a wide base of slabs was built under the northwestern corner of the main log cabin. In 1823, the altar log cabin and the southern façade of the building were supported by a ribbon structure of stone foundations. No banded foundations were found under the western base of the chancel and the northern base of the nave. The lower gallery of the nineteenth and early twentieth centuries is supported by a system of foundations and smaller stands. Within the fourth probe, a deep archaeological site was localised with a ceramic sherd in the fill dating to the princely period. The analysis of several features and stratigraphic features of the fill gives grounds to interpret the object as the remains of a semi-hut of this period. Based on the location of the first immovable object, an attempt is made to clarify one of the hypotheses of the urban development of Drohobych from the unfortified initial settlement of salt workers on the right bank of the Pobuk in the twelfth and thirteenth centuries, through its gradual development into a proto-city settlement of the thirteenth and early fourteenth centuries in the present Zvarytske suburb to the foundation of a new locational centre in the fourteenth/fifteenth centuries on the free adjacent territory

Keywords: Church of the Ascension; foundation probing; stands; semi-subsistence housing; urban reconstruction

INTRODUCTION

Architectural archaeology is a sub-discipline of archaeology that studies man-made structures preserved underground. The largest field for the application of its methods is in historic cities – nodes of concentration of architectural monuments: sacred buildings, fortifications, residential and public buildings, cobbled or wood-paved ancient

streets/squares, important craft buildings, engineering structures and even gardens and park complexes, which also left traces underground. Architectural and archaeological research is required not only for the lost and forgotten relics of past architecture and urban planning, but also for the surviving monuments that need to be restored to

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emphasise the continuity of development, continuity, and identity of culture.

Architectural and archaeological research is one of the fundamental methods of architectural monuments comprehensive restoration (Kajzer, 1984; Harris *et al.*, 1993). It is carried out before the start of research and design as part of field research and surveys and lasts until the final stage of restoration (Mohytych & Lukomskyi, 2021). The most common method used in the initial stages of such research is reconnaissance probing of the underground parts of monuments using probes (<2 m²), pits (<20 m²), or trenches. Recently, these exploration works have been combined with geological surveys near monuments. The advantage of the probing method is to obtain the most necessary information while rationally interfering with the cultural layer around the objects, while the disadvantage is the localisation of the surveys and, therefore, the receipt of relatively limited information about its underground structures and adjacent cultural layers with archaeological objects. In the practice of architects and restorers, foundation probes are primarily interested in the building structures themselves, while archaeologists are interested in cultural layers and movable artefacts. Therefore, it is optimal to use the architectural and archaeological methodology for processing probes at architectural monuments. Wooden architectural monuments are considered to be quite difficult to study, as wood is generally less durable than stone or brick. Exemplary in this respect is the architectural and archaeological studies of the seventeenth-century Church of St. Paraskeva Pyatnitsa in Belga, Lviv region, in 2003, which revealed earlier archaeological sites with accompanying materials, based on which reasonable assumptions were made about the location of previous churches of the fifteenth and sixteenth centuries mentioned in written sources (Petryk *et al.*, 2004; Lazurko, 2007).

The research aim was to demonstrate how the results of the architectural and archaeological methodology used to probe the foundations of a specific seventeenth-century wooden architecture monument allowed the development of a hypothesis about the stages of formation of the urban planning structure of Drohobych during the princely era and early modern times.

MATERIALS AND METHODS

As part of the pre-project comprehensive scientific research of the architectural monument of national importance (No. 378) of the Church of the Holy Cross in Drohobych, Lviv region (Fig. 1), conducted by the Research Laboratory (RL) No. 104 of Lviv Polytechnic National University (hereinafter – LPNU) under the direction of Doctor of Architecture, Professor Mykola Bevz, a programme of architectural and archaeological sounding at the foundations of the object was developed. The project was executed by architect-restorer Yurii Dubyk (LPNU), and the author of the article is the executor of the soundings.



Figure 1. A general view of the Church of the Exaltation of the Holy Cross in the Zvarytske suburb of Drohobych from the southwest

Source: author's photo

The pre-project surveys at the monument aimed to determine the construction and technical features, construction periodisation, and state of preservation of the foundations under all four components of the site (Fig. 2). The fieldwork lasted from 12 to 20 November 2021. Performers: the expedition of the NULP Research Laboratory 104. Assistance in the fieldwork was provided by the Archaeological Laboratory of the Faculty of History of the Ivan Franko Drohobych Pedagogical University (Doctor of Historical Sciences Leonid Tymoshenko), as well as by a 2nd-year student of this faculty Vasyl Syvorotka. Taras Ivanyshyn, a researcher at the B. Voznytskyi Lviv National Gallery of Art, occasionally participated in the expedition.

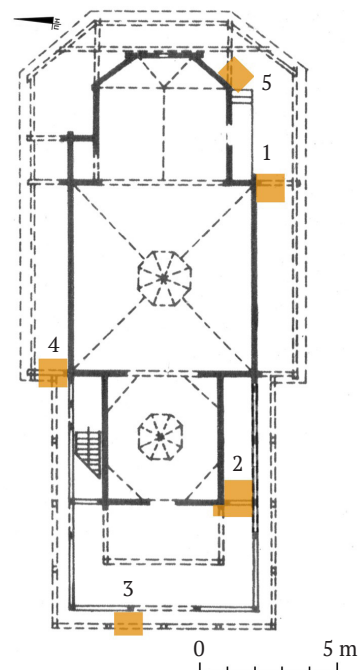


Figure 2. The plan of the church with the implemented probes

Source: V.S. Vuytsyk (1985) with author's edits



The methodology of the architectural and archaeological probe is a line-by-line deepening of areas with a descriptive, graphic, and photographic recording of planographic and stratigraphic information, discovered immovable objects, and selection of movable artefacts from cultural layers. Measurements were made using measuring instruments from conventional zeroes “tied” to the ground foundations of the site.

Before the survey, the history of the monument was studied in detail (Slobodian, 2017) and a chronological

table was created (Table 1). According to written sources, the history of mentions of the church dates back to the second half of the fifteenth century, but the monument that has survived to the present day, according to the inscription on the cross, dates back to 1613. Therefore, based on the historical information reflected in written sources (Slobodian, 2017), seven construction and renovation periods of the monument were noted from the beginning of the seventeenth century to the present day.

Table 1. Construction periodisation of the facility based on published sources

| Date, year | Event | No. of build period |
|-------------------|--|---------------------|
| 1460 | The earliest mention of the existence of a church in Drohobych | |
| 1496 | The first mention of the Church of the Holy Cross in Drohobych on the outskirts of the city | -2 |
| 1499 | Church burns down during Turkish-Tatar attack | |
| 1507 | The church was rebuilt | -1 |
| 1613 | The modern Church of the Exaltation of the Holy Cross was built | 1 |
| 1661 | During the control of Father Anthony Chesnokhrestskiy, the church was expanded by building an upper church or chapel of the Nativity of St John the Baptist above the babynets (women space) | 2 |
| 1715 | Under Pastor Stefan Hlibkovych, the church was renovated | 3 |
| 1738 | Renovation of the church under pastor Vasyl Hlibkovych | 4 |
| 1823 | The renewal of the church was “weighed”, i.e., lifted for installation on a new stone foundation | 5 |
| Beginning of 1920 | A porch is arranged in the lower gallery | 6 |
| 1963 | The monument is included in the National Register of Monuments of Ukraine under the protection number 377 | |
| 1967 | A study of the monument was carried out (architect Ihor Starosolskiy) | |
| 1970-1971 | Restoration (architect Ivan Mohytych). At that time, the buildings and the chancel were dismantled, and the church was covered with new shingles, and the murals were partially restored | 7 |
| 1987 | The Church of the Exaltation of the Holy Cross belongs to the Department of Wooden Architecture Monuments of the Drohobychyna Museum | |

Source: compiled by the author based on V.M. Slobodian (2017)

The stratigraphic method of relative object dating was used in the probe processing, the aim of which was to determine the chronology of archaeological and architectural objects by the sequence of cultural layers, the formation of which is associated with their appearance.

RESULTS

Probe 1 (1×1 m) was located at the southeastern crown of the nave foundations. The eastern boundary of the probe coincided with the end of the longitudinal foundation (Fig. 2). Within the probe, a support structure of two standers of different times, located one above the other, a part of the stone foundation was revealed, the state of preservation of the underground structures of the monument was found, and archaeological material was collected.

A stander is a piece of log without bark, the ends of which were cut with an axe to better preserve the wood in the soil. The stander was placed or driven vertically to support the crown of the foundations of a wooden building.

Stander 2 is located under stander 1 in a vertical position. It is in a worse condition than the first one. Stander 2 has no finished end. Its upper part was broken off before the later structure was installed. A base slab (40×40×1.5-2 cm) of dense limestone stone in a cracked state was found under the base of stander 2. The slab was installed on the horizontally cut surface of yellow mainland clay, i.e., on the pit bottom (1.63 m), in which the structure was arranged (Fig. 3; Fig. 4). The edge of the pit could not be detected within the part of the buried probe.



Figure 3. Probe 1 is at the final stage of opening.
View from the south, from above

Source: author's photo

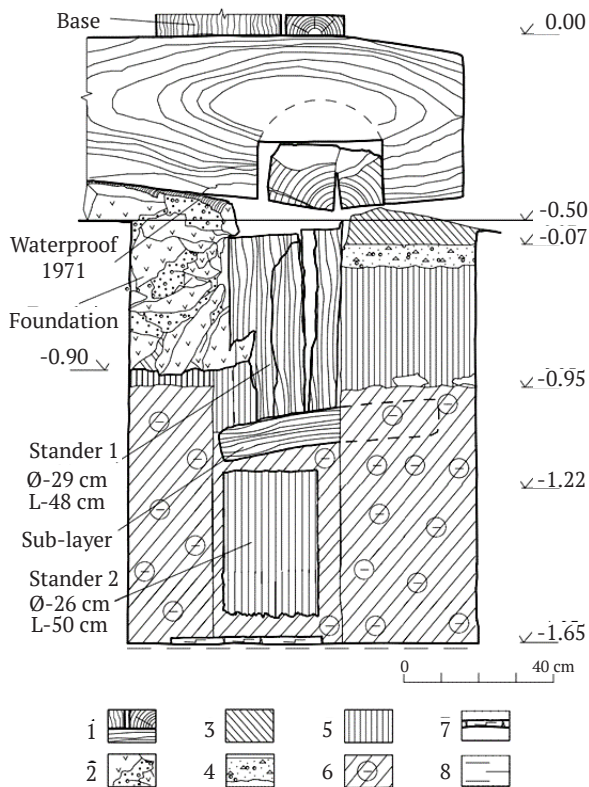


Figure 4. Probe 1. North wall at a scale of 1:10

Note: 1 – wooden structures; 2 – masonry foundation; 3 – grey loam; 4 – lime-sand mortar layer; 5 – grey-brown loam; 6 – brownish-yellow loam; 7 – limestone slab base; 8 – mainland yellow clay

Source: developed by the author

Stander 1, a round timber with a smoothly chopped end surface, without bark, semi-rotten, and heavily cracked in the longitudinal direction, was found just under the crown of the log cabin. Loose soil took the place of the rotted or dried wood areas. Stander 1 was supported on transverse bedding made of a 10 cm thick and ~24 cm wide piece of board. The board is located parallel to the southern footing, i.e., in an east-west direction. The western edge of the substrate board is evenly cut off, corresponding to the designed contour of the stander, and the eastern edge extends beyond the opening. The length of the substrate was determined using a feeler gauge to be ~58 cm. Therefore, stander 1 was supported on one side of the substrate without a groove for fastening. During the operation of the structure, the western side of the substrate settled and the fragment of the substrate board itself tilted by ~10° from its original position (Fig. 3; Fig. 4). The sagging of the base board indicates that the stander was performing its support function before the brick foundation was built, and after the strip foundation was installed, the drying of the stander wood led to a gap of 5-8 cm between its upper end and the foundation (Fig. 3; Fig. 4).

In the north-western corner of the probe, the foot of a part of the ribbon foundation of the southern foundation was reached. It was built using a medium-strength grey lime-sand mortar of flaked dense sandstone and granite. There are no layers in the masonry. There are no traces of grouting between the stones. Most likely, the structure was built from the opposite, inner side of the building. The width of the foundation at the top is about 40 cm, and slightly increases to about 50 cm downwards. The base of the foundation lies at the level of -0.95 m, i.e., the height of its structure is 50-55 cm. The foundation is installed on mixed soil. Judging by the nature of the surface, the structure was built openly. The foundation is laid to stander 1 (Fig. 3; Fig. 4).

During the last restoration in 1970-1971, waterproofing in the form of roofing material was installed between the surface of the foundation and the basement. During this process, the nave timber frame had to be slightly supported. The state of preservation of the foundation above the waterproofing is satisfactory (Fig. 3; Fig. 4).

There is almost no stratigraphy in the side walls of the probe. In its lower part, there is a variegated brownish-yellow mixture of loams – the fill of a pit much wider than the probe. Small fragments of pottery, glass, and bricks were found in the pit fill. The most recent finds of the complex are fragments of thin walled, glazed on both sides, ceramic containers dating from the seventeenth to the eighteenth centuries. Considering the latter definition, the pit with unidentified outer contours, in which stander 2 was installed and later replaced by stander 1, can be dated to the second rather than the first construction period (Table 1). A decisive argument in favour of the first or second assumption would be a dendrochronological analysis of the remains of stander 1, a fragment of which has about 40 annual rings in contact with the bast layer of wood.



In the western wall of probe 1, the profile of another pit, dropped into the previous one, can be traced. Its bottom is horizontal, with a mark corresponding to the level of the stone foundation sole (-0.9 m). At a distance of 85 cm from the contour of the foundation, the bottom of the pit turns into a sloping side wall at an angle of $\sim 60^\circ$. The pit fill contains interspersed clumps of lime-sand mortar, which is similar to the foundation fill. On this basis, the pit should be attributed to the time of the church's renovation in 1823, when a stone foundation was laid under it (Fig. 3; Fig. 4).

Based on the stratigraphic method of relative dating, it was concluded that stander 2 dates back to one of the earliest periods of construction or substantial renovation of the church in 1613 or 1661, stander 1 with the foundation underneath to one of its repairs in the eighteenth century (1715 or 1738), and the stone foundation to the major renovation of the church in 1823, during which the log cabins were built with supports (Vuytsyk, 2004).

Probe 2 was laid at the southwestern corner of the Babinets, mainly from the south and partially from the west. Its dimensions in plan: 1.3×1.0 m with a cut of 0.4×0.2 m at the very crown of the log house (Fig. 2). The soil under the gallery floor is mixed and dry. It contains rotten wooden chips, clots of lime-sand mortar, inclusions of yellow clay, and redeposited human bones. In general, it is a mixed brown loam. It can be concluded that the probe entered a

former wider dig. At the level of -0.85 m, the probe reached the base of the stone foundation (Fig. 5).



Figure 5. Probe 2 at the final stage of processing.

View from the south-west, from above

Source: author's photo

The bases are connected by an interesting hidden oblique lock. The upper part of the cross-base outlet was lost before the last restoration work, as indicated by its uneven surface, which is covered with red paint as an antiseptic, along with the side face of the longitudinal plane. The fairly evenly chipped crown of the transverse base originally filled the cavity under the upper base's mortise to the top. The end of the upper base is cut with an axe (Fig. 5; Fig. 6).

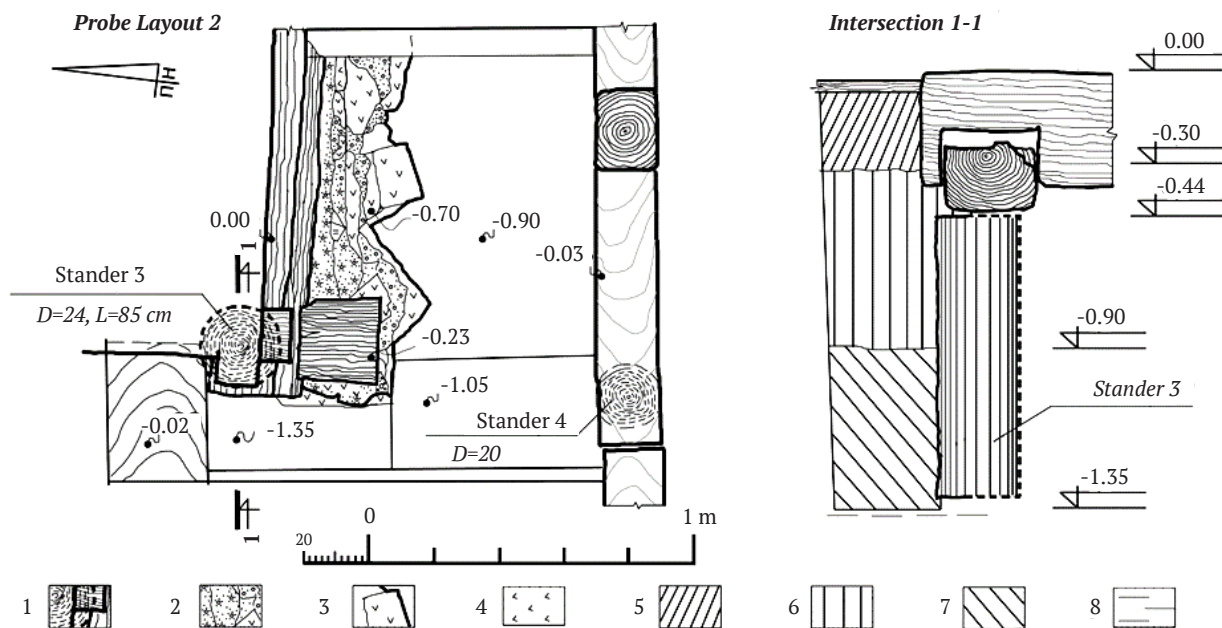


Figure 6. Probe 2. Plan and stratigraphic section

Note: 1 – wooden structures; 2 – masonry foundation; 3 – dense sandstone; 4 – granite; 5 – grey loam; 6 – light brown loam; 7 – dark brown loam; 8 – mainland clay

Source: developed by the author

Unlike the nave log cabin, there was no waterproofing between the foundations and the foundations of the Babinets, which is why the condition of the lower parts of the wooden structures at the junctions with the masonry is

unsatisfactory. The wood of both foundations in the lower part has rotted to a thickness of 5-7 cm (Fig. 5).

Under the crown of the log cabin, stander 3 was discovered. Its state of preservation is unsatisfactory, similar to





the state of preservation of stander 2, i.e., the wood has lost its full bearing capacity, and rotted, but retained the shape of its former shell with fibres at the time of opening. This shell was destroyed on the opposite eastern side during the construction of the stone foundation, one of the stones which practically cuts through the wood (Fig. 5). Thus, in 1823, when the stone structure was erected, the wood of stander 3 was already in a rotten state. To the north of stander 3, no stone foundations were found.

Stander 3 was installed directly on the horizontally cut plane of the mainland clay. The mark is -1.37 m. The edges of the pit in which it was constructed were not found. The stratigraphy of the northern wall of the pit consists of three layers. The upper layer is a grey loam with wood remains up to a depth of -30 cm; the middle layer is a light brown loam with inclusions of mainland clay and fragments of semi-rotten wood, up to a depth of -0.90 m; the lower layer is a dark brown loam with small grains of mainland clay and woody smoke. All three layers are bulk, in a dry state. The two lower ones are related to the backfilling of the stander. The upper one was formed later, during the last restoration of the monument (Fig. 6). No dating archaeological material was found in the fill layers.

The foundation structure was built in an open-cast manner. The material for the foundation is a dense, crushed grey sandstone, as well as granite, generally pinkish in colour with dark and light angular inclusions of feldspar, quartz, and crystalline mica specks. The stones are of various shapes, mostly with one/several naturally formed or chipped smooth surfaces. The masonry is bonded with a light grey lime-sand mortar. In terms of material and construction techniques, the foundation is similar to the masonry found in Probe 1 (Fig. 5; Fig. 6).

The foot of the foundation is laid much wider than its upper part, by 20-27 cm. The contours of the lower layer are irregular, and its thickness is 18-20 cm. The next layer is built with bedded stones and is 10 cm thick. The third layer, 20 cm thick, consists of sub-cubic stones, which are set in a row almost to the bottom edge of the foundation. The surface of the row was levelled with smaller stones and filled with a layer of mortar, into which the undermined foundation unit was lowered or "drowned" (Fig. 5). The mortar on the outside is often in the form of frozen streaks, without traces of grouting. Thus, the foundation structure was built from the opposite, inner side of the building. A significant number of cavities can be seen on the southern face of the masonry. A characteristic feature that indicates that the foundation was built under existing foundations is that the mortar partially covers the base of the foundation, forming a kind of rim several centimetres high and wide (Fig. 5).

At the southern boundary of the probe, the foundations of the lower gallery, which support its pillars, were traced. The cross-section of the foundations is 14×14 cm (Fig. 2). They are connected "in a paw". The joints do not coincide with the pillars. Under the junction of the foundations, in the southwestern corner of the probe, a part of the stander 4 with a diameter of 20 cm and a length of 35 cm was exposed

(Fig. 6). Stander 4 was installed without a base, directly on the ground. A 3 cm thick and 20 cm wide piece of board was placed between its top and the joint of the bases.

Thus, in Probe 2, it was possible to examine and record stander 3, part of the foundation structure under the Babinets, the foundation of the lower gallery, and stander 4. The structures of the lower gallery appear much fresher than the previous ones. Their appearance should be dated to the nineteenth and twentieth centuries. The state of preservation of the structures is unsatisfactory: stander 4 is in a semi-rotten state, and cracks can be seen in the foundation structures. Judging by the condition and appearance of stander 3, it, similar to stander 2, should be dated no later than the first two construction periods – 1613 or 1661 (Table 1).

Probe 3 (1×0.8 m) is located at the northern pillar of the main entrance to the lower gallery. Its longer side is oriented in the north-south direction. The probe is adjacent to the foundations of the lower gallery (Fig. 2; Fig. 7).



Figure 7. Probe 3 is at the final stage of opening. View from the west, from above

Source: author's photo

Under the junction of the lower gallery's foundations, the remains of stander 5 can be traced, which is only partially preserved. Its core has completely rotted away. In contrast to the previous stander 4, which relates to the same construction of the lower gallery base, a horizontal substrate in the form of a granite slab with dimensions of 30×30×3-3.5 cm was found under stander 5 (Fig. 7). Between the top of the stand and the junction of the foundations, a 2.5 cm thick piece of board was placed across them.

At the northern wall of the probe, in the north-western corner, at a depth of -0.45 m, a human skull was found – burial 1 (Fig. 8). It was decided not to examine the burial and leave it in place, but to go deeper only in the southern part of the probe to the mainland horizon. At a depth



of -0.85 m, a patch of dark soil was cleared. It revealed a part of grave 2. The probe included femurs, partially pelvis and tibia. The burial lies at the level of -0.90 m. The skeleton is in an elongated position, sideways, with the head to the west. The length of the femur is 41 cm (the person was ~1.64 m tall). A nail fragment with wood remains in situ

was found near the northern wall of the burial pit, indicating the presence of a coffin, no traces of which survived. The surface of the mainland horizon was reached in the middle part of the probe at the level of -0.95 m. It is cut off, as the transition between the mainland and the mixed soil is quite sharp (Fig. 7; Fig. 8).

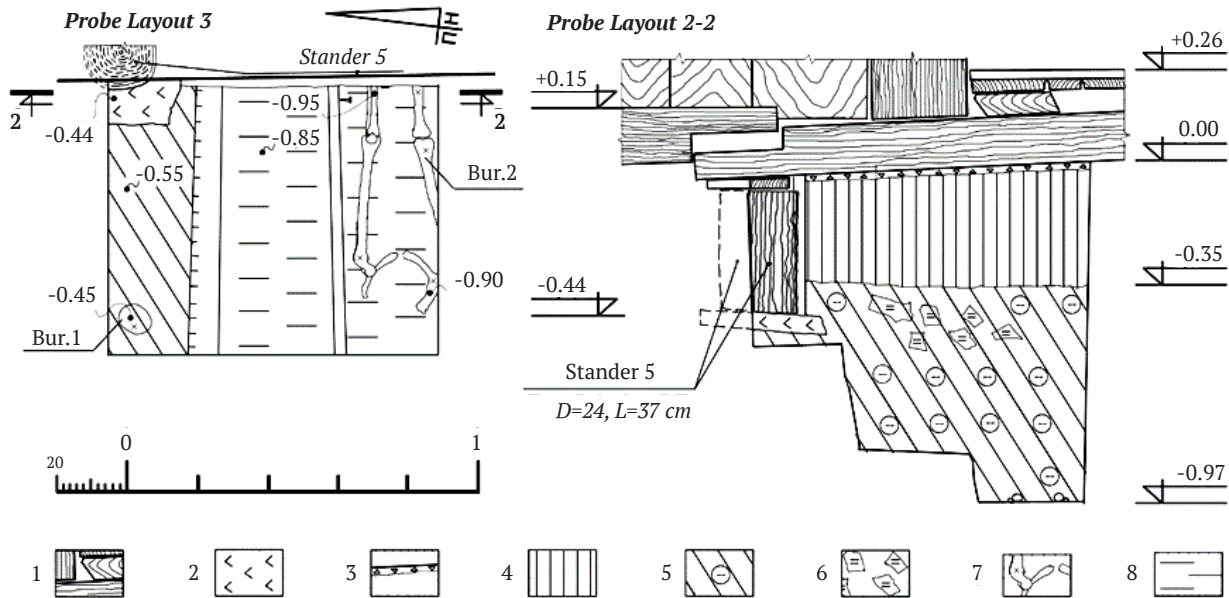


Figure 8. Probe 3. Layout and eastern wall in scale 1:20

Note: 1 – wooden structures; 2 – granite slab; 3 – crushed stone layer; 4 – grey loam; 5 – brown loam with clay; 6 – brick cluster; 7 – human bones; 8 – mainland clay

Source: developed by the author

Between the marks of -0.350.65 m, a cluster of brick fragments was found, among which two almost intact brick tiles were found. Their format is 16×14×4-4.5 cm. The tiles are completely baked, i.e., well fired. The medium-density

ceramic dough contains impurities of quartz sand, especially on the lower and side surfaces. The upper bed of the tiles is quite convergent, i.e., smoothed by friction. They come from a ceramic floor that has been in use for a long time (Fig. 9).



Figure 9. Probe 3. Fragments of two brick floor tiles

Source: author's photo

Thus, in probe 3, the remains of another stander under the node of the lower gallery foundations, the remains of burials in the church necropolis, and fragments of two brick tiles that may have come from the former church floor were traced. According to the composition, manufacturing

technology, and typology, they can be tentatively attributed to the Renaissance and Baroque periods of architecture, i.e., to the late sixteenth and seventeenth centuries.

Probe 4 (1×1 m) was located at the north-western corner of the nave, with its north-south axis running along





the junction of the nave's log cabin and the lower gallery (Fig. 2). The soil in the probe differed from the previously described ones by its dark colour, humus loam and higher moisture content. At the level of 0.6 m under the crown of

the log house, a part of the masonry foundation supported by two wide slabs was uncovered, and at the final stage of excavation within the probe it turned out that the slabs were installed over the filling of a deep pit (Fig. 10; Fig. 11).



Figure 10. Probe 4

Note: 1 – stripping at the level of 0.6 m; 2 – the final stage of opening, view from the north, from above
Source: author's photo

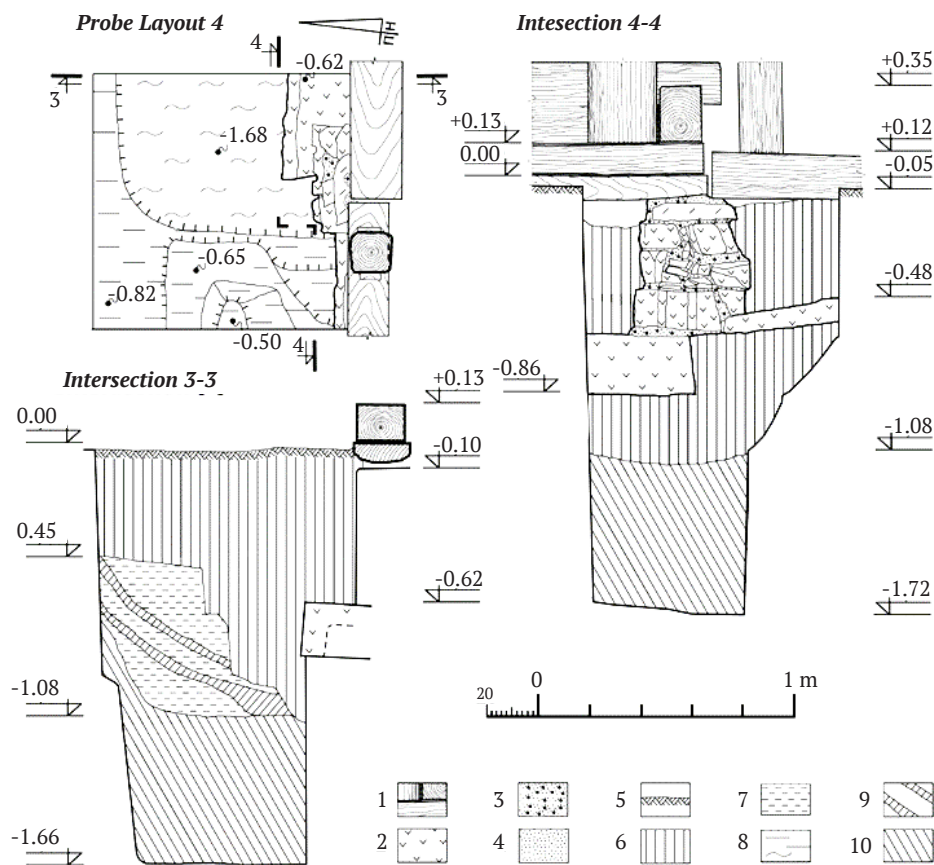


Figure 11. Probe 4. Graphical fixation of the plan and sections in 1:20 scale

Note: 1 – wooden structures; 2 – dense limestone; 3 – creamy mortar; 4 – greenish mortar; 5 – sod layer; 6 – grey-brown loam; 7 – bulk clay; 8 – mainland clay; 9 – layers of brown loam; 10 – dark humus loam
Source: developed by the author

The foundation itself was built openly from dense limestone with a strong cream-coloured mortar. The slabs at its base are made of the same stone. The first of them, the

eastern one, is >43 cm long and 24 cm thick. The slab continues in an easterly direction beyond the boundaries of the probe. From the west, it can be seen that it has an L-shaped



cross-section, which is similar to a fragment of a stone sarcophagus with adjacent walls ~10 cm thick (Fig. 11).

The second, western slab, 10-12 cm thick, lies with a slight slope and is visible in the probe for a length of 47 cm. It continues in a westerly direction beyond the limits of the exposure. Part of the end face of the slab is smooth, which makes it similar to a tombstone or sarcophagus lid.

The first layer of the stone foundation was laid on the edges of both slabs, with a 12 cm gap between them. The larger stone is slab-shaped and 16 cm thick. It is supported by the eastern slab. On the northern face of the stone, vertical traces of two drilled holes 3.5 cm in diameter are visible. These marks are associated with the extraction of the stone in the quarry by drilling a series of dotted holes. The second stone of the first layer is much smaller. It is resting on the edge of the western slab. Both stones are bonded with lime-sand mortar. The width of the masonry is 42 cm (Fig. 11).

The second layer of the foundation structure, 16 cm thick, resembles double-faced masonry – larger stones are set on the sides, and the space between them is filled with small stones on the filling. The third layer of masonry, 34 cm wide and 14 cm thick, is made up of two partially

processed stones with knees and naturally flat surfaces. The fourth layer is made up of a single bedded limestone, which is slightly different in structure from those used for the foundation, although it may also belong to the original masonry, as a seam filled with “native” mortar has been partially preserved under it, and fragments of the same filling can be traced on its upper bed. At the same time, another lime-sand mortar of a greenish hue was observed on the surface of the stone, on which a sheet of roofing material was installed and supported by a new restoration base in the form of a rough board, added from below the old one. These are traces of the 1971 restoration of the monument (Fig. 10).

The exposed foundation structure consists of three to four versts of semi-worked dense limestone stones, laid with cream-coloured mortar (Fig. 12). It is surrounded on both sides by a loose grey-brown loam, which is almost indistinguishable from the one that fills the pit under the slabs at the base of the foundation. It was not possible to establish whether the foundation is in the form of a column or a ribbon that could run along the transverse base of the nave, although it is more logical to assume its ribbon rather than a column-like shape in plan (Fig. 2; Fig. 11).

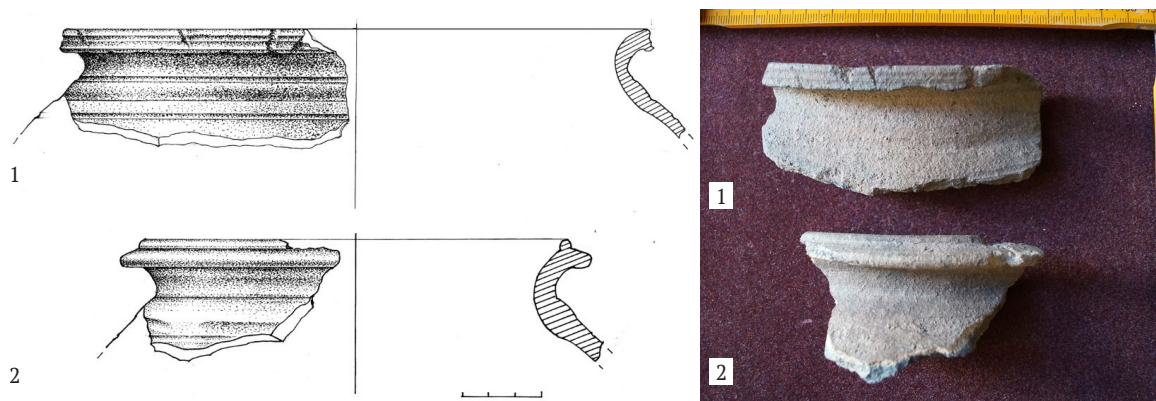


Figure 12. Crowns of round pots

Note: 1 – from site fill 1; 2 – from probe 5

Source: drawing by Ihor Prynada; photo by the author

At the level of -0.5-0.6 m, at the western wall and in the northeastern corner of the probe, two yellow spots were revealed, which was due to the content of mainland clay (Fig. 10, 1). By selecting the dark fill from among the mainland remains, a buried archaeological object 1 was discovered – part of a pit with vertical mainland walls and a horizontal bottom at the level of -1.68-1.72 m. The side walls of the object form a right angle in the plan. They are orientated to the cardinal points (Fig. 10, 2; Fig. 11). In the lower part of the fill of Feature 1, a fragment of a ceramic pot crown was found. It is made of well-tempered clay with a significant content of fine sand and a small proportion of crushed fireclay and jasper; the surface is smooth, rough, fired evenly to dark beige on the outer and inner surfaces, three-layered at the fracture (the core is dark grey), and has a porous texture. The neck is characterised by an arcuate outward curve. The outer surface of the crown is formed in the form of a cuff, obliquely cut outwards, the plane of which is slightly profiled with two shallow

grooves; on the inner surface of the crown, faint traces of an almost completely levelled roller can be traced. The pot is decorated with a rectilinear ornament in the form of wide irregular furrows applied with a point at the base of the neck and in the upper part of the shoulders (Fig. 12, 1).

The morphology of the crown is debatable. According to the typology of outlines, the ceramics can be attributed to Group I and dated to the end of the eleventh – first half of the twelfth century (Hupaló, 2014). At the same time, based on the levelled outlines of the roller on the inner surface, the blurred contours of the neck and shoulders, and a particularly significant number of impurities, including finely ground tin and fireclay, the pot fragment can be dated to the second half of the 13th century (Hupaló, 2020).

Thus, in probe 4, object 1, buried in the mainland base, which should be dated to the princely period, was discovered, as well as the construction of a masonry foundation supported by wide stone slabs, which, according to the





archaeological complex, dates from the seventeenth – first half of the nineteenth century. In terms of construction technique, parameters, and mortar characteristics, the foundation is similar to the previous foundations of 1823, although the use of granite is not evident in the construction, the masonry is double-faced in some places, and the mortar used is cream rather than grey, as in previous cases. Based on this, the foundation can be dated not to the fifth

but to the second or fourth construction periods, i.e., its appearance can be attributed to the second half of the seventeenth or first half of the eighteenth century (Table 1).

Probe 5 was carried out at the foundations of the first southeastern bay of the altar log. The probe area of 1×1 m was oriented at an angle of 45° to the cardinal points, i.e., exactly coincident with the broken face of the altar log (Fig. 2; Fig. 13, 1).



Figure 13. Probe 5

Note: 1 – the location of the probe, viewed from the east; 2 – a fragment of the combined stone and wood foundation structure under the altar log, viewed from the southeast

Source: author's photo

The foundations of the altar log house are provided with waterproofing in the form of roofing material and are in a good state of preservation. The foundation structure was laid from a mark of -0.53 m relative to the lower edge of the foundation on the cultural layer cut, not on the mainland. The horizontal section of the cultural layer at this mark shows predominantly grey-brown dry loam with small inclusions of mainland clay, brick fragments and charcoal. The foundation was constructed rather crudely of untreated granite and limestone blocks/stones, which is associated with the rear side of the masonry, which was carried out from the interior of the building. It is similar to those described in probes 1 and 2.

The stone masonry completely covers the remains of stander 6, the upper part of which was destroyed during the foundation laying. The diameter of the stander is 30 cm, and its surviving length is 22 cm. It is similar to standers 2 and 3 in terms of its state of preservation and wood character. The base of the stander consists of two tiers of cream-coloured sandstone slabs. The upper slab (45×40×4 cm) is installed in line with the side foundation, and the lower slab (60×24×12 cm) is installed along the direction of the broken foundation. In other words, the slabs are arranged in a similar sequence to the foundations (Fig. 13, 2).

The sides of the probe to some extent reflect the formation of the adjacent stratigraphy. On the northeastern side of the probe, a horizontal boundary between the grey-brown and dark brown strata at -0.5 m is visible. Since the upper layer contains grains of lime-sand mortar used in the foundation, it is logical to associate its formation with the construction of the stone foundation in 1823. The lower

horizon belongs to an earlier period. It is evenly mixed due to the church necropolis, the objects of which can be found below (Fig. 13, 2).

On the south-western side of the probe, a light layer of redeposited lime-sand mortar is visible from above, which should also be linked to the construction of the foundation in 1823. Above it, a layer of clay lock has been preserved. The foundation pit did not extend into this area. It could have been occupied by the structures of one of the levers used to raise the altar log. From the level of -0.45 m in the right (western) part of the wall, the sloping contour of the pit leading under the crown of the log house is visible. Most likely, this is a pit for the construction of stander 6. It is filled with brown loam mixed with grains of yellow mainland clay and brick fragments. Above this pit, the fill of which was still relatively loose, the construction layer just mentioned is settling (Fig. 13, 2).

Even older layers in the stratigraphic profile are located in the lower left (eastern) part between -0.5-1.0 m. Here, there are unevenly mixed soils with human skeletal fragments deposited in them. Such a mix is typical of cultural layers formed over Christian necropolises.

At the level of -1.00 m, a fragment of a pot crown was found in probe 5 (Fig. 12, 2). The filling is made of well-made clay with a medium content of fine sand and a slight admixture of crushed chamotte and jasper; the surface is smooth, rough, three-layer firing – dark beige on the surface and dark grey in the core, the texture is porous. The profile is characterised by an arched outward neck. The shape of the crown belongs to the roller-cuff model but differs from the “classic” version by its deformed outlines. The top of the crown is



shaped as a small roller, well profiled from the outside and accentuated by a rim on the inner surface; from the outside, the roller abruptly turns into an obliquely cut edge, lined with a roller-like thickening, which gives it the appearance of a cuff. According to morphological features, characteristics of the pottery dough and firing, the pot can be dated to the second half of the 13th century (Hupaló, 2020). Considering the purpose of the reconnaissance probe, it was decided to stop its examination at this level.

In general, in probe 5, it was possible to uncover and record part of the masonry foundation, as well as the remains of the original foundation of the temple in the form of a stander 6. It was not supported on the mainland foundation but on the cultural layer. Because of this, two slabs were laid at its base in compliance with the direction and sequence of the altar log foundations.

Hypothetical reconstruction of object 1 in probe 4

An important node of archaeological features recorded in probe 4 requires more detailed consideration and interpretation. The lower part of the pit of object 1 was filled with dark humus loam. It was overlain by a mound of yellow clay. It was preserved in the left, northern half of the section. On the right, southern side, a pit filled with grey-brown loam with inclusions of small construction debris and mainland clay cuts into the clay layer (Fig. 11, section 3-3).

The layer of grey-brown loam, which cut into the layer of yellow fill clay above object 1, is related to the construction or repair of the church, as it contains the stone foundation of the north-western corner of its largest log house. A 5.5 cm thick brick fragment was found in the lower part of the fill of this layer. It is similar in thickness

and composition of ceramic dough to the tiles from probe 3 described above. It differs from them by the smooth surface of the upper bed, cut off during moulding with a flat grain measurement stick. The micro-furrows from the stick indicate the direction of cutting the raw material. The lower edges of the product are smoothed similarly to tiles. It can be assumed that this fragment comes from the same tile, which, however, was not in use. Based on the typological similarity of the fragment to the tiles, it should be dated within a wide range – from the late sixteenth to the eighteenth century.

In the surviving part of the yellow clay fill layer, darker layers of brown loam can be traced, which lie obliquely with characteristic deflections. The curvature of the fill layers suggests that the pit of the buried object 1 should extend much further to the south and east, and the darker post-functional layers have settled into the middle part of its fill over time (Fig. 11, section 3-3).

The uncovered north-western part of object 1 resembles the corner of a semi-hut of the princely period in its characteristic features. The highest preserved level of the mainland horizon is located at the western wall of the pit. Here it is 0.50 m (Fig. 11, layout). The bottom of object 1 is at 1.68 m. That is, the height of the western wall of the pit was more than 1 m (~1.18 m). This characteristic fully coincides with the pits of semi-earth dwellings of the princely period (Rappoport, 1975). In the twelfth century, half-hearted dwellings were built and functional in the capital cities of the Galician land (Voynarovskiy *et al.*, 2002). In the peripheral centres, the tradition of their construction could have lasted until the second half of the thirteenth century. Based on this, it is reasonable to hypothesise that object 1 is the remains of a half-hearted dwelling of the princely era (Fig. 14).

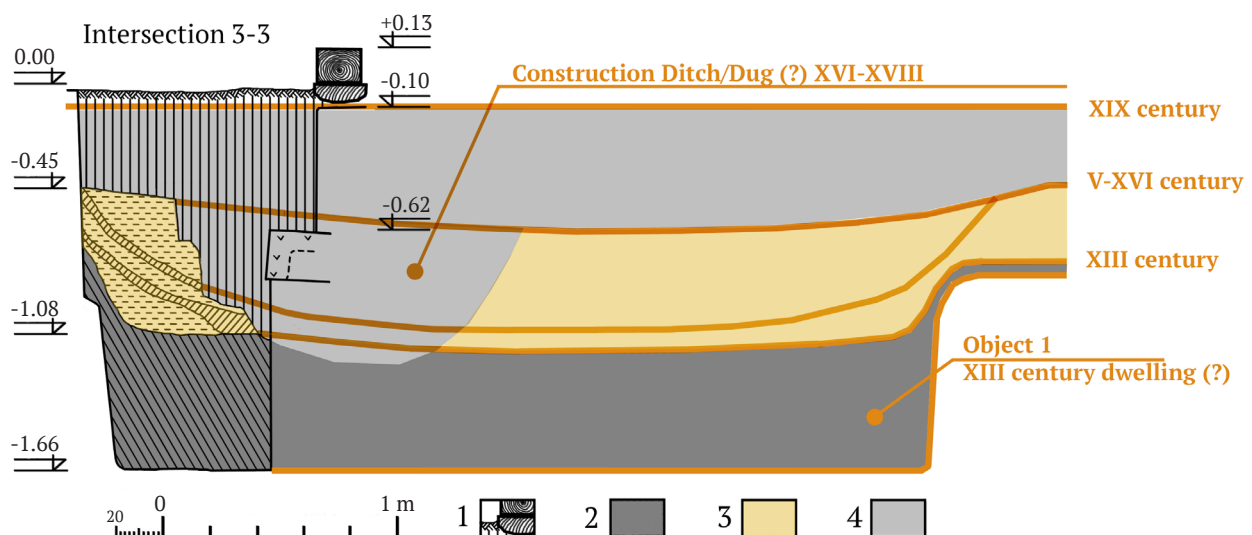


Figure 14. The hypothesis of the formation of a cultural layer over object 1

Note: 1 – northern foundation of the church nave with the adjacent day surface; 2 – dark humified loam with a find of the 13th century; 3 – layer of bulk clay of the 15th-16th centuries; 4 – layer of grey-brown loam with materials of the 17th-18th centuries

Source: developed by the author



According to the stratigraphy analysis, it can be assumed that after the cessation of the functioning of object 1 or the probable 13th-century dwelling, its recessed part was filled with dark humus loam. The loose fill shrank, which eventually led to the appearance of a clay layer at the site of the depression. Only then did the pit associated with the construction of the wooden church appear. The first foundation structure of the building could likely have been a stander, similar to the original standers found under other cornerstones of the building. However, such a structure would have quickly begun to settle into the fill of the earlier object, leading to its radical replacement by a foundation set on a platform of stone slabs. These probable stages cannot be traced archaeologically, as the pit of the complete foundation replacement completely absorbed previous interventions in the cultural layer related to the construction of the wooden support. However, it is also possible that a single initial installation of a foundation with stone slabs in the early seventeenth century, i.e. during the first construction period in 1613, was possible. The previous two possible periods of construction and reconstruction after the church fire of 1496 and 1507 (Table 1) have not yet been archaeologically traced at this site.

The hypothesis of a princely dwelling can only be confirmed or refuted by further archaeological research (Fig. 15).

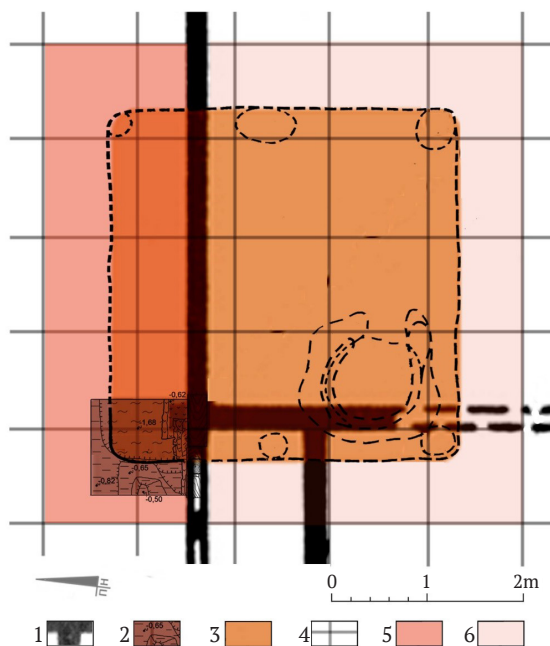


Figure 15. A hypothesis testing program

Note: 1 – foundations of a wooden church; 2 – completed probe 4; 3 – plan of a hypothetical half-earth dwelling of the 13th century; 4 – grid of archaeological squares 1×1 m; 5 – first stage of hypothesis testing; 6 – second stage of hypothesis testing

Source: developed by the author

First of all, it is necessary to extend the area of probe 4 in the eastern direction and identify the northeastern

corner of the probable dwelling. If the hypothesis is confirmed, it will be possible to justify the issue of the fullest possible disclosure of the remains of the dwelling from the interior of the Church of the Exaltation of the Holy Cross, enriching the monument with older bright relics that could be displayed or marked on site.

DISCUSSION

There are many hypotheses in the literature about the early stages of the formation of pre-local Drohobych in the princely era. The first of them were based on local legends, recorded by I. Vahylevych in the nineteenth century, about the existence of the first city of Bych somewhere nearby and the foundation of the second Bych, from which the oikonym “Drohobych” was derived (Mściwujewski, 1935). The archaeological localisation of fortified settlements near Drohobych (Ratych, 1957; Sveshnikov, 1976) fuelled this hypothesis. At the end of the last century, the noted culture monuments recorded in literature and the surviving monuments of material culture gave scholars grounds to put forward a new hypothesis that the beginnings of Drohobych are genetically linked to the salt springs on the banks of the Pobuk and the expected princely castle, on the site of which a parish church was built in the late fourteenth century (Oliynyk, 1994; Havryliuk, 1998). Based on a thorough review of written sources, urban analysis, archaeological supervision, observations, and excavations in the historic city, the first part of this hypothesis was confirmed (Tymoshenko, 2004; Petryk *et al.*, 2000; Petryk, 2009). Wider archaeological investigations revealed a large collection of redeposited materials from the twelfth and thirteenth centuries: a 2001 study was conducted on the site of the oldest Drohobych church of the Conception of the Blessed Virgin Mary from the first half of the fourteenth century, which was re-dedicated into a church in 1339; a 2003 study was conducted on the territory of the Drohobych saltworks (Petryk, 2004). Instead, the results of quite fundamental architectural and archaeological research at the bell tower of St. Bartholomew’s Church near Drohobych’s market square, conducted in 2015-2016, convince us of the formation of a cultural layer in the area near the church and the present-day city centre starting in the fourteenth century (Lukomskyi *et al.*, 2017), which casts doubt on the second part of the former theory of a princely castle on the site of the church.

The discovery of object 1, similar in characteristics to the dwellings of the 11th-13th centuries with the finding of a 13th-century pot crown in its fill, gives grounds for reinforcing and refining this hypothesis, namely, the location of the first immovable object – very likely, one of the buried dwellings of the princely settlement.

The object is located on the right bank of the Pobuk or Seret stream, which, skirting the hills of the present-day central part of the city from the west and south, runs through the suburb of Zvarychi along the street of the same name between the saltworks and the centre of Drohobych (Fig. 16).

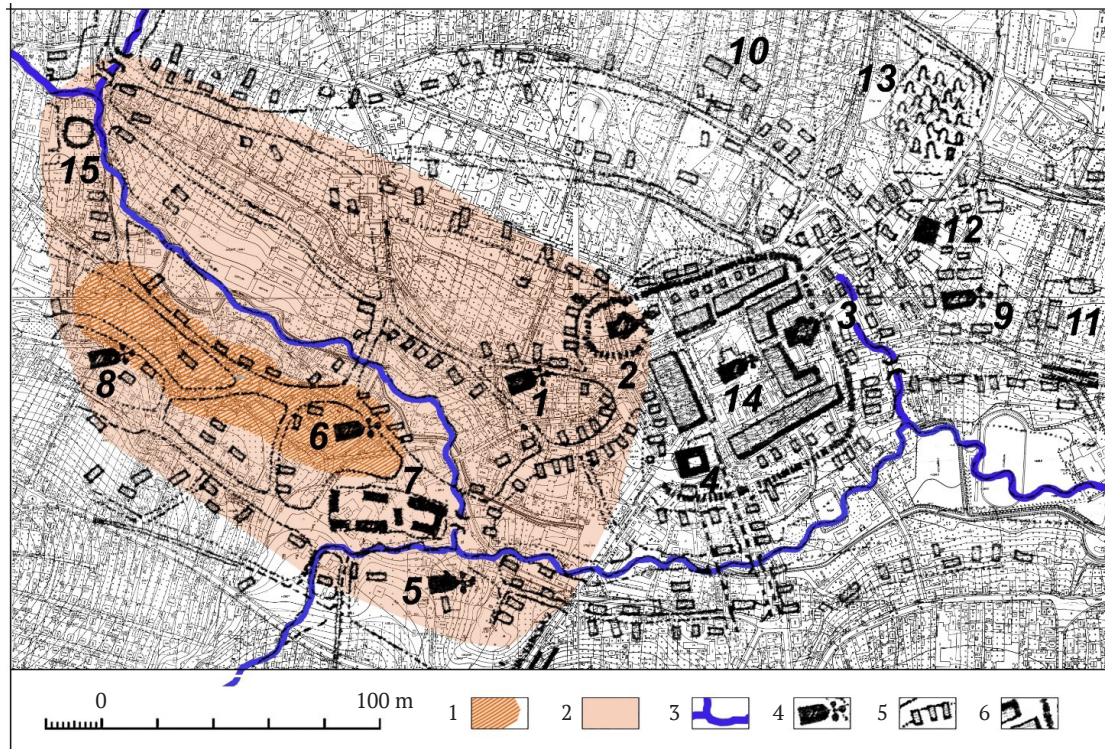


Figure 16. The hypothesis of the planning development of Drohobych in the thirteenth and fifteenth centuries

Note: 1 – area of the unfortified settlement of salt workers of the thirteenth century; 2 – planned growth of the salt workers’ settlement in the thirteenth and fourteenth centuries; 3 – water streams; 4 – sacred buildings; 5 – residential buildings of the thirteenth century; 6 – the city centre. Elements of the location town on the map: 1 – Church of the Blessed Virgin Mary; 2 – Church of St. Bartholomew; 3 – Church of the Holy Trinity; 4 – Carmelite Monastery; 5 – Church of St. George; 6 – Church of the Exaltation of the Holy Cross; 7 – zhupa (saltworks); 8 – Church of St. Paraskeva Pyatnytsia; 9 – Basilian monastery of Saints Peter and Paul; 10 – monastery yard (?); 11 – starosta’s castle; 12 – synagogue; 13 – Jewish cemetery; 14 – town hall on the Market; 15 – “Bear’s Yard” (?)

Source: compiled by the author based on Bezv & Petryk (2001), Bezv *et al.* (2003), Prokop (2017)

Considering the level of the daytime surface from which the site pit was lowered (-0.5 m), it was located 2-2.5 m above the stream level. The analysis of the terrain and certain patterns of settlement formation along streams or rivers concludes that the settlement could have been located along the Pobuk on its original bank. Most likely, it had a linear planning structure, which was formed along the shoreline and the road that ran along the right bank of the stream. The peculiarities of the terrain, which has no sharp bends or natural boundaries, do not give grounds to assert that the settlement was protected by significant external fortifications. Most likely, it could have been a weakly fortified settlement of a relatively small size. This type of unfortified riverside rural settlements – selytsia – were stretched in a narrow strip of 40-60 m along the bank for an average length of 500 m (Kuza, 1985), although much larger settlements (0.8-1.5 ha) are known (Kuchera, 1975). Taking into account the twelfth- and thirteenth-century materials discovered by the expedition of the Ivan Franko Drohobych State Pedagogical University (Petryk, 2009) on the opposite left bank of the Pobuk, and superimposing the outline of F. von Mieg’s map of 1779-1782 on the modern

topographic basis of Drohobych (Bezv & Petryk, 2001; Bezv *et al.*, 2003; Prokop, 2017), it should be assumed that the settlement could have developed in this northern direction during the thirteenth and fourteenth centuries, exploring the favourable southern slope of the left bank of the river, where the ancient street pattern is observed and where the oldest church of the Conception of the Blessed Virgin Mary was founded in the first half of the fourteenth century. The centre of the new locational city with a separately fortified church of 1392 and the Market Square of the fourteenth/fifteenth century turn of the century was planned to the northeast of the early proto city (Fig. 16). From this perspective, it also seems logical that a cluster of churches – not only the Vozdvizhenska and the nearby Yuriyivska churches but also others – appeared later in this long-populated historical part of the princely city.

CONCLUSIONS

As a result of the architectural and archaeological probing of the foundations of the wooden architectural monument, several foundation systems of different periods were discovered, their state of preservation was determined, stratigraphy was recorded, the burial of the church necropolis





was caught, mortar samples and movable archaeological material were taken, and a part of the archaeological site older than the construction of the church was uncovered.

The original foundations of the wooden church consisted of standers, the remains of which were recorded under the crowns of the nave, altar, and narthex log structures. The two-tiered foundation of slabs under stander 6 is archaic. Based on the typological analysis of movable archaeological material, the appearance of the structures of standers 2, 3, and 6 should be attributed to the first (1613) or second (1661) construction periods, and the replacement of standers 2 with a new stander 1 should be attributed to the repair of 1715 or 1738. The system of standers recorded under the foundations of the lower gallery should be dated to the nineteenth and twentieth centuries.

Stone foundations were discovered under the log cabins of the altar, nave, and narthex, but not under the entire perimeter of the three-aisle church. Judging by the similar construction technique and building materials used, as well as stratigraphic observations, the banded stone foundations should be associated with the renovation of the church in 1823. The fragment of the foundation discovered in probe 4 differs from the other foundations by its special base of large stone slabs, the absence of granite stones, mortar, and the double-faced construction technique. It is not yet possible to confidently date this structure.

A study of the adjacent stratigraphy suggests that the continental horizon lies at a depth of half a metre. The cultural layers at the site are heavily mixed with construction and burial pits. Two Christian burials were located in front of the western façade of the church. One of them was partially uncovered, recorded, and preserved.

The movable archaeological material is represented by fragments of household and building ceramics, glass, metal, and wood. It dates from the 13th to the 19th centuries, indicates a deep tradition of settlement of the area, and gives grounds for reasoned hypotheses about the construction periodisation of the monument. The discovered fragments

of rectangular brick tiles may relate to the interior of the church of the seventeenth and eighteenth centuries.

The oldest finds are fragments of crown pots from the second half of the thirteenth century, which come from the lower part of the fill of object 1 and probe 5. They, together with the characteristics of object 1 and the peculiarities of its stratigraphy, gave grounds to interpret the site as the cornerstone of a semi-earthwork dwelling of the twelfth and thirteenth centuries and to expect the localisation of a settlement of the princely era in the Zvarytske suburb. Based on this, the hypothesis-reconstruction of the planning development of early Drohobych has developed: 1) an unfortified settlement of salt workers of the XII-XIII centuries; 2) a proto-city settlement of salt workers of the XIII-XIV centuries; 3) a local fortified city of the XIV-XV centuries.

The Church of the Exaltation of the Holy Cross in Drohobych is a valuable and promising multi-layered object of architectural and archaeological study. Under its foundations are hidden artefacts and relics of a much older development of the Zvarychi tract, namely, the period of the princely era. Further study of the monument should be interdisciplinary and as comprehensive as possible, considering dendrochronology, anthropology, and other fields of knowledge.

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CONFLICT OF INTEREST

None.

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Архітектурно-археологічні дослідження та гіпотеза розвитку долокаційного Дрогобича у XII–XIII ст.

Анотація. Архітектурно-археологічні дослідження збережених пам'яток архітектури підкреслюють тяглість розвитку, спадкоємність, самобутність культури кожного народу. Мета статті полягає у висвітленні результатів архітектурно-археологічних зондувань при фундаментах пам'ятки дерев'яної архітектури – церкви Воздвиження Чесного Хреста в Дрогобичі, а також у розвитку гіпотези урбаністичної генези міста. Згідно аналізу письмових джерел визначено сім будівельних періодів з часу побудови церкви 1613 року. Метод зондувань показав, що перші фундаменти – стендари, які встановлювали у ямах на зрізану поверхню материка, часто з підкладами кам'яних плит, та засипали ґрунтом. Архаїчною вважається система підкладів подвійних плит, зафіксована під вівтарним вінцем зрубу. Впродовж третього–четвертого будівельних періодів окремі стендари замінили, а під північно-західний наріжний головний зрубу підвели мурований фундамент, опертий на розлогу основу з плит. 1823 року під вівтарний зруб та південний фасад споруди підвели стрічкову конструкцію мурованих підмурків. Під західною підвалиною бабинця та північною підвалиною наві стрічкових підмурків не виявлено. Нижня галерея XIX – початку XX ст., оперта на систему підвалин та менших стендарів. У межах четвертої зони локалізовано глибокий археологічний об'єкт зі знахідкою у заповненні уламку кераміки, яка датується періодом княжої доби. Аналіз низки ознак і стратиграфічних особливостей формування заповнення дає підставу інтерпретувати об'єкт рештками пів-землянкового житла вказаного часу. На основі локалізації першого нерухомого об'єкту, робиться спроба уточнення однієї із гіпотез урбаністичного розвитку Дрогобича від неукріпленого початкового поселення солеварів на правому березі Побуку XII–XIII ст., через поступове його переростання у протоміське поселення XIII – початку XIV ст. на теперішньому Зварицькому передмісті до закладення у XIV/XV ст. нового локаційного середмістя на вільній суміжній території

Ключові слова: церква Воздвиження; зондування фундаментів; стендари; пів-землянкове житло; урбаністична реконструкція

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Green space and planning structure optimisation ways in parks and monuments of landscape architecture

Abstract. Renovation of urban space is not possible without new approaches to the formation of green spaces of the landscape gardening heritage. In restoring parks-monuments of landscape art, simultaneous consideration of ecological and biological foundations, preservation of the historical structure of plantations and landscape planning framework, as well as meeting the modern needs of users of these spaces is an important issue. The research aims to formulate practical recommendations on the main ways to optimise the planning structure and green spaces, as well as means of protecting biodiversity in parks and monuments of landscape art. The study used general scientific methods (analysis and synthesis, field research) and special methods (dendrological, cartographic, historical, and architectural analysis, and computer methods for processing graphic data). During the pre-project stage of the study, the prerequisites for the formation of Zhovtnevyi Park in the structure of the Chernivtsi landscape were identified. A list and description of typical plant species typical for the area were provided. In addition, the pre-project study analysed conflicts in the park, which were divided into the following main groups: transport and pedestrian, functional, natural, anthropogenic, and visual. The interconnection of different types of conflicts and their impact on the conservation of biodiversity of green spaces in the park was revealed. As a result, new elements of the planning structure have been formed that improve the landscape-spatial organisation of the park's territory and contribute to the optimisation of green spaces. The project developed and analysed in this study has selected an assortment of plants that enrich the biodiversity of park plantings and can be used in the design of other urban parks. The example of the project for the maintenance and reconstruction of Zhovtnevyi Park in Chernivtsi demonstrates practical planning approaches and recommendations aimed at maximising the preservation of the natural landscape and enhancing its functional and artistic features

Keywords: biodiversity; city park; planting assortment; plant microhabitat; invasive species

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INTRODUCTION

Parks are living and perfect works of art that carry the function of preserving heritage (Kyseliov & Kyseliova, 2020). Parks-monuments of landscape gardening art are a category of protected objects defined by the Law of Ukraine on the Nature Reserve Fund. The most outstanding and valuable examples of park construction are declared as parks-monuments of landscape gardening for their protection and use for aesthetic, educational, scientific, environmental and health purposes. The territory of parks-monuments of landscape gardening art may be zoned following the requirements established for botanical gardens (Law of Ukraine No. 2456-12, 1992). They are objects of historical, cultural, and architectural heritage. Urban parks are usually artificially created oases of nature surrounded by an urbanised and aggressive environment. When establishing parks, dendrologists and landscape architects formed a species diversity and a certain palette of species, which has been significantly transformed over time and operation. Therefore, one of the main problems of most urban parks in the world today is the reduction of biodiversity of plant and animal life. In particular, a significant number of invasive species are often found in parks. Insufficient plant care leads to the presence of a significant number of dangerous and dead trees. These negative impacts lead to changes in the structure of plantations.

The preservation of urban parks is a major task for modern scientists. Territorially, urban parks, monuments of landscape art, are located in the middle of the urban system, which is constantly growing and changing. In this regard, the space is losing its original ratio of architectural and natural dominants; opportunities for achieving aesthetic expressiveness of the environment by means of landscape architecture are not being realised; the role of natural elements of the landscape as integral components of architectural ensembles is underestimated. The problem of preserving natural resources was formulated at the UN Conference on Environment and Development held in 1992 in Rio de Janeiro, which adopted the International Convention on Biodiversity, supported by 190 countries (Convention of the..., 1992). Greening urban and peri-urban areas is given special attention in the recently adopted Pan-European Biodiversity Strategy for 2021-2030 (European Commission, 2020), which states that green urban spaces, from parks and gardens to green roofs and urban farms, provide a wide range of benefits for people: they provide food and filter water, and supply air for breathing. The document also highlights the importance of nature for human mental and physical well-being and society's ability to cope with global change, health threats and disasters through nature. However, it also notes that green spaces are often losing out in the competition for land as the proportion of the population living in urban areas continues to grow. This strategy aims to reverse these trends and halt the loss of green ecosystems in cities.

Many foreign studies are concerned with the study of public opinion regarding the comfort of staying in parks

and meeting the needs of different categories of visitors to urban parks. These studies often use sociological methods of surveying park visitors. In particular, it is worth mentioning an article published by Taiwanese scientists on the needs of park visitors in Taiwan (Wu & Song, 2017). The researchers identify three basic needs of park visitors, namely: safety (high priority), accessibility (moderately high priority), and constant park maintenance (medium priority), and summarise the needs of all visitors. There are also numerous studies that focus on the needs of people in specific age groups, such as the elderly. H.K. Yung Esther *et al.* (2017), based on a sociological survey, argue that for older people, the most important criterion for the quality of urban parks is the ability to form social connections and improve social participation and inclusion of spaces.

Ukrainian scientists studying the problem of urban greening design emphasise the importance of considering the existing urban environment and its historical context, as well as involving city residents in the design process (Petryshyn *et al.*, 2022). Due to the modern development of urban areas, a special urban environment has been formed – the ecological condition of which requires constant monitoring (environmental monitoring). Plants react very sensitively to changed conditions, so they can serve as indicators of the state of the environment (Lukashchuk, 2018). In particular, scientists from the Central region of Ukraine, who studied the current state of plantations in the parks-monuments of Vinnytsia region, proved that the parks they examined have an unsatisfactory sanitary condition of plantations, and their ecological condition is critical (Yelisavenko *et al.*, 2018). This once again emphasises the need for special attention to the problems of optimising greenery in urban parks.

Thus, this study aims to develop specific planning tools for optimising green spaces and protecting biodiversity in parks of landscape art. These means of protection include the selection and supplementation of the existing range of plantings during the reconstruction of urban parks, including parks of landscape art monuments. The problem of optimising and forming sustainable green spaces in protected areas requires scientifically sound approaches that should be based on an understanding of the biological processes that occur in the area.

MATERIALS AND METHODS

The research is based on the reconstruction project of the Zhovtnevyi Park, a monument of landscape art in Chernivtsi, which was developed by the author's team of the Research Laboratory 117 (Tupis *et al.*, 2022) in 2021 at the request of the park administration.

The study used both general scientific methods and special methods. General scientific methods include an analytical review of publications and literature, international conventions, Ukrainian regulations, and legislation, as well as scientific publications and dissertations. Field research was conducted on the territory of Zhovtnevyi Park, accompanied by photographic documentation of the



territory and identification of characteristic viewpoints on the ground. In the course of the field research, observations were made of the behaviour of park visitors and the places of their stay and the negative impact on plants and landscaping in the park were recorded. The special research methods used in the pre-project studies and during the project development included the following: dendrological, cartographic, historical, and architectural, and computer-based graphic data processing.

The dendrological surveys of the territory of Zhovtnevyi Park in Chernivtsi were carried out on 15.09.2021 and 06-07.10.2021 by the route method, which is one of the main methods of geobotanical research. The names of plants used in the article are given according to the plant list version 1.1 (2013). In addition, during the dendrological surveys, taxonomic descriptions, and vegetation maps (Ukrainian State Design..., 1989) provided by the administration of Zhovtnevyi Park were used. The cartographic method was used to create graphic materials for the project based on the vegetation maps and comparison with modern data obtained during the route survey. These materials were used as a basis for writing the article. In the course of the study of age-old trees, the methodology of distribution of age-old woody plants by age and assessment of their aesthetic condition on a six-point scale was used (Shlapak *et al.*, 2011).

In addition, the pre-design study included a historical and architectural analysis of the cartographic material, in particular, the evolution of the development of the territory of Zhovtnevyi Park and its surroundings, the location

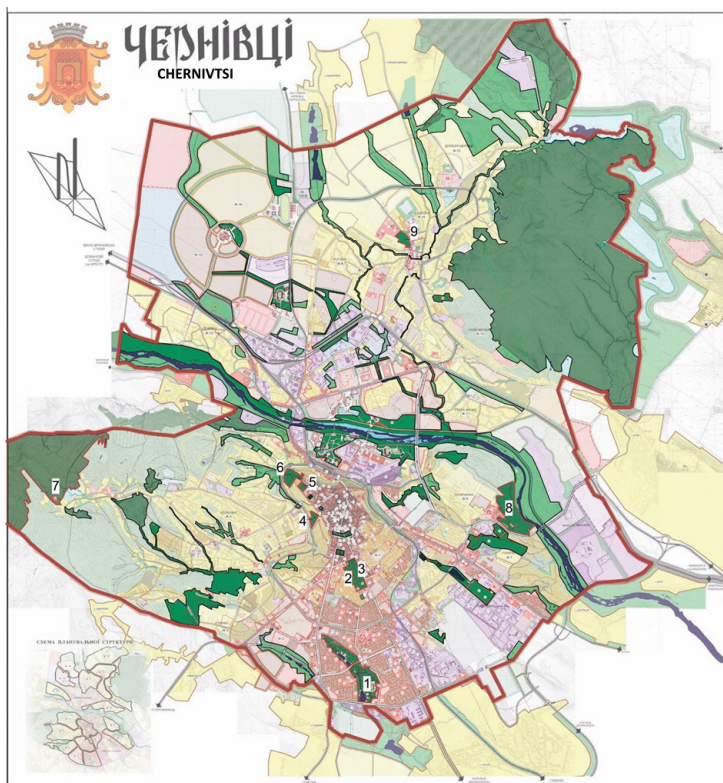
of the park in the structure of Chernivtsi, its landscape planning, spatial organisation, style and patterns of formation.

At the design stage, computer software was used to analyse the existing spatial structure of the park, which involved calculating the area under green spaces, lawns, meadows, and water bodies. This was used to determine the ratio of open and closed spaces in the park.

RESULTS

Prerequisites for the formation of vegetation in Zhovtnevyi Park

There are 331 protected areas in the Chernivtsi region with a total area of 103598.3 ha, which is 12.8% of the region's area (Chorney *et al.*, 2017). Today, there are nine parks-monuments of landscape art of local significance within the city of Chernivtsi with a total area of 108.55 ha. These are the Taras Shevchenko Chernivtsi Park of Culture and Recreation (16.9 ha), the J. Schiller Park (10.0 ha), the Yuriy Fedkovych Park (10.0 ha), the park square on Soborna Square (0.75 ha), the park square on Korduba Street (0.5 ha), and the park on the city's main street. Korduba (0.5 ha), Sadgirskyi Park on Tolyatti Street (2.0 ha), Sadgirskyi Park on Pidkova Street (7.3 ha), park square on Stetsenko Street (0.5 ha), Zhovtnevyi Park (63.5 ha). The basis of the city's parks-monuments of landscape gardening art is formed by the manor parks of the Austro-Hungarian historical period (XIX century) (Reshetiuk, 2017). Zhovtnevyi Park occupies an important place among the objects of the nature reserve fund of local importance in Chernivtsi (Fig. 1).



LEGEND:

- city limits
- forests
- public forested space
- newly-planted
- main nature reserve fund objects

1. Zhovtnevyi Park, a park-monument of landscape art of local importance
2. Botanical garden of national importance "Chernivtsi"
3. Park-monument of landscape gardening art of local importance "Taras Shevchenko Chernivtsi Park of Culture and Recreation"
4. Park-monument of landscape art of local importance "F. Shiller Park"
5. Dendrological park of national importance "Chernivtsi"
6. Park-monument of landscape gardening art of local importance "Y. Fedkovych Park"
7. Landscape reserve of national importance "Tsetsino"
8. Landscape reserve of national importance "Hot Urban"
9. Sadhirskyi Park, a landscape art monumental of local importance

Figure 1. Map of the location of Zhovtnevyi Park in the natural framework of Chernivtsi

Source: created by the authors based on the general layout of Chernivtsi





The Chernivtsi city centre is located to the south of the Prut River on a hill. The northern edge of this hill drops steeply into the river valley, and in the south, it looks like a gently sloping plain, where Zhovtnevyi Park is located. In the second half of the XX century, the territory where the current Zhovtnevyi Park, a monument of landscape art, is located, was used for grazing, hayfields, and orchards. Work on the creation of the park area began on 18 April-May 1968. During the first year, the area of about three ha was landscaped. To preserve the greenery and improve the further development of the territory as a recreation area for the city's residents, the decision of the Chernivtsi Regional Executive Committee of 30.05.1969 No. 198 created Zhovtnevyi Park (Chernivtsi City Council, 2019), which covers an area of 72 ha and is located in a picturesque stream valley in a residential area with a population of up to 63 thousand people. Thus, the construction of Zhovtnevyi Park was supposed to create excellent conditions for recreation and significantly increase the total number of green spaces in the city.

The area of the park is 63.5 ha, of which 6.5 ha are occupied by decorative lakes. On the territory of Zhovtnevyi Park, a stream flows along the bottom of the park from the northwestern to the southeastern part of the park, which is a tributary of the Korovia River. The stream is shallow up to 0.5 m, 0.5-1.5 m wide. Lakes are formed in three places on it. The lakes are filled with rain and melt water and underground flow. The first lake was formed by crossing the beam with an earthen dam. The second lake is a digging lake formed by artificially deepening a part of the gully and thereby creating conditions for retaining surface and groundwater. The third lake is the largest in the park, covering an area of 2 ha, formed by blocking the gully with an earthen dam; its maximum depth is 2.5 m, it is heavily silted, swampy, and overgrown in the upper reaches, and no intensive erosion is observed. The hydrological conditions of the park are characterised by the close occurrence of groundwater. In the floodplain of the stream and the gully, groundwater is at a depth of up to 0.5 m. The relief of the park's territory is represented by a gully and foreseeable slopes of different steepness. The width of the gully along the bottom is from 20 to 60 m. The territory of the park, which occupies the gully and the anticipated slopes, is a 2 km long section in the direction from northwest to southeast, 140 m wide in the north-eastern part of the section and 450 m wide in the south-eastern part. At a distance of about 1.2 km from the top of the main gully, a short but visible lateral gully joins it. Due to this arrangement, the lower part of the park, which is located between these beams and rises to 25 metres above the level of the beam junction, looks like a hill from the top. This hill, the middle of which is a plateau with a slight slope, offers beautiful views of the entire valley

with the silhouette of Mount Tsetsino and the distance towards the village of Velykyi Kuchuriv (Tokaryuk, 2019).

The studied territory of the park contains communities of forest, meadow, marsh vegetation types, aquatic and coastal water phytocoenoses, and significant areas of synanthropic communities (Korzhan, 2011). In Zhovtnevyi Park, 46 species of adventitious plants were identified, which formed rather dense and numerous populations within the groups of 9 associations, 8 unions, 8 orders, and 7 vegetation classes. The main biotopes of adventitious plants in the park are synanthropic, forest (anthropogenic broadleaf forests), and ruralised coastal and herbaceous habitats (Tokaryuk, 2019).

When Zhovtnevyi Park was created, fragments of forest vegetation were left behind, alleys were formed to suit the terrain, and alley and tapeworm plantings were laid out with introductions. The alley of pyramidal poplar, which was part of a field road in the past, has been preserved and remains an important element. To recreate elements of the forest landscape and to reforest degraded areas, massifs were formed, mostly pure deciduous with a predominance of *Robinia pseudoacacia* L., *Acer platanoides* L., *Aesculus hippocastanum* L., *Quercus rubra* L. or with a small participation of related species. Today, these plantations look like massifs in which, in the absence of targeted care, a natural biological process of change of woody plant species took place, overgrowing with low-value tree and shrub species by self-seeding. Groups of *Picea abies* (L. Karst.) were partially destroyed and remained as individual tapeworms. Some groups have been preserved in the protected part of the park. Groups of *Fagus sylvatica* L., *Acer pseudoplatanus* L., *Acer campestre* L. remained an important element of the park landscape. As for all park territories in Zhovtnevyi Park, urbanisation is causing synanthropisation of the vegetation cover. This leads to the depletion of the species composition of native species.

According to the computer analysis of the graphic materials of the territory of Zhovtnevyi Park, the existing spatial structure of the park was characterised, which is distributed as follows: the area under greenery is 54.4382 ha (86% of the total area of the park), of which the approximate area under lawns and meadows is 14 ha (25.72% of the area under greenery). The area under water bodies is 6.1087 ha (9.65% of the total area of the park). The preserved garden areas are usually a semi-open landscape type with low completeness. This type of landscape also includes the area of ruderal meadow with some clumps of trees.

The park is conventionally divided into two parts: the first is the northern part, covering 41.8829 ha, and the second is the southern part, covering 21.4105 ha. In Zhovtnevyi Park, 80 plant microgroups were identified, often with one predominant tree species, but with different participation in the composition of the plantation (Fig. 2).

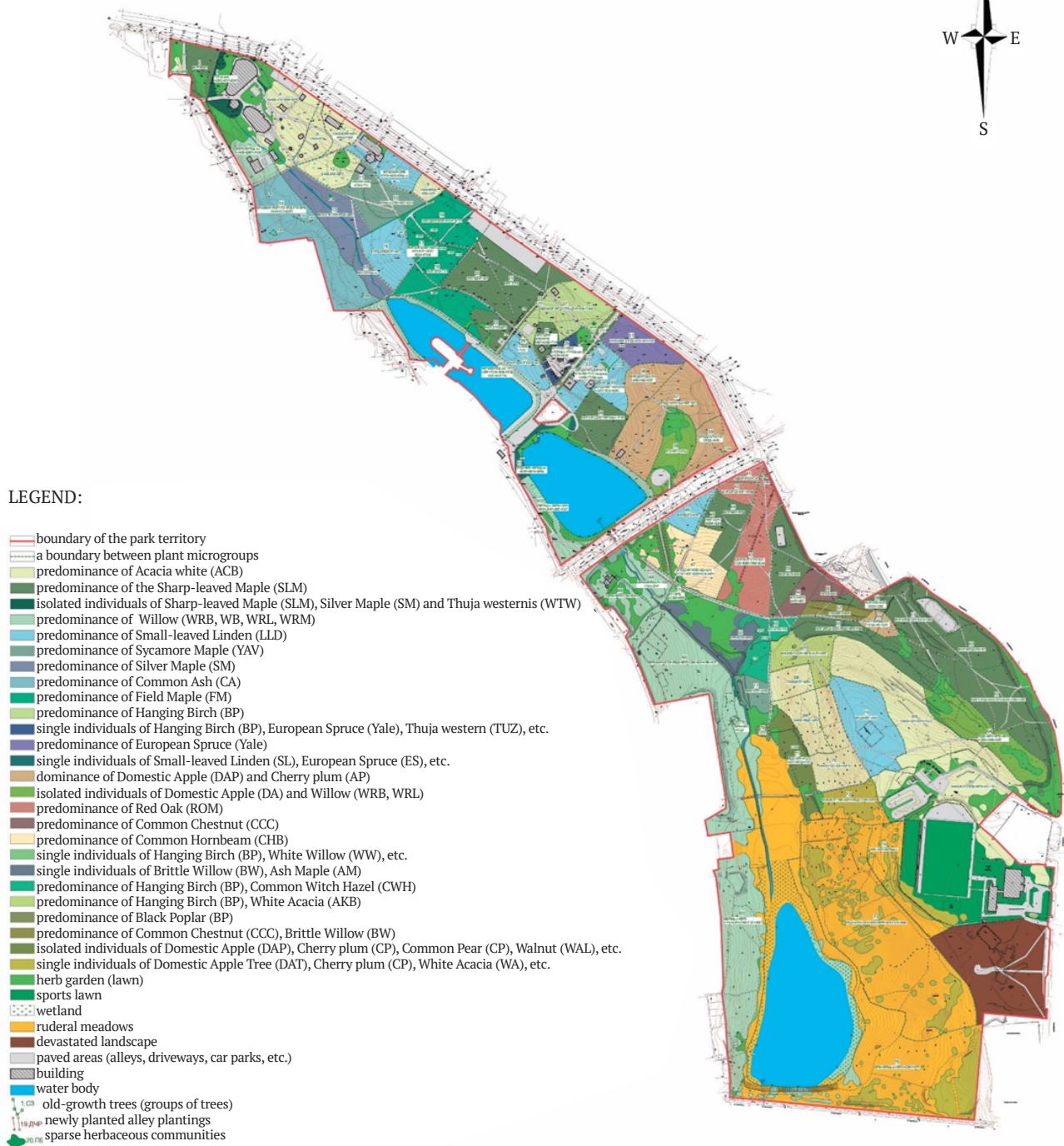


Figure 2. The basic planting plan for Zhovtnevyi Park

Source: Project for the maintenance and reconstruction of the Zhovtnevyi Park, a monument of landscape art in Chernivtsi (Tupis et al., 2022)

Having analysed the plant microhabitats, it should be noted that certain species are landscape-forming in the park. These are the species that are predominant in certain plant micro-groups. These include *Robinia pseudoacacia* – 12 microhabitats; *Acer platanoides* L. – 14 microhabitats; species of the genus *Salix* L. – nine microhabitats; *Tilia cordata* Mill – seven microhabitats; *Acer pseudoplatanus* – three microhabitats; *Acer sacharinum* L. – two microhabitats;

Acer campestre – three microhabitats; *Betula pendula* Roth. – two microhabitats; *Picea abies* – three microhabitats; *Malus domestica* Borkh., *Prunus cerasifera* Ehrh. – four micro-groups; *Quercus rubra* – three micro-groups; *Aesculus hippocastanum* and with the participation of *Salix fragilis* L. – three micro-groups. *Populus pyramidalis* Roz. – three microhabitats. The remaining nine micro-groups are represented by a set of different species without the dominance of a particular species.

The study separately identifies a list of plants that are concentrated near recreational complexes and attractions in Zhovtnevyi Park. These are mostly ornamental tree and shrub plants that are not separated into separate micro-groups geographically. They are included in the list of dendroflora. They can be called conventionally: micro-groups of ornamental plants. These are plantations of the later period of planting and new plantings, they include modern ornamental forms and hybrids of woody plants. During the surveys of park plantations, trees or groups of trees were identified that have lost their aesthetic value, attractiveness and are at different stages of drying out and digression. First of all, these are the trees of the first tier of communities dominated by *Robinia pseudoacacia*, which have reached their age limit. They are characterised by partial or complete drying out of the trunk, dominated by drying out of branches of the 1st and 2nd orders, and damage to *Viscum album* L.

In the microhabitats dominated by the common bitter chestnut, there are traces of damage by diseases, pests, and pathogenic fungi. There is a massive defeat of mistletoe in micro-groups dominated by silver maple. There is an accidental dead wood of *Populus canadensis* on the site. The communities dominated by species of the *Salix* genus in the plantation become susceptible to various diseases and pests as they reach the age of ageing. Groups formed from fruit trees require special attention and sanitary care. Most of them have reached the age of obsolescence and are in a state of emergency. Some of them need gradual rejuvenation. In almost all micro-groups of Zhovtnevyi Park, a significant number of trees have some damage as a result of natural disasters (windstorms, storms, snowstorms, frost cracks). Due to the improper formation of tree communities in the past, as well as untimely felling, the territory of micro-groups is becoming cluttered, and less resistant tree species are being suppressed by other, more resistant ones. As a result of these processes, ornamental shrubs and trees of the lower tier die off and *Sambucus nigra* L. and *Cornus sanguinea* L. spread. In all microhabitats, there is a lot of self-seeding of sharp-leaved maple, which has a low level of biological stability. Over the period of existence of Zhovtnevyi Park, in the absence of targeted care, a natural biological process of change of woody plant species has occurred, which has led to changes in the landscape characteristics of microhabitats. The young self-seeding and

overgrowth have grown, changing the contours of groups and clumps, individual vistas, and glades.

In general, the degradation of green spaces in the surveyed area of Zhovtnevyi Park is caused by a combination of biological, environmental, organisational, legal, financial, and economic factors.

Analysis of the existing dendroflora

Since no tree-by-tree inventory of tree and shrub species was carried out in the studied territory of the Zhovtnevyi Park of the Monument of Landscape Art in Chernivtsi, the species composition of the dendroflora is not complete. The species diversity of park plantations is an extremely important feature of them, as it determines the structure and strategy of plant communities' development in specific conditions. The route surveys of the park territory revealed the growth of 125 species, cultivars and hybrids of trees and shrubs belonging to 32 families. They belong to two divisions: *Pinophyta* – 21 species (16.8% of the total number of species), and *Magnoliophyta* – 104 taxa (83.2%). Representatives of *Magnoliophyta* prevail. The most numerous is the family *Rosaceae* Juss. (24 taxa), which is connected with the inclusion of old orchards in the park territory. Many representatives of this family belong to the micro group of ornamental species that do not act as landscape-forming species and are concentrated near entertainment areas and attractions. The next largest family by the number of species is *Salicaceae* Lindl. (13 taxa). Such presence of species of this family is due to the presence of fresh and humid hydrothermal conditions on the territory: close occurrence of groundwater, the location of a significant area along the bottom of the gully where the stream flows and the presence of three lakes. These are the remnants of a natural vegetation cover typical of the Prut riverbed and its floodplains and floodplain terraces. The family *Pinaceae* Lindl. includes ten species and cultivars, most of which are ornamental. The family *Cupressaceae* F. Neger. Eight taxa belong to the family *Hydrangeaceae* ENDL. This is a group of ornamental species of later establishment. Next are the families *Aceraceae* Lindl. and *Caprifoliaceae* Vent. (seven taxa each). Representatives of the *Aceraceae* family are landscape-forming. Other families are represented by one to five taxa (Fig. 3). Representatives of many of these families are predominant in the microhabitats.

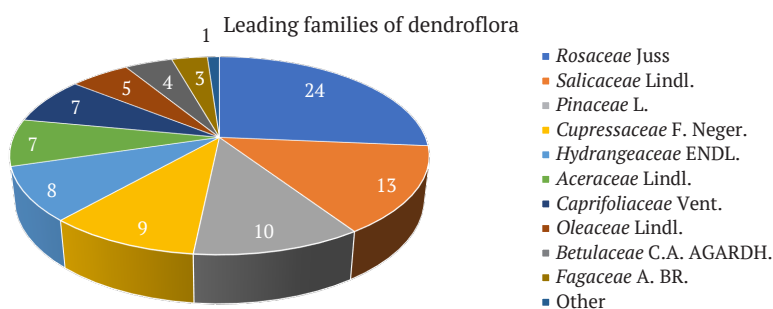


Figure 3. Diagram of the existing dendroflora in Zhovtnevyi Park

Source: developed by the authors



The park's phytocoenosis includes introduced species of woody plants and species listed in the Red Data Book of Ukraine: *Staphylea pinnata* L.. The newly introduced species include *Taxus baccata* 'Fastigiata'. The introduced species include: *Juglans mandshurica* Maxim, *Phellodendron amurense* Rupr, *Acer sacharinum* L. and *A. negundo* L., *Salix matsudana* Koidz., *Pinus pallasiana* Lamb., *Tsuga canadensis* Carr., *Picea pungens* Engelm., *Platycladus orientalis* (L.) Franco), *Thuja occidentalis* L., *Juniperus chinensis* L., *Catalpa bignonioides* Walt., *Platanus acerifolia* Willd., *Ailanthus altissima* (Mill.) Swingle, *Gleditsia triacanthos* L., *Robinia pseudoacacia*, *Quercus rubra* L., *Aesculus hippocastanum*, *Morus nigra* L., *Populus pyramidalis* in alley planting etc. Many ornamental shrubs are exotic in plant communities. These are *Calycanthus floridus* L., *Cotoneaster horizontalis* Decne, *Symphoricarpos albus* (L.) Blake. In total, there are 54 introduced species of woody plants. These species are characterised by high resilience under the current growing conditions.

Trees (79 taxa) predominate among the life forms that form the basis of this park. The shrub layer is of varying degrees of development and often forms thickets. The shrubs are represented by the following forest species: *Euonymus europaea* L., *Cornus sanguinea*, *Sambucus nigra*, rarely *Corylus avellana* L. and a large group of ornamental species and cultivars of later establishment: *Hydrangea sargentiana* Rehd., *Spiraea japonica* 'Albiflora', *Cotoneaster horizontalis* etc.

During the surveys, single old trees were found. These are the above-mentioned exotics (Manchurian walnut, Amur velvet) with trunk girths ranging from 0.34 to 1.10 m. Native age-old individuals are: *Pinus sylvestris* L., *Quercus robur*, *Pyrus communis* L., *Tilia cordata* Mill. in inline planting.

The centuries-old trees that have survived to this day in Zhovtnevyi Park in Chernivtsi give a certain idea of the original plantations, although they do not fully reflect their taxonomic structure. They give the plantations more expressiveness and power. Long-lived trees have scientific, aesthetic, and economic value and require measures for their protection and conservation.

As a result of dendrological analysis, the spread of highly active invasive species is observed in both parts of the park: *Acer negundo*, *Robinia pseudoacacia*, *Quercus rubra*, and occasionally *Amorpha fruticosa* L., *Ailanthus altissima*. The spread of invasive woody species should be continuously monitored. Sloping meadows, remnants of old gardens, wet meadows are overgrown with *Solidago canadensis* L., *Pastinaca sativa* L., *Helianthus tuberosus* L., *Rudbeckia laciniata* L. and other invasive species. Populations of these plants are tall. They suppress populations of native species. This contributes to the reduction in the number of populations of native species, and its rapid spread even into the water-coastal areas of the park's cultural and phytocoenosis can be observed. There is no haymaking in these meadow and water-coastal complexes, so they are also overgrown with low-value and invasive tree and shrub vegetation.

The existing layout of Zhovtnevyi Park is designed in such a way that there is an uneven distribution of visitors across the park. Certain areas of the park are overcrowded

with visitors, while other large areas of the park are virtually unused. Such a planning structure leads to the problem of irrational development of the park's territory with excessive anthropogenic impact on the park's natural complexes in crowded areas. A necessary step towards solving this problem would be to disperse visitors with the help of planning tools.

The main visual axes in the park are the park alleys and the valley space of the cascade of lakes. The northern half of the park has significantly less open space compared to the southern half of the park. Therefore, the visual connections in this area are best seen along the main wide alleys (Fig. 4; Fig. 5), around the lake (Fig. 6), and on the open lawn between the entrance from Heroiv Maidanu Street and the park administration building (Fig. 7). These visual disclosures have the character of separate viewpoints.



Figure 4. View along the central poplar alley of the park
Source: authors' photo



Figure 5. View along the alley of the park
Source: authors' photo





Figure 6. View from the lake shore

Source: authors' photo



Figure 7. View from the hill to the lawn from the side of the residential area on Heroiv Maidanu Street

Source: authors' photo

Among the main problems and conflicts in the park are the following groups: transport and pedestrian, functional, natural, anthropogenic, and visual. In addition, there are also financial problems (lack of adequate funding; insufficient number of employees to maintain the territory; outdated and insufficient material and technical base, lack of equipment), legal problems (illegal activities of unauthorised persons on the territory of the nature reserve fund), as well as those related to the safety of staying in the park

(lack of fencing of the park; lack of park security and video surveillance system). These conflicts have a negative impact on the conservation of biodiversity of green spaces and the comfort of visitors in the park.

Ways to optimise the park's green spaces

It is advisable to divide the strategy for the development of the greenery system in Zhovtnevyi Park into two periods: five years and ten years (Fig. 8).



Figure 8. Project of greening measures for Zhovtnevyi Park

Source: Project for the maintenance and reconstruction of the Zhovtnevyi Park, a monument of landscape art in Chernivtsi (Tupis et al., 2022)



Based on the research conducted within the project, a five-year action plan was drawn up:

- To protect and preserve green spaces, a full inventory of the territory of Zhovtnevyi Park should be carried out. A partial inventory of the greenery in the central part of the park was carried out in 2017-2018. At that time, 10.7742 ha were inventoried, while the rest of the territory was not.
- Sanitary measures aimed at preserving valuable species of woody plants and valuable and rare herbaceous plant communities should be carried out.
- Identify valuable and rare woody plants on the territory of Zhovtnevyi Park.
- Carry out sanitary felling to remove trees affected by phytopathogenic pests and entomological pests that cannot be treated (communities with common chestnut), as well as dead wood. These plantations are a source of disease spread and can significantly affect the condition of healthy trees.
- Phase out the plantations, leaving the healthier and more viable ones. Introduce species of common hornbeam, forest beech, common oak or sycamore maple into this community. In elevated areas – rock oak. In wetlands, introduced species of the genus willow, poplar, etc.
- It is advisable to restore old pyramidal poplar alleys by supplementing them with adults using double planting (planting parallel rows of large-sized seedlings with a pile of the earth closer to the alley with the gradual removal of old, damaged individuals). The distance from old individuals to young plantings depends on the condition of the crown of the old tree and can range from 2 to 5 m. By the time the old tree dies, the young individual should already serve as a full-fledged replacement.
- Urgent felling of dangerous and dry trees of the first tier, which are unstable and pose a threat to park visitors.
- Reconstructive felling, planting of new trees and flower arrangements to create new entrances to the park.
- Landscaping of the main park alley. A specific dendrological plan and working drawings can be proposed at further stages of designing parts of the park.
- Landscaping of the designed alleys and serpentine areas with viewing platforms.
- Preservation and rejuvenation of old orchard sites as a “placemark”.

The ten-year action plan provides for:

- Sanitary felling of trees of the second and third tiers that are dead or in the process of dying and reduce the aesthetic appeal of tree micro-groups near the entrance areas and in the area of emergency attractions.
- Felling of trees that hinder the development of more powerful and decorative trees, the continuation of the design of the projected alleys.
- Felling of trees in the area from the side of Parkovy passage, which covers views and individual interesting specimens, viewpoints, and compositional units. Reconstructive felling should be aimed at improving lighting and aeration conditions, increasing artistic expressiveness, emphasising the existing relief and picturesque water areas, creating perspectives, and improving the structure of plantations.

- Conservation and care of valuable groups within plant microhabitats.
- Reconstruction of heavily densified areas and the formation of edges of ornamental shrub species biologically compatible with the predominant species in the microhabitat along secondary projected alleys; while maintaining the contours of old plant communities. The age of the planting material should be selected depending on the age of the tree plantations. For old plantings, 4-5-year-old specimens with a clod of the earth are recommended, and for young ones – 2-3-year-old specimens. Young specimens should be planted with trees that have reached the age of natural death.
- In the peripheral areas of the park, the later plantings should be preserved and maintained.
- Regularly carry out sanitary maintenance of the park’s natural areas with the least possible intervention. Conduct a phased restoration of grass cover in areas overgrown with invasive vegetation. At the same time, use an integrated system of controlling invasive species, including the integrated use of mechanical, agrotechnical and biological methods of control and biological control.
- To systematically enrich the dendrological flora with species that are not invasive in the area and are suitable for the given ecotopes, introduce conifers to ensure the aesthetics of the winter landscape.
- Restore natural herb and flower gardens, while ensuring a continuous decorative effect (introduction of spring ephemerals into shade tree groups).
- Arrangement of an alpine slide in the second part of the park.
- It is recommended to introduce representatives of the family *Poaceae* Barnhart, *Cyperaceae* Juss. and *Juncaceae* Juss. following the existing ecotopes (along the stream in the second half of the park). Introduce aquatic plants into the lake’s coastal and water areas without disturbing the ecotope.
- Continuation of the restoration of old alleys (poplar alley), restoration of the Chernobyl alley from mountain ash, completion of landscaping of the designed alleys and observation decks with the formation of compositions.

In general, the project applied principled approaches to the formation of the planning structure of the park, which have a positive impact on the condition of green spaces and resolve the main conflicts in the park, namely the preservation of the integrity of the park’s territory; preservation of valuable ecological habitats through functional zoning; improvement of the existing vegetation of the park with the addition of species composition of plantations; even distribution of visitors through the park through the design of new alleys and paths, as well as changes in the functional zoning of the park’s territory; ensuring accessibility to the park with the design and construction of new entrances to the park and an underground connection between the two parts of the park separated by the motorway; improving the system of pedestrian paths and alleys by reconstructing existing and designing new pedestrian and bicycle connections, etc.

To preserve the authenticity of the site, the project included the restoration of individual trees and bushes, the





preservation and addition of historic orchards and a historic poplar alley. An important aspect of the project was to enhance the aesthetic expressiveness of the landscape as perceived by visitors. This was achieved by placing additional observation decks and designing new serpentine paths between them on the steep terrain in the southern part of the park, as well as increasing the overall decorativeness of the park's plantings (decorating entrances, main alleys and planning nodes with decorative plant compositions). The project considered the needs of the park users, in particular, places for picnics with the possibility of making bonfires in the warm season were provided, and areas for various purposes were designed: children's, sports, dog walking and utility areas.

DISCUSSION

The presented study results are formulated in the form of design measures and fundamental approaches related to the optimisation of the planting structure, landscape-spatial and planning structure of the Zhovtnevyi Park-Monument of Landscape Art in Chernivtsi (Ukraine). The developed planning approaches are based on pre-project studies, including the author's observations of the behaviour of park visitors. At the same time, it is also common among modern studies to use a sociological survey of visitors to urban parks to determine their needs in terms of age. In particular, the needs of older visitors are more specifically covered in the publication by Ma *et al.* (2021), which identifies the main factors to be considered in park planning, namely: sufficient insolation and aeration of spaces, comfortable temperature conditions, the presence of drinking fountains or tanks, the possibility of unimpeded movement along alleys and paths, a sufficient number of seating places for rest, and diverse vegetation. The design of pedestrian alleys and paths in urban parks in China from the perspective of older people is discussed in Y. Zhai & P. Baran (2017). The researchers found that the most desirable characteristics of pedestrian alleys for the elderly are the use of soft surfaces, good lighting, benches and flowers along the paths, significant length, and width (3-3.9 m) of the paths, paths along water bodies, shade, side visibility and visual connection with water, and lack of visual connection with areas of visitor concentration. The results of these studies once again confirm the correctness of the planning approaches used in the Zhovtnevyi Park reconstruction project, as much attention was paid to forming visual connections between visitors and water bodies and the paths along them, as well as the use of soft surfaces on the paths, etc. The needs of adolescent children were also considered in the project, in particular, additional playgrounds were designed, including an inclusive playground, as well as sports grounds and places for active recreation, such as a bicycle track with jumps. For children and adolescents, the arrangement of these facilities is the most important in the park, as evidenced by a study conducted among schoolchildren in Melbourne, Australia (Rivera *et al.*, 2022). According to the article, the six most frequently mentioned characteristics of

parks by schoolchildren surveyed that prevent them from visiting a park are play equipment (e.g. small/kids' playgrounds without play equipment without swings); social factors (e.g. crowded parks, presence of unwanted people); natural environment (e.g. small space without lawn, large open space with grass); maintenance (e.g. dirty facilities, litter); sports/recreational facilities (e.g. skate park); Other studies have also highlighted the importance of multifunctionality of park spaces (Roberts *et al.*, 2022), and the diversity of park plantings for different categories of visitors (He *et al.*, 2022).

The developed planning approaches to the design of the Zhovtnevyi Park, a monument of landscape gardening art, emphasised the quality of the plant material used, the diversification and enhancement of its decorative effect, and the cultivation of local plant species. These principles are in line with the results of research conducted on the selection of planting assortment. Among them is a joint publication by Portuguese and American scientists, in which they highlight the perception of plants in urban parks and the implications for the design and management of new urban ecosystems (Teixeira *et al.*, 2022). This study examines the issue of plant cultivation and spontaneous planting, as well as the planting of native and non-native species in urban greenery from the perspective of landscape architects. The problem of the quality and quantity of green spaces in parks, as well as how park landscaping can encourage park visits and promote the health of urban residents, is highlighted in a publication by Chinese scientists (Yang *et al.*, 2021). Their results showed that the quality of greenery is more strongly correlated with the total number of park visitors than the quantity. Both the quantity and quality of green spaces were more important for older visitors (aged 65 and older) than for children or adults.

In the context of the prospects for the development of parks-monuments of landscape art, the following areas of promising use of parks are recommended: recreational and tourist, excursion, eco-educational, scientific and cognitive, and virtual exploitation. It is noted that an important component of the future of parks should be their promotion and development of a network of recreational and tourist infrastructure facilities on their territory (Pidhovna, 2020).

The created plan for Zhovtnevyi Park in Chernivtsi, Ukraine, takes into account the needs of visitors of all ages, emphasising the quality and variety of green spaces, comfortable conditions for recreation, and the provision of additional active recreation facilities. Recommendations on the prospects for park development are taken into account, including the expansion of recreational and tourist infrastructure and the promotion of the park as an important component of the urban environment.

CONCLUSIONS

Measures for the reconstruction of parks-monuments of landscape gardening art should be aimed at improving the aesthetic properties of parks, their conservation and rational use, promotion and adaptation to modern urban planning and social conditions. The optimisation of landscaping



in parks-monuments of landscape architecture should be carried out using a set of methods: restoration of the most valuable elements of plant micro-groups; conservation of trees and shrubs subject to protection; adaptation of the entire park complex to modern conditions. At the same time, the formation of new plantings – arrays, groups of trees and shrubs – should be carried out on the condition of preserving valuable woody plants. The condition and species composition of the green spaces of parks and monuments of landscape art should be constantly monitored, and their biodiversity should be preserved, used and managed sustainably for the sake of human benefits (intangible values and services), rather than “protected” from people in certain places.

The main planning measures designed to increase the quality of visitors’ stay in the territory of parks-monuments of landscape art, while not harming the vegetation, are even distribution of pedestrian alleys and paths across the park; creation of a multifunctional environment to meet the needs of different age groups of visitors; creation of a protected area within the most environmentally valuable parts of the park; adherence to the principle of “memory of place” in the planning concept with the preservation of authentic planting groups and functional use of individual parts of the park; creation of barrier-free pedestrian connections and accessibility for people with limited mobility to the park; development of bicycle infrastructure; arrangement of entrances to the park; use of plant compositions with high decorative value and the effect of continuous flowering along the trajectory of visitors; creation of visual accessibility and spatial diversity of the park; provision of utilitarian functions.

The proposed practical planning approaches and recommendations are aimed at maximising the preservation

of the natural landscape and enhancing its functional and artistic features. The greater the biodiversity of a park area, the better its biological balance and the better all its inhabitants will feel plants, animals and, ultimately, people. Numerous studies confirm that such approaches also meet the expectations and needs of park visitors. However, in the context of current global threats, such as viral pandemics, and the high level of mental health problems among people, including those affected by military operations, a more in-depth analysis of the impact of landscape architecture on people’s physical and mental health could be an important area of research in this area in the future. It would be important to identify specific plant species, their characteristics, and other means that should be used in the reconstruction of parks and monuments of landscape architecture in the context of this issue. Conducting relevant research would make it possible to improve the quality of further park reconstructions, as well as to increase people’s sense of safety during their stay in parks.

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CONFLICT OF INTEREST

None.

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Шляхи оптимізації зелених насаджень та планувальної структури у парках-пам'ятках садово-паркового мистецтва

Анотація. Реновація міського простору не можлива без нових підходів у формуванні озелених просторів садово-паркової спадщини. При відновленні парків-пам'яток садово-паркового мистецтва важливою проблемою є одночасне врахування еколого-біологічних основ, збереження історичної структури насаджень та ландшафтно-планувальної основи, а також забезпечення сучасних потреб користувачів цих просторів. Метою статті є формування практичних рекомендацій щодо основних шляхів оптимізації планувальної структури та зелених насаджень, а також засобів захисту біорізноманіття у парках пам'ятках садово-паркового мистецтва. В ході дослідження були застосовані загальнонаукові (аналіз та синтез, польові дослідження) та спеціальні методи (дендрологічний, картографічний; історико-архітектурний аналіз; комп'ютерні методи з обробки графічних даних). В процесі передпроектного етапу дослідження виявлено передумови формування парку «Жовтневий» в структурі ландшафту м. Чернівці. Подано перелік та опис типових видів рослин, що характерні для даної місцевості. Окрім того, в процесі передпроектного дослідження проводився аналіз конфліктів на території парку, які були поділені на такі основні групи: транспортно-пішохідні, функціональні, природні, антропогенні, візуальні. Було виявлено взаємозв'язок різних видів конфліктів та їх вплив на збереження біорізноманіття зелених насаджень у парку. В результаті сформовано нові елементи планувальної структури, які покращують ландшафтно-просторову організацію території парку та сприяють оптимізації зелених насаджень. В розробленому та проаналізованому у статті проекті підібрано асортимент рослин, що збагачують біорізноманіття паркових насаджень та можуть бути використані при проектуванні інших міських парків. На прикладі проекту утримання та реконструкції парку «Жовтневий» в м. Чернівці продемонстровані практичні планувальні підходи та рекомендації, що спрямовані на максимальне збереження природного ландшафту та підсилення його функціональних і художніх особливостей

Ключові слова: біорізноманіття; міський парк; асортимент насаджень; рослинне мікрогруповання; інвазійні види



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Frontline town centres within the area of the Hirskiy Tikych river

Abstract. The study presents the history of the emergence, development and decline of the frontline towns concentrated in the area of the Hirskiy Tikych River. The research focuses on Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka and Monastyryshche. Natural factors and the branching of the Black Way determined the concentration of settlements in the river area. The study of the frontline towns is relevant due to the peculiarities of urban processes in Central Ukraine and is important for the development of historical and architectural reference plans. The research aims to determine the spatial features of the city centre in the cities of the right-bank Ukraine frontier in the seventeenth and eighteenth centuries. In the course of the study, the methods of analysis (for literary sources), comparative analysis (for the cartography of different times), and a set of field studies were used. The studied towns had an optimal defensive perimeter dominated by a Ukrainian wooden church, and a key element of the spatial image was a residential wooden house. It is determined that the cities of the frontier had political and cultural conflicts with the centre of the state, which caused the loss of the role of settlements and the division of the Polish-Lithuanian Commonwealth in the late seventeenth century. Based on historical cartography, source material, and the preserved ancient street network, the urban planning features of the town centres are localised and identified. The frontier towns concentrated in the area of the Gorny Tikich River were economically and culturally united and were characterised by rational planning. Improvements in the town centres of the frontier towns are linked to the political and economic intentions of magnates in the late sixteenth and early seventeenth centuries. The spatial layout of the town centre was centred around a Ukrainian wooden church, except Monastyryshche, which also had a wooden church in the town centre. The main building element was the Ukrainian wooden house, which defined the spatial and cultural image of the settlement. Due to the uncertain political boundaries and the division of the Polish-Lithuanian Commonwealth in the late seventeenth century, the frontier towns lost their significance. In the nineteenth century, except for Monastyryshche, all settlements declined economically and administratively. The practical value of the study lies in the fact that the results can be used in the development of historical and architectural reference plans, revitalisation projects for the centres of historic towns, downtown regeneration projects, and the commemoration of lost important monuments. The research materials can be used in a course on the history of urban planning and architecture of Ukraine, as well as in the development of tourist and recreational routes

Keywords: area; location; culture; urban planning; church; market square; defensive perimeter

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INTRODUCTION

Ukrainian cities were actively founded and developed during the 16th and 17th centuries. Trade routes and rivers were the historical components of urban settlement. Thanks to the established trade routes, such Ukrainian cities as Bar, Kitaygorod, Dunayivtsi, Berdychiv, Pavoloch and many others developed. The town centres in these settlements were actively developing during the 16th and 17th centuries due to economic growth. Consequently, they built castles, a reliable defensive perimeter of the city centre, churches, monasteries, and town halls, and filled market squares with shops and residential buildings. It is worth noting that the presence of rivers and ponds in these settlements served both defensive and commercial purposes. Rivers and lakes created additional obstacles for attackers. At the same time, bridge tolls generated income, and milling, fishing, and crafts that required the use of water volumes developed.

These components of Ukrainian cities are optimally shown on the Map by Guillaume Levasseur de Beauplan from the mid-17th century (n.d.) and the Map by Giovanni Antonio Rizzi Zaroni from the second half of the 18th century (n.d.). On the mid-sixteenth-century map, a group of towns in the area of the Gorny Tikich River concentrated in the southern part, attract attention. To the south of them stretched the steppe part of Ukraine with no urban settlements with a fixed defensive perimeter. This concentration consisted of the following towns: Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka and Monasteryshche. Today, these settlements have lost the three-dimensional spatial image created in the seventeenth and eighteenth centuries. Buzivka, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka are now villages. Buky is an urban-type settlement and only Monasteryshche is a town. Changes in the state of the settlements were caused not only by wars, fires, and changes of magnates but also by the relocation of the frontline. These settlements are not represented in the history of Ukrainian architecture and urban planning, the territory of the city centre is not protected from uncontrolled development, and there is no programme for the revitalisation of the historical and cultural environment. These facts determine the research's relevance.

The studies of many Ukrainian scholars present different ways of urban accents of Ukrainian historical cities. M. Bezv (2022) analyses the qualities of fortifications and compositional characteristics of Renaissance cities. V. Vechersky (2022) emphasises the importance of historical and urban planning research for the development of monument protection documentation. P. Rychkov (2020) analyses the problems of the evolution of the spatial structure of historical cities of Ukraine. I. Lytvynchuk (2021) deals with the formation of defensive urban complexes in southeastern Podillia. The very problem of frontline cities is the subject of analysis by many American and European researchers in the fields of geography, economics, cultural studies, and urban studies. In Ukraine, however, settlements of this type remain neglected, including their spatial features in the seventeenth and eighteenth centuries.

Publications by P. Nugent (2012) and M.-V. Martinez (2006) highlights the issues of the theory of frontier culture. C. Sohn & F. Lara-Valencia (2013) point out that open borders do not necessarily generate hybridisation processes that create mixed identities in frontier cities. B. Reitel *et al.* (2002) argue that frontier cities maintain a privileged relationship with the border and are at the same time privileged markers of the border.

The research aim was to establish the perimeter boundaries of the city centres and the current state of their preservation. The scientific novelty is determined by the fact that for the first time, the frontier agglomeration of cities concentrated in the area of the Hirskyi Tikych River is introduced into scientific circulation, the urban planning composition, and volumetric-spatial properties of the city centres in the cities of the frontier of right-bank Ukraine in the XVII-XVIII centuries are presented.

MATERIALS AND METHODS

The methods of analysis and classification of the source base, systematisation, and synthesis of statistical data, as well as the method of historical periodisation, were used in the study. In the study of city centres in frontline towns, the method of analysis (for primary sources) was used, which allowed to determine the compositional and planning characteristics – the perimeter of the city centre's defences, the location of the castle, churches, and the spatial properties of the quarters. Using the method of comparative analysis (for multi-temporal cartographic materials and aerial photographs, archival documents, and field research), the preserved urban relics of the city centre (streets and quarters), the line of ancient defensive structures, and urban changes in the city centre in the nineteenth and twentieth centuries were identified. Knowing that the historical cities of Ukraine were destroyed during the 19th and 20th centuries when identifying the boundaries and spatial properties of the city centre, special attention was paid to graphically recreating the line of fortifications and finding the locations of churches.

The research is mainly based on the data from Map by Guillaume Levasseur de Beauplan from the mid-17th century (n.d.) and Map by Giovanni Antonio Rizzi Zaroni from the second half of the 18th century (n.d.). However, the source base of the study also includes publications from the second half of the 19th century on the historical development of Ukrainian cities, archival documents, and articles in periodicals. A group of publications filled with historical facts were written by L. Pokhylevych (1864), F. Sulimierski & W. Walewski (1880). These studies are the basis for this research.

RESULTS

In the seventeenth century, the territory of Right-Bank Ukraine experienced complex political processes: In 1596, the Union of Brest (Ruda, 2008); in 1609-1618, the 2nd Moscow War lasted, resulting in the Deulin Armistice in



1618 (Sas, 2010); in 1632-1634, the 3rd Moscow (Smolensk) War lasted, which ended with the Peace of Polyaniiv in 1634 (Chukhlib, 2011); in 1648-1657 Khmelnytskyi (Hrushevsky, 1907); in 1654-1667 the 4th Moscow War, which resulted in the Andrusiv Armistice in 1667 (Chukhlib, 2009); the conclusion of the Treaty of Hadiach with the Cossacks in 1658 and the political project of the Polish-Lithuanian Commonwealth of Three Nations (Poland, Lithuania, and Rus) (Plokhij, 2009). Although cities suffered spatial losses, they managed to repopulate and rebuild.

The cities located in central and western Podillia, Volyn and Galicia had more favourable conditions for development. Predictably, the development paths of the cities on the frontline were more difficult. According to the Map by

Guillaume Levasseur de Beauplan from the mid-17th century (n.d.), the border was unclear and diffuse at that time. The process of urbanisation of Steppe Ukraine in the sixteenth century was characterised by competition between Ottoman-Tatar feudal lords, Polish-Lithuanian magnates, and Cossack officers (Chukhlib, 2011).

Thus, the towns of the frontier in the sixteenth century are characterised by the phenomenon of land appropriation, spatial marking of the occupied territory, and the formation of ethnocultural identity. Each of the towns concentrated in the area of the Hirskiy Tikych River had individual historical and spatial properties, which are described in alphabetical order: Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka and Monastyryshche (Fig. 1).



Figure 1. The towns of the frontier were concentrated in the area of the Gorny Tikych River, in 1650

Source: Map by Guillaume Levasseur de Beauplan from the mid-17th century (n.d.)

The town of Buzivka

In the seventeenth century, the settlement belonged to Prince Dominik Zasławski. He built a fortified city on the territory of the hillfort (Sulimierski & Walewski, 1880). According to a map by Guillaume Levasseur de Beauplan from the mid-17th century (n.d.), there was a wooden castle on a promontory near the mouth of the Olshany River. In the beginning, Buzivka had only one wooden church of the Assumption of the Virgin Mary, built of oak cobblestones. It was built in 1718 near the old church. The early eighteenth-century church burned down in 1812, and a brick church with a bell tower was built in its place. According to legend, there were many churches in the old town of Buzivka, including two Armenian churches. In the middle of the nineteenth century, the crowded and developed town of Buz turned into a small village (Pokhylevych, 1864).

The centre of Buzivka was built on an elevated promontory. The approaches to it were blocked on three sides by river water overflows, and on the north by a deep and wide moat (Fig. 2). A triangular market square was located in the centre of the city centre, formed by detached buildings along the perimeter. A church was located on the

southern side of the marketplace. The planning and spatial characteristics of Buzivka's centre are similar to the estates of Prince Władysław Dominik Zasławski, namely Zasław, Ostroh, Dubno, Mezhyrich, Kostiantyniv, Stepani, Baslia, Sulzhyntsi, Krasyliv, and Krasnopil (Havryliuk, 2014). It can be argued that the centre of the city was reliably secured. A map by Giovanni Antonio Rizzi Zandoni (n.d.) shows that the castle and the town centre retained their spatial and functional properties in the second half of the seventeenth century. During the nineteenth and twentieth centuries, the settlement lost several churches, and the built-up areas to the north of the city centre were expanded. Unfortunately, today it is difficult to identify the locations of Armenian, Ukrainian, and Polish churches. The figure of the founder of Buzivka, Prince Władysław Dominik Zasławski, is very ambiguous. He is considered responsible for many political and military crises in the Polish-Lithuanian Commonwealth. He is accused of excessive love of luxury, poor understanding of economics, and illiteracy, but despite this, the frontline town of Buzivka developed. The period of the town's rise lasted almost 200 years (Havryliuk, 2014).



Figure 2. Buzivka. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author

The town of Buky

After purchasing the estate of Cossack Fedir Zvenyhorodets in 1592, Jerzy Strus of Komorów built a town and a castle on the banks of the Hirskiy Tikych River. In 1615, Tatar units destroyed the settlement (Tronko & Steshenko, 1972). The lustration of 1616 states that Buky was destroyed and only 10 people living in pits survived. Subsequently, the town developed quite actively, as already in 1629 it had 317 dyms (Archive of south-western russia, 1886). Buky had a fortified city centre and a wooden castle (Map by Guillaume Levasseur de Beauplan, n.d.). In the second half of the seventeenth century, the castle lost its spatial properties, while the town centre retained its fortification qualities and functional properties (Map by Giovanni Antonio Rizzi Zanoni, n.d.). After the formation of the city centre, the Antonivka suburb began to develop actively. In the centre of Buky, there was a wooden church of the Assumption of the Virgin Mary, built in 1772. In the suburb of Antonivka, there was a wooden church of St. Paraskeva built in 1781. Both churches needed restoration in the mid-nineteenth century (Pokhylevych, 1864).

The Hirskiy Tikych River creates a natural security side from the southwest of the city centre. According to topographical relics and rudiments discovered by the author during the field surveys, the wooden castle with earthen ramparts and ditches was located on a small ledge near the southern boundaries of the city centre (Fig. 3). The castle and the town centre controlled the trade route from Uman to Bila Tserkva, as well as the collection of bridge tolls at the river crossing. The surviving relics of the city centre streets show that a regular market square with a town hall was located in the centre, and a church was situated in the southern corner. The well-thought-out layout of the town centre was initiated by Jerzy Strus from Komorów, who was a Polish-Lithuanian Commonwealth official and owner of the town of Khorostkiv. At the beginning of its formation, the town had an ambitious name Struszhorod (Yakovenko, 2008). At the end of the seventeenth century, the ramparts and ditches were levelled and the castle territory was transformed. The town developed actively during the nineteenth century and lost its status in the 1920s.



Figure 3. Buky. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author





The town of Vorone

The territory was acquired from the local Zolotary residents by Jerzy Strus from Komorów in the late sixteenth century. In the early seventeenth century, the settlement became the property of the Kalinowski family (Jablonovsky, 1897). Vorone had a fortified centre and a bridge over the Hirskiy Tikich River (Map by Guillaume Levasseur de Beauplan, n.d.). Vorone is located on a major transit road from Bila Tserkva to Uman. It has a wooden church of Archangel Michael built on the site of the old one in 1802 (Pokhylevych, 1864). The

town centre of Voronezh is protected from the north and east by a large pond formed by the Hirskiy Tikych River (Fig. 4). The southern and western parts have a natural elevation. The town had earthen ramparts surrounding it. The town centre was accessible through two gates. In the southern part, there was an elongated market with a town hall, and the church was located in the northwestern corner of the town centre. The town lost its fortifications in the eighteenth century, as Vorone is marked as an ordinary village on the Map by Giovanni Antonio Rizzi Zanoni (n.d.).



Figure 4. Vorone. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author

The town of Zelenyi Rih

Zelenyi Rih had a fortified centre and a wooden castle (Map by Guillaume Levasseur de Beauplan, n.d.). It is known to have had a wooden church of St George built in 1754 (Pokhylevych, 1864). The Hirskiy Tikych River reliably supplies the western and northern sides of the town centre and the castle. The Konela River affects the security of the southern side. Only the eastern side needed reliable defences (Fig. 5). According to the author's field and

desk surveys, the castle was located in the northwestern corner of the city centre near the gate. To the right of the northern gate stood a wooden church, and to the south of it stretched the elongated Rynok Square, built up with detached wooden houses. In the seventeenth century, the castle lost its relevance, while the city centre still retains the features of a fortress. In the nineteenth and twentieth centuries, the settlement declined and became a village. This was due to its remoteness from active trade routes.

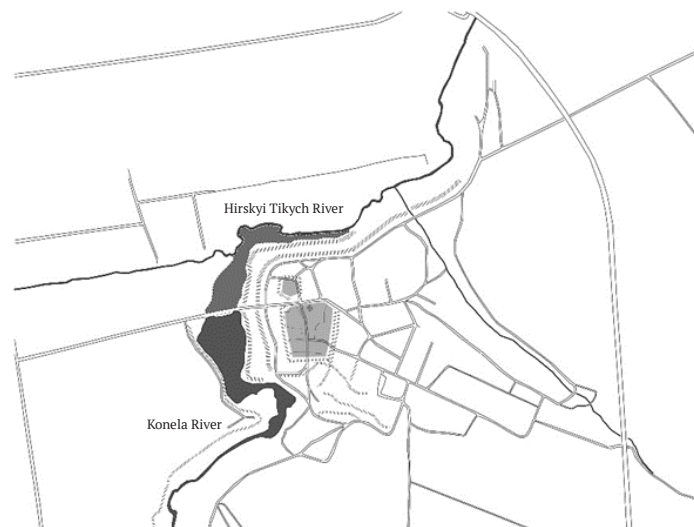


Figure 5. Zelenyi Rih. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author



The town of Zubrykha

The settlement belonged to the princes of Chetvertyn. In 1574, it became the property of Prince Janusz Zbarazki, who actively fortified the town centre and built a castle (Sulimierski & Walewski, 1880). As early as the nineteenth century, the village had a wooden church of the Nativity of the Virgin Mary, built on an unknown date (Pokhylevych, 1864). The town centre and the castle in Zubrykha were protected by the Hirskiy Tikych River from the north, and

the eastern side was fortified by slopes and a full-flowing stream. In the middle of the town centre was an elongated market square with a church located in the southwestern corner (Fig. 6). The town collected bridge tolls over the river crossing on the way to Buzivka. The Map by Giovanni Antonio Rizzi Zanoni (n.d.) shows the fortifications around the town centre, while the castle has ceased to exist. The settlement loses its role as a town in the nineteenth century and gradually turns into a village.

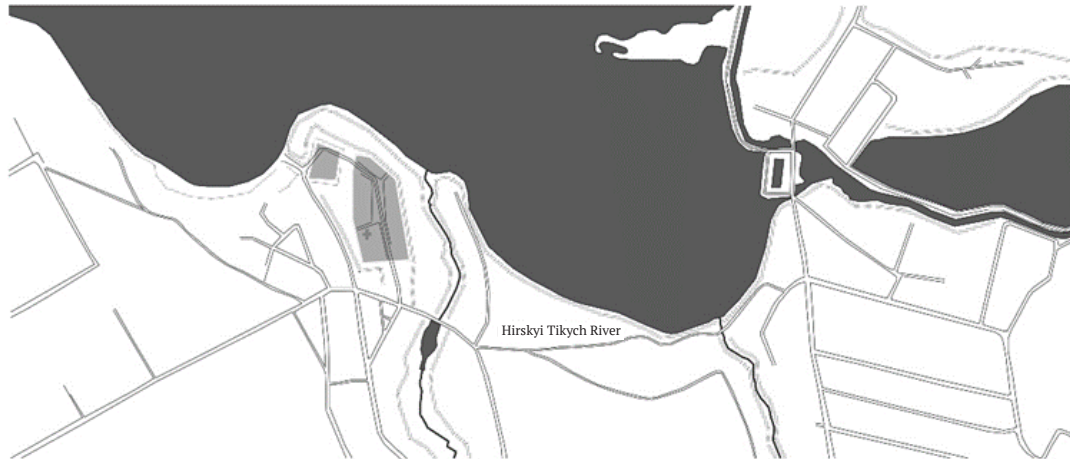


Figure 6. Zubrykha. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author

The town of Okhmativ

Prince Janusz Ostrozky built a castle in Okhmativ and fortified the town centre (Sulimierski & Walewski, 1880). According to an old legend, Okhmativ was a large town with 16 churches in ancient times. There was a fortified castle near Okhmativ. In 1644, Hetman Koniecpolski led an army that defeated the Tatars near this town. It has a stone church of the Assumption of the Virgin Mary built in 1808. The previous church was wooden, made of oak beams and covered with straw, built in 1735 (Pokhylevych, 1864). The

Hirskiy Tikych River created obstacles for the enemies from the south and west. According to the preserved fragments of old streets, the town centre had a regular structure and strong fortifications (Fig. 7). The castle was located near the southern side of the town centre and was also well fortified. An important road to the town of Stavyshe passed through the settlement. In the second half of the seventeenth century, Okhmativ turned into a village. The castle and ramparts around the town centre were removed (Pokhylevych, 1864).

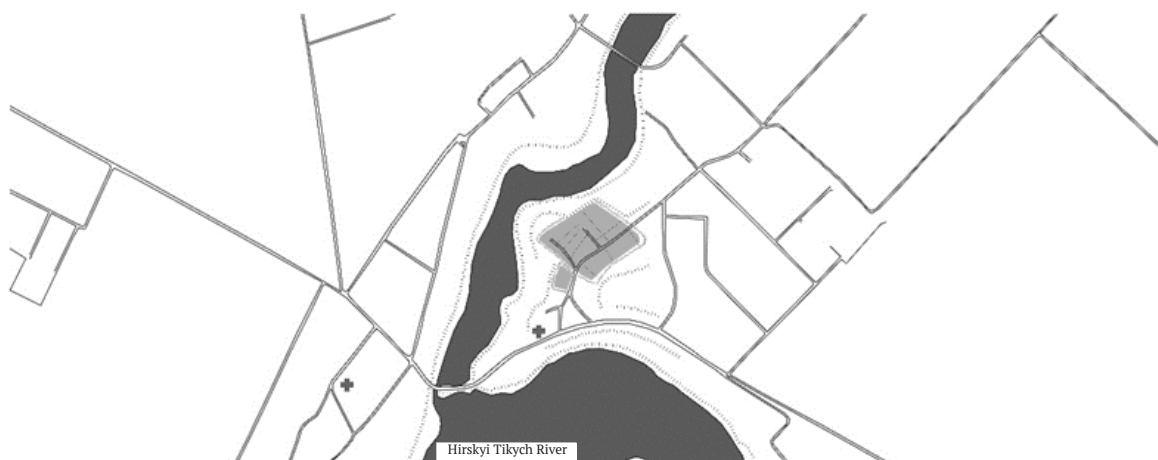


Figure 7. Okhmativ. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author





The town of Sokolivka

The town is located on the right bank of the Konela River. In the middle of the XVII century, the town centre already had reliable earthen fortifications. In 1760, the owner of the town, Francis Salesius Potocki, wishing to improve the urban environment and economic situation of the settlement, issued a charter to the townspeople, ordering them to improve the town and granting them freedoms (Archive of south-western Russia, 1869). The town has a Theological brick church built at the expense of magnate Stanisław Potocki in 1784 (Pokhylevych, 1864). The town was owned

by Aleksander Potocki until 1830 (Sulimierski & Walewski, 1880). On the south-western side, the centre of Sokołówka was securely enclosed by a pond formed by the Konelka River (Fig. 8). According to the preserved ancient street network discovered during the research, the town centre had good earthen ramparts that arched around its north-eastern side. The road connecting Uman with the town of Zelenyi Rih passed through Sokolivka. Therefore, the centre of the town had two gates, a rectangular Rynok square and a church located in its north-western corner. The settlement fell into decline in the second half of the nineteenth century.



Figure 8. Sokolivka. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author

The town of Monasteryshche

The town is located by the Konela River. In the late 1630s, Prince Janusz Wyszniwiecki developed the settlement and fortified its centre and castle (Sulimierski & Walewski, 1880). In the middle of the seventeenth century, the Cossacks of the Kalnytsia regiment further strengthened the ramparts and erected a palisade around the centre of Monasteryshche (Sulimierski & Walewski, 1880). In March 1653, S. Chernetskyi's troops destroyed the castle and part of the fortifications of the Monasteryshche town centre during an assault (Velychko, 1991).

In the nineteenth century, the town had four wooden churches: The Church of the Transfiguration, built in Stari Monasteryshche in 1648; the Church of St Nicholas in Novi Monasteryshche in 1767; the Church of St Matthew in the suburb of Avramivka; and the Church of the Intercession (Pokhylevych, 1864) in the suburb of Letychivka. Anna Tarłowa funded the construction of a wooden church in the town. In the middle of the nineteenth century, a

brick Roman Catholic church was built in Monasteryshche, which has been rebuilt and has survived to this day. In the second half of the seventeenth century, there were 68 houses in the centre of Monasteryshche and 180 on the outskirts (Sulimierski & Walewski, 1880).

The town centre of Monasteryshche is built on an arched promontory formed by the Konela River, which protected its northern, eastern, and southern sides. The western side needed the most defence, so a good system of fortifications was created here (Fig. 9). Today, these ramparts are lost as Hetman Tarnowski built a palace here in the early seventeenth century, then in the first half of the nineteenth century the complex was reconstructed by the Kalm-Podoski magnate family, and in the late nineteenth century, a large sugar factory was founded (Pokhylevych, 1864). Despite significant interventions, part of the historic street network has survived to this day. It shows that the regular Rynok Square was located in the centre of the city centre, with two churches on its southern and northern sides.



Figure 9. Monastyryshche. The town centre and castle in the mid-17th century

Source: developed by the author based on aerial photography and preserved urban relics discovered by the author

Due to the properties of the urban planning composition and the volumetric and spatial structure of the city centre, the city centres in frontline cities, regardless of their geographical location, are very heterogeneous, vulnerable, and limited.

DISCUSSION

The concentration of towns in the area of the Hirskiy Tikych River was due to the border of the forested and steppe territories of Ukraine, which was surrounded by branches of the Black Road to the west and east. The Black Road was the most important trade route for the Turkic peoples of the northern Black Sea region. Favourable climatic, relief and water characteristics influenced the choice of the place for settlement. Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka and Monastyryshche formed an urban agglomeration located on the state border of the Polish-Lithuanian Commonwealth. Therefore, their history, spatial organisation, development, and functioning were influenced by the presence of the border. All frontier towns were private, so the relationship between the border settlement and the state borders was partially contradictory: the towns expressed the idea of centrality, while the border was associated with the idea of separation. Therefore, the frontier cities did not fully follow the policies of the state to which they belonged, but instead paid attention to the economic and political advantages that the neighbouring state could offer them (Martinez, 2006).

The towns of Buzivka, Buky, Voronoye, Zelenyi Rih, Zubrykha, Okhmatove, Sokolivka and Monastyryshche had a small area of approximately 10-12 hectares. Their small

size made for an optimal and resourceful defensive perimeter. These indicators show that the defensive properties of the city centre influenced the localisation of the cultural and political identity of the townspeople. Thus, these settlements formed a special cultural and spatial territory of coexistence in the face of danger. This is consistent with the findings of M.-V. Martinez (2006) but does not fit the concept of mixed identities identified by B. Reitel *et al.* (2002) in frontline cities.

The frontline towns concentrated in the area of the Hirskiy Tikych River were not colonialist settlements. Therefore, they did not represent space at the crossroads of empires, foreign spatial anomalies, or foreign expansion, and were not a crossing point to an unknown world. These statements do not correspond to the conclusions of J. Gitlin *et al.* (2013), who analysed the frontline cities from the perspective of an encounter at the crossroads of empires.

The relevance and expediency of analysing the frontline cities in Ukraine is confirmed by the work of A. Geuze & D. Vasini (2018), in which they examine settlement landscapes to identify proactive urban infrastructure, forms and functions of space, emphasise the importance of the street network as a sustainable factor in uniting the urban landscape and stimulating the individual development of the settlement's architectural image.

Thus, comparing the results of the analysis of the frontline cities in Ukraine and abroad, it can be noted that from the very beginning of their formation, the settlements developed in a format of separation, and over the centuries, irritating differences were erased, as well as the process of integration into a related socio-cultural space pulsated.





CONCLUSIONS

The city centres in the frontline towns concentrated in the area of the Hirskiy Tikych River are an example of urban, economic, and religious control of the borderlands. The towns of Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka and Monastyryshche were founded in forested areas. The development and transformation of all frontline settlements are linked to the ambitions of the founders in the late 16th and early 17th centuries. Ukrainian wooden churches dominated in all the towns represented, except for Monastyryshche, which also had a wooden church in the centre of town. Therefore, the town centres of the frontline towns concentrated in the area of the Hirskiy Tikych River were dominated by Ukrainian citizens. Their wooden residential buildings defined the spatial image and culture of the settlement and also formed the uncertain political border of the Polish-Lithuanian Commonwealth. This uncertainty of the political and cultural border caused the cities to lose their role as frontline towns and divide the Polish-Lithuanian Commonwealth in the late sixteenth century. In the nineteenth century, except Monastyryshche, all towns declined economically and administratively.

Of the eight settlements concentrated in the area of the Hirskiy Tikych River, five had castles. However, in three town centres, the owners could own residential properties. The towns of Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka, and Monastyryshche, which are located in the area of the Hirskiy Tikych River, were spatially

well-designed, interconnected, and inextricably linked. The results of the study record new objects of cultural heritage and reveal the volumetric-spatial and compositional qualities of the city centres in the frontline towns. The comparative analysis of historical and modern cartography and field surveys helped to identify for the first time the sites of lost castles, buildings, churches, and fortifications of great historical significance.

In the future, it is worth continuing scientific research into the evolution of the layout, regional, stylistic, and constructive features of the buildings, updating the issues of archaeological research and granting special status to the territories of the historic centre. The need to continue research is since the settlements of Buzivka, Buky, Vorone, Zelenyi Rih, Zubrykha, Okhmativ, Sokolivka and Monastyryshche have good indicators for the development of economic and recreational potential in the long term. The study of the downtowns in the frontline towns concentrated in the area of the Hirskiy Tikych River lays the methodological foundations for the analysis of settlements of the Left Bank of Ukraine and Hetman's towns from the area of the border with the Russian empire.

None.

None.

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CONFLICT OF INTEREST

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Середмістя у містах фронтиру зосереджених в ареалі річки Гірський Тікич

Анотація. У статті представлено історію виникнення, розвитку та занепаду міст фронтиру зосереджених в ареалі річки Гірський Тікич. В поле дослідження потрапили Бузівка, Буки, Вороне, Зелений Ріг, Зубриха, Охматів, Соколівка та Монастирище. Природні фактори та розгалуження Чорного шляху визначили концентрацію поселень в ареалі річки. Дослідження міст фронтиру актуальні з позицій розкриття особливостей урбаністичних процесів у Центральній Україні і мають важливе значення для опрацювання історико-архітектурних опорних планів. Мета статті – визначити просторові особливості середмістя у містах фронтиру правобережної України у XVII-XVI-II століттях. Під час проведення дослідження було використано методи аналізу (для літературних джерел), порівняльного аналізу (для картографії різного часу) та комплекс теренових досліджень. Досліджені міста мали оптимальний оборонний периметр у якому домінувала українська дерев'яна церква, а ключовим елементом просторового образу був житловий дерев'яний будинок. Визначено, що міста фронтиру мали політичні та культурні конфлікти із центром держави, що і стало причиною втрати ролі поселень та поділу Речі Посполитої наприкінці XVIII століття. Опираючись на історичну картографію, джерельну базу та збережену давню вуличну мережу, локалізовано та визначено містобудівні особливості середмість. Зосереджені в ареалі річки Гірський Тікич міста фронтиру були економічно та культурно об'єднані, а також відзначалися раціоналістичним плануванням. Вдосконалення середмість у містах фронтиру пов'язані із політико-економічними намірами магнатів у кінці XVI – першій половині XVII століть. Просторовий образ середмістя гуртувався навколо української дерев'яної церкви, за винятком Монастирищ, у яких в середмісті також був дерев'яний костел. Основним елементом забудови була українська дерев'яна хата, яка визначала просторовий та культурний образ поселення. Через непевний політичний кордон та поділ Речі Посполитої наприкінці XVIII століття міста фронтиру втрачають значимість. У XIX столітті, окрім Монастирищ, економічно та адміністративно усі поселення занепадають. Практична цінність дослідження полягає в тому, що результати можна використати під час розробки історико-архітектурних опорних планів, проектів ревіталізації центрів історичних міст, проектів регенерації середмістя та відзнакування втрачених важливих пам'яток. Матеріали дослідження можуть бути використані у навчальному курсі з історії містобудування та архітектури України, а також у формуванні туристично-рекреаційних маршрутів

Ключові слова: місцевість; локалізація; культура; містобудування; церква; ринкова площа; оборонний периметр

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The Mannerism of Giulio Romano: Innovation and dramatic imagery

Abstract. Giulio Romano was a prominent Italian Mannerist architect from Mantua of the Late Renaissance who made a significant contribution to the development of architectural processes and proposed methods of interpreting the order system used in the modern era. The research aims to present the architect's activity as a natural step in the development of the classical order system. The methods of systematisation, comparative and synchronic analyses were used. The study analyses from the artistic point of view the most significant realised objects by Giulio Romano: Palazzo del Te, Cavalerizza in Palazzo Ducale, and the architect's house in Mantua. It is shown how the artist interpreted the order system to form an individual architectural style, full of drama and tension in composition. The study proposes a concept that explains the reason for the emergence of Mannerism, which is based on the Renaissance architects' perception of their place in the historical process. It is shown that the architects' understanding of their time as superior to the masters of antiquity and the awareness of the idea of permanent development as the basis of the historical process created a methodological and methodological prerequisite for Mannerism, which can be described by the term "stylisation". The study also proves that the methods of interpreting the order system proposed during the Late Renaissance were developed in the practice of postmodernism and have not lost their relevance in the present

Keywords: Mannerist architecture; transformation of the order system; Mantua; stylisation

INTRODUCTION

The term "Mannerism" appeared in the dictionary of art and architecture historians in the late nineteenth century. It was coined to distinguish between classical Renaissance art and the "anti-classical" (according to the ideas of the time) Baroque. The acknowledged master of Mannerism was the architect Giulio Romano, whose work is mostly associated with the Italian city of Mantua. His work, due to its vivid specificity and non-triviality of architectural solutions, has long attracted scholars and many works have been devoted to his activities. In particular, the architect's work is covered in the chapters in the collected works of W.D. Faught (1969), which generally deals with the problems of the development of Italian Renaissance architecture. F. Hartt, & D. Wilkins (2003) is a synthetic

work devoted to various aspects of Italian Renaissance art. Thus, A.P.C.M. Stoeldraijer (2013) presents an interesting and important proportional analysis of the facades of Renaissance palazzos and derives general compositional and scaled regularities of their construction.

Another group of studies includes publications devoted directly to the work of G. Romano. The early (Roman) period of the architect's work is the subject of a study by D.J. Jansen (2019). T. Rutter (2019) analysed the architect's work in the context of contemporary artists. The work of M. Introini & L. Spinelli (2018) is a collection of the most prominent architectural objects of Mantua with detailed information on the time of design and construction of objects, including works by G. Romano. An important source

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for understanding not only the peculiarities of the architect's work but also the ideological context of his time was the study by D.L. Michiulis (2016), devoted to a deep and comprehensive analysis of the most prominent object of G. Romano – Palazzo del Te in Mantua.

Methodologically, the study is based on two consecutive steps: visual surveys and interpretation of the results of visual surveys. The objects presented in this article were examined by the author independently in 2018-2020. They include Palazzo del Te, the so-called "Cavalerizza" in Palazzo Ducale, the architect's own house on *Via Carlo Poma*, the city gate *Porta Giulia*, and the Fish Market. The work of any architect can only be considered in the context of the historical and political events of his time. To form the historical and political background of the development of the architecture of that time, the research of L. Kaborycha (2013) and Lviv historian L. Voitovych (2018) was used. Another important prerequisite for writing this article was the work with materials devoted to various problems of Italian Renaissance art. For example, V. Mako (2021) wrote about Mannerist interpretations of the order system, and L. De Girolami Cheney (2016) analysed the ethical problems of the Renaissance (in particular, the concept of beauty).

Based on the comparative analysis, the characteristic methods of transformation of the order system in the objects designed by G. Romano were identified. The criteria for the analysis were the following: a change in the scale of the elements of the order system, a change in compositional rhythms, and peculiarities of the interpretation of visual architectonics. Based on the historical and logical approach, the cultural context of the time when the architect worked was analysed and the peculiarities of the Renaissance's perception of the ancient heritage were determined. The semi-otic approach was used to trace the development of the semantics of the architectural order, the change in its meaning and the significance of morphological transformations.

Thus, the architect's art is mostly interpreted in studies as a phenomenon of his time and its significance for further processes of architectural development has not been considered. Therefore, the research aims to present the peculiarities of the work of Giulio Romano, one of the representatives of Mannerism in the architecture of Italy during the Late Renaissance, not only as an outstanding phenomenon of the late Italian Renaissance but also as a natural step in the development of the order system, due to the current cultural situation.

THE BEGINNING OF GIULIO ROMANO'S CAREER IN ROME

Giulio Romano (true name Giulio Pippi, 1499-1546) is one of those representatives of the late Italian Renaissance who combined the talents of a painter, sculptor, and architect. His career is divided into two periods: the first in Rome, when he worked in Raphael's studio and was considered the most gifted of his students, and the second in Mantua. The analysis of the first period of his art is difficult (his role and importance in Raphael's workshop is unknown, as well

as the degree of independence in the execution of orders), the next period is the time of independent activity, which has brought us much more information (Jansen, 2019).

G. Romano was born and raised in Rome (he was the only known architect of the Italian Renaissance who was a native of Rome). He was among Raphael's students who were entrusted with the paintings of the Villa Farnesina, the Vatican loggias and stanzas, and the decoration of the Villa Madama in Rome (Hartt, 1944).

G. Romano is credited with the construction of two palazzos in Rome: *Palazzo Alberini* (1519) and *Palazzo Maccarani Stati* (1535). As for the Palazzo Alberini, according to some sources, it was still Raphael's project (Coffin *et al.*, 2008) and G. Romano did not take any part in the design and implementation, and according to G. Vasari, G. Romano was the architect of the palazzo (although the first floor is attributed to D. Bramante with a possible date of 1512). The palazzo was completed by P. Rosselli (Grundmann & Fürst, 1998). The current appearance of the building is the result of reconstructions in the nineteenth century. The general composition and decor of the palazzo's facade corresponded to the type of Roman palazzo of the early sixteenth century, developed by D. Bramante: the rusticated ground floor, the main second floor (where the owner's rooms were located) is decorated with the richest flat pilasters and window frames, the third floor, which was intended for the servants, had the most modest decoration.

In 1520, Romano's teacher, Raphael Santi, died, and in 1521, the architect's patron, Pope Leo X. This may have been the reason why he was forced to look for new patrons and left Rome. Thus, in 1524, G. Romano began working in Mantua for his new patron, Marquis Federico II Gonzaga (Jansen, 2019).

The historical context in which the architect's work unfolded is important for understanding G. Romano's work. The beginning of the sixteenth century in Italy was a time of dramatic military cataclysms. Political fragmentation made Italy easy prey for the neighbouring states of France and Spain, each of which had completed its unification at the end of the fifteenth century and turned into a strong centralised monarchy. The Italian states, which were constantly at odds with each other, themselves gave rise to foreign invasions – the so-called Italian Wars, which devastated the country's territory for 65 years – from 1494 to 1559. Emerging as a dynastic struggle for the throne of the Kingdom of Naples, the Italian Wars quickly turned into a pan-European conflict. Since the 1520s, the main component of this conflict has been the struggle between France and the Habsburgs for dominance in Western Europe. The political outcome of the wars was the transfer of Italy to Spanish rule, the consolidation of its fragmentation and the pushing of Italian states to the periphery of European international relations (Kaborycha, 2011; Voitovych, 2018).

The year 1521 marked the beginning of the last period of wars in Italy, which lasted until 1559. The King of Spain, together with the Holy Roman Emperor Charles V, launched a military campaign against France, after which he captured Milan, where French garrisons were based. Gradually,



Charles V turned the Pope, the King of England, Florence, and Mantua into his allies. In 1530, Emperor Charles V appointed Frederick II of the Gonzago family, who had ruled Mantua since 1328, as the first duke of the newly formed Duchy of Mantua. The historical power and influence of the duchy under the Gonzago family made it one of the main artistic and cultural centres of Northern Italy. It is with the personality and activities of Frederick II of Gonzaga that the work of G. Romano is associated (Voitovich, 2018).

THE BEGINNING OF GIULIO ROMANO'S CAREER IN MANTUA

After moving to Mantua in 1524, G. Romano was appointed supervisor of the construction of all the buildings of the Dukes of Gonzago in 1526, and later received the position of the so-called "supervisor of the streets". At this time, he realised his most significant projects: the Palazzo del Te, the Cavalerizza in the Palazzo Duccale, his own house, as well as the reconstruction of the Duomo in Mantua, the design of the Fish Market, the City Gate, and several smaller commissions.

One of the first buildings in Mantua, the Palazzo del Te (1525-1534), was the most significant and large-scale architectural achievement in Mantua. In the middle of the sixteenth century, the Riona Canal divided Mantua into several parts, forming small islands surrounded by lakes. One of these islands, *Tejeto*, or Te for short, was quite swampy. By order of the Duke of Gonzago, the island was drained and adapted for the construction of the stables of the Dukes of Gonzago, who were famous for breeding horses and supplying them to the most famous families in Europe. Philip II of the Gonzago family decided to build a country villa next to the stables, which was entrusted to G. Romano. It is worth noting that Federico II Gonzago was a great patron of the arts, and his relentless desire to build and decorate was considered one of his most important virtues. The construction work was completed relatively quickly in less than two years – from 1524 to 1526, and the interior decoration took a decade. However, in 1630, during the Mantuan War, the palace was looted and later abandoned. Later, it was used as sheepfolds and military warehouses. In the second half of the nineteenth century, the building became the municipal property of Mantua, it was restored, and a museum was opened there (Introini & Spinelli, 2018).

G. Romano created the palace complex as a composition of ideal geometric volumes. The palace building is low and has a horizontal composition, which allows it to harmoniously fit into the picturesque surroundings. It was fully in line with the principles of Renaissance architecture. However, at the same time, it was a completely innovative work. The architect was one of the first in the late Renaissance architecture to offer an example of an axial composition that develops in space, thus anticipating the Baroque practice (Fig. 1). The centre of the composition is the palace building, which is adjoined by a garden surrounded by rows of columns. The composition is completed by a semicircular colonnade called *Esedra*. The palace itself is a square building with a large inner square courtyard and

four entrances leading to the courtyard. The main entrance from the city is made in the form of a loggia consisting of three arches (Fig. 2). The façade planes are covered with rough rustication and are divided by the rhythm of rectangular windows and Tuscan pilasters. The main function of the pilasters is to create a clear vertical order in the façade composition. However, the architect was not particularly concerned about this: the distances between the pilasters vary without forming a specific metric series. In addition, the surface of the pilasters, which was carefully worked out in detail, contrasted with the rough texture of the rustication. Already in 1537, Sebastiano Serlio wrote that the palace looked similar to the work of human hands and the creation of nature (Stoeldraijer, 2013).

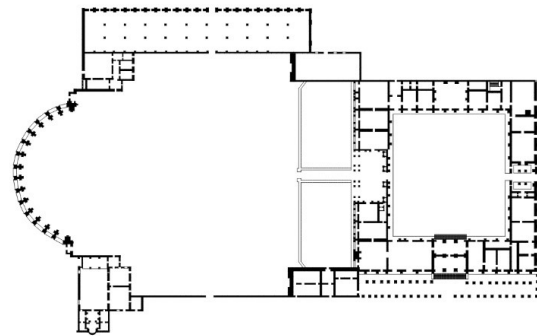


Figure 1. Palazzo del Te in Mantua. Layout

Source: author's drawing



Figure 2. Palazzo del Te in Mantua. North facade, entrance to the palace

Note: architect G. Romano, 1525-1534

Source: author's photo

The façade of the palace from the side of the spacious garden is interpreted differently, and it is, after all, the most famous (Fig. 3). The architect again uses the idea of a three-bay arch but interprets it differently. This is a very harmonious, balanced composition, the core of which is the motif of a triumphal arch crowned with a triangular pediment. The five arches are supported by twin Tuscan columns, behind which is a luxurious loggia decorated with frescoes (Fig. 4). The motif of the arched colonnade is continued in the window decoration, forming a harmonious balanced horizontal. The façade is reflected in two small pools with a bridge over them, which fills the composition with additional harmony and inner peace and brings it closer to nature.





Figure 3. Palazzo del Te in Mantua.

The facade of the palace from the garden

Note: architect G. Romano, 1525-1534

Source: author's photo

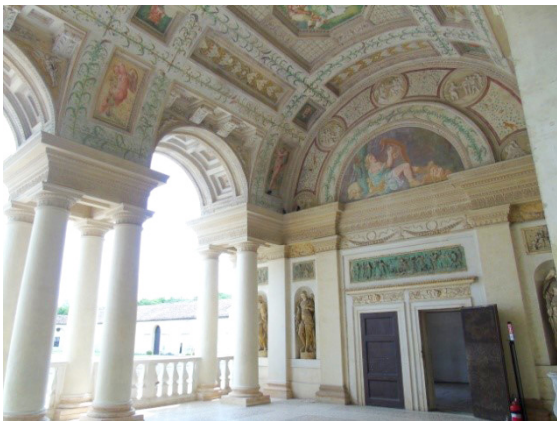


Figure 4. Loggia of the Palazzo del Te

Note: architect G. Romano, 1525-1534

Source: author's photo

In 1530, a small building, the *Appartamento della Grotta*, was built in the eastern part of the garden. It consists of several small rooms with small loggia and its small courtyard with a grotto, where there used to be a water cascade for playing and bathing (Fig. 5; Fig. 6).



Figure 5. Palazzo del Te in Mantua.

Loggia of the house with a grotto

Note: architect G. Romano, 1525-1534

Source: author's photo

The small loggia is decorated with Pompeian-style frescoes depicting various episodes of life and death. The side walls were once decorated with frescoes with perspective views of buildings, but they have not survived. At the top of the wall, there are 18 niches containing images from Aesop's fables. The main entrance to the house is decorated paradoxically, resembling a cave entrance, and defiantly contrasting with the balanced and harmonious composition of the courtyard. The dramatic clash of the "natural" and the man-made, the rough and the refined, again becomes the leitmotif of the architectural concept.



Figure 6. Palazzo del Te in Mantua.

Entrance to the house with a grotto

Note: architect G. Romano, 1525-1534

Source: author's photo

However, the most interesting for analysis is the courtyard of the palace "*cortile*" (Fig. 7). The dynamism and ambiguity of the courtyard's forms contrast with the harmonious completeness and tranquillity of the garden façade. Peter Murray noted that the whole building "is full of surprises and contradictions which are obviously intentional and which, furthermore, were intended to appeal to a highly sophisticated taste since most of the established rules of architecture are deliberately flouted in such a way that the educated spectator is intended to feel a thrill of delicious horror" (Faught, 1969). The author chooses and uses elements not based on their structural function, but on their "dynamic" capabilities, giving them a new paradoxical sound in a familiar context. Here, a violation of many rules of architectonics can be noticed: the famous "falling" triglyphs from the cornice, the combination of the arched form of the portal with a triangular pediment (which is a structural paradox), the use of giant keystones, and finally, the rhythm of the semi-columns that breaks up the surface of the rusticated façade is also not uniform. A. Ikonnikov points out the ambiguity of the interpretation of the order: it may be its incompleteness, or it may be the beginning of its destruction: "The unexpectedness of the whole is emphasised by the imitation of randomness, the instability of the situation" (Ikonnikov, 1997). The abundance of textures and the combination of elements from



different architectural vocabularies seem to deliberately demonstrate a disregard for the principles of classical heritage: “The impression on the viewer of the time must have been extremely great” (Hartt & Wilkins, 2003).



Figure 7. Palazzo del Te in Mantua.
Order system of the courtyard

Note: architect G. Romano, 1525-1534
Source: author’s photo

The theme of tension, destruction, and ambiguity is continued in the interior of the palace. The *Sala dei Giganti* has frescoes depicting the fall of giants (circa 1530-34) (Fig. 8; Fig. 9), based on Ovid’s *Metamorphoses*. One fresco completely covers the entire surface of the hall, “crawling” onto the dome’s plane and blurring the boundary between the surfaces. The dome depicts Jupiter, who, with a bunch of lightning bolts in his hand, smashes the Giants trying to climb Olympus. Boulders and columns fall on their bodies. These frescoes, which make extensive use of illusion and a certain theatrical patheticism, are one of the most striking manifestations of Mannerist art (Michiulis, 2016).



Figure 8. “The Hall of Giants” in the Palazzo del Te in Mantua. The image of Jupiter on the dome of the hall
Note: architect G. Romano, 1530-1534
Source: author’s photo



Figure 9. “The Hall of Giants” in the Palazzo del Te in Mantua. Depicting the Giants trying to climb Olympus
Note: architect G. Romano, 1530-1534
Source: author’s photo

The iconography of these frescoes is traditionally interpreted as a recognition of the power of the Holy Roman Emperor Charles V, as the frescoes were executed around the time of Charles V’s global political reorganisation of Italy. And the patron saint of G. Romano, Federico II Gonzago, often acted as an ally of the emperor in the long Italian wars (Voitovych, 2018). However, researchers note that the iconography can be additionally interpreted in an alternative way – as a secret warning message from G. Romano to the emperor, whom the architect will see during the emperor’s second visit to the palace in 1532 about the possibility of the collapse of the empire and the transience of earthly power (Michiulis, 2016).

The Palazzo Ducale in Mantua was the residence of the noble Gonzaga family from the 14th century. G. Romano was commissioned to build additional rooms adjacent to the palazzo in 1538-1539, which were to face the lakefront garden. This facade, later called *La Rustica*, is now part of the courtyard (Fig. 10). Three additional facades were built later by Giovanni Battista Bertani around 1556 in the style of G. Romano (later, in the seventeenth century, this courtyard was called *Cortile della Cavallerizza*) (Introini & Spinelli, 2018).

At first glance, the composition of the façade resembles the Bramantean Roman palazzo type: a massive parterre lined with rusticated wood, and the upper floors decorated with an order. However, this analogy is not entirely correct: it is rather a free interpretation of Brahman motifs. The lower arched floor is ostentatiously decorated with a rough “rustic” rusticated style, the rhythm of the arches is off, and they have “lost” their foundations and start directly from the ground, “hinting at the instability of the foundation”. The





windows in the piers of the blind arches actually “cut into” the arches and create a certain visual tension: they protrude the keystones of the arches, which in turn “breakthrough” the line of the inter-floor cornice. However, the most surprising are the semi-columns of the second floor (Fig. 11).



Figure 10. The courtyard of La Rustica (now *Cortile della Cavallerizza*) near Palazzo Ducale

Note: architect G. Romano, 1538-1539

Source: author’s photo



Figure 11. The facade of La Rustica, designed by G. Romano

Note: architect G. Romano, 1538-1539

Source: author’s photo

The semi-columns are twisted unusually in different directions, showing the tension and destructive effects of external forces. They are supported by consoles, which, however, seem unstable themselves. The detailing of the windows and doors is also paradoxical. The windows in the smaller piers are finished with simple cornices, and this is quite enough from a structural point of view. However, above them, the theme of a bow-shaped arch unfolds, which contradicts the architectonics. The arch’s keystone is immediately “supported” by a quite classical entablature with triglyphs. It seems that it was this entablature that caused the “flattening” of the bow-shaped arch. The larger piers house the balcony doors, which have a rectangular frame. However, they are again surrounded by a blind arch. The combination of a rectangular lintel and an arch, which

in itself contradicts the constructive purity, is the same technique that has already been used in the treatment of the Palazzo del Te courtyard. The attic floor was completed after the death of G. Romano Battista Bertani around 1570. Subsequently, Bertani repeated the “mannerist” experiment on the other three facades of the courtyard, creating a coherent composition (Introini & Spinelli, 2018).

In 1531, G. Romano bought an old building and a plot of land in Mantua to build his own house. The architect partially preserved the existing building and partially completed it. The result is a building that is complex both in terms of its interior and facade aesthetics (Fig. 12; Fig. 13). It is a multifunctional building with an asymmetrical layout, which is also reflected in the organisation of the façade, which is stretched along the street front and squeezed into the row housing.

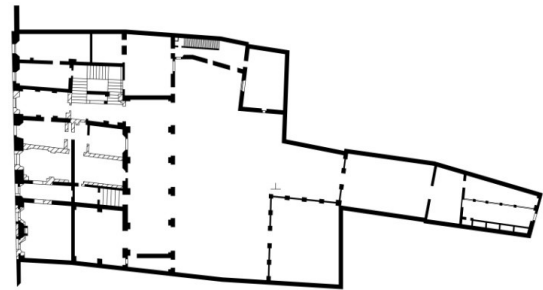


Figure 12. The layout of G. Romano’s house in Mantua

Note: architect G. Romano, 1531-1535

Source: author’s drawing



Figure 13. G. Romano’s house in Mantua

Note: architect G. Romano, 1531-1535

Source: author’s photo

On the ground floor was the architect’s studio, which opened onto the courtyard through an arched loggia. It displayed (according to Vasari) antiquities “brought from Rome and received from the Duke” (Introini & Spinelli, 2018). Living rooms were located on the second floor, including a frescoed salon with a fireplace. The façade is divided by a horizontal inter-floor cornice, which curves in a strange way above the main entrance, forming its pediment. In this way, the cornice loses even its illusory tectonics and turns into a



decorative element. The curvature of the cornice is accentuated by the axis, which is supported by the sculpture of Mercury in the Oedipus above the main entrance. The rough rustication of the first floor gives way to a more refined one on the second level. The main architectural theme of the second-floor façade is blind rusticated arcades with large windows with triangular sandriks in the piers. They contrast with the semi-circular ends of the arches. The keystones are embedded in the crowning cornice.

Mantua is surrounded by several lakes, so fishing and selling fish has always been an important part of the city's economy. Since the Middle Ages, many residents have been involved in the fishing business, and the city had a fishery inspection to ensure that taxes were paid properly, prices were not inflated, and products were fresh and of good quality (Grandi, 2007). Therefore, the construction of the Fish Market in Mantua was prompted by the need to streamline the control and sales processes. In 1536, this task was entrusted to G. Romano. According to medieval tradition, the market was built partially over the bridge over the Rio Canal (Fig. 14; Fig. 15). Its planning structure consists of two porticoes placed parallel to each other. The ground floor level of the porticoes is cut through by arcades with a deliberately rough rustication. The second floor is designed as a massive attic, divided by metric rows of rusticated pilasters and windows. The work was completed in 1546 (Introini & Spinelli, 2018).



Figure 14. Fish market in Mantua. General view

Note: architect G. Romano, 1536-1546

Source: author's photo



Figure 15. Fish market in Mantua. Internal port view

Note: architect G. Romano, 1536-1546

Source: author's photo

The Porta Giulia (*Porta della Cittadella*, 1542-1549) is a city gate through a fortified outpost for the defence of Mantua (Fig. 16; Fig. 17). The construction of the citadel began earlier in 1522-1538 by order of Federico II Gonzaga. Construction continued intermittently, and in 1542 G. Romano was commissioned to build a new city gate to replace the previous one. The leitmotif of the compositional solution was the theme of a triumphal arch with a high-arched passage in the middle and smaller rectangular entrances on the sides (a kind of interpretation of Serliana). Doric rusticated pilasters support the entablature, which is divided by triglyphs and metopes. The inner space is not only a transit communication, but a large room covered with a barrel vault. From the inner space of the gate, there were entrances to the rooms for artillery positions, the brig, and warehouses (Introini & Spinelli, 2018).



Figure 16. Giulia port. General view

Note: architect G. Romano, 1542-1549

Source: author's photo



Figure 17. Giulia port. Inside the gate space

Note: architect G. Romano, 1542-1549

Source: author's photo

G. Romano also carried out other commissions, such as the reconstruction of the Duomo in Mantua in 1545 (the main façade was completed and the interiors were changed), the design of the *Torelli house at Piazza Broletto*





(1527), and the portals of palaces (Rutter, 2019). In general, the architect's projects have defined the architectural image of the city to this day.

G. ROMANO'S MANNERISM: ORIGINS AND PECULIARITIES

The question of the origins of G. Romano's architectural "style" remains open. After all, he was not the only Mannerist in the Italian Renaissance. It is possible to mention Balthasor Perucci, Sebastiano Serlio, Michelangelo, and Andrea Palladio. These architects, whose work took place in the early to mid-sixteenth century, represented different approaches to understanding and using ancient heritage. Researchers note that the key to understanding their work is the word "manner", which was the desire to distinguish themselves and their activities from others, to find their path (Coffin *et al.*, 2008).

It is difficult to say whether Mannerism was opposed to "classical" architecture: in this case, it is necessary to understand what "classical architecture" is. It was an architecture that focused on the development of ancient heritage. However, the ancient heritage itself did not leave clear indications of what is a classical order and what is not. Its comprehension and search for "ideal" examples continued throughout the Renaissance, starting with Alberti and his reprinting and new interpretation of Vitruvius' Ten Books. Alberti was the first Renaissance architect to consistently apply the structural techniques of Roman builders – pillars, arches, cylindrical vaults, and hemispherical domes (Graschenkov, 1977). Alberti proposed a methodology for using Roman heritage in contemporary construction: projecting an ancient order onto the wall plane of a Roman palazzo (Palazzo Rucellai in Florence (1446-1451); for the facade of the Church of Sant'Andrea in Mantua (project of 1470, Alberti chose prototypes of the Roman order), Alberti chose the composition of the ancient Roman triumphal arch as a prototype, supplementing it with a "large" (three-storey high) "graphic order"; decorating the facade of the medieval church of Santa Maria Novella (1456-1470) in Florence in an "inferior" style). In Florence in the "inlay style", Alberti combined medieval and Renaissance motifs in one composition, linking them with a rational system of proportionality based on three levels (Ikonnikov, 1997).

The pinnacle of the development of Renaissance architecture was marked by the work of Bramante, where the culmination of mastering the language of the classical Roman order was reached. It was necessary to find new ways of developing architecture. One of them was the path based on the principle of autonomy of artistic form, which was especially noticeable in painting (the first signs of this phenomenon can be observed already around 1520), and later spread to other types of artistic creativity, including architecture. The spread of Mannerism in architecture is associated with the work of Raphael and his school. The specificity of the form was the preservation of the vocabulary of architectural forms of the Roman heritage, but the syntax and patterns of combining forms became a field for experimentation.

G. Romano seems to have gone the furthest, offering paradoxical, dramatic solutions (Ikonnikov, 1997).

An important question is: why did it become possible for architects to treat the heritage of Ancient Rome so "freely"? Why does a deviation from a certain norm (even conditional) become the basis of creativity? It should be noted that the famous treatise "The Rule of the Five Orders of Architecture", based on a thorough study of ancient monuments and Vitruvius' treatise, was published by G. Villola only in 1562, after the death of G. Romano.

The question requires immersion in the cultural situation of the time and an understanding of how architects understood themselves, their time, and how they related it to the past. In the Middle Ages, the question of historical distance (or the past) was not specified. After all, the past was irrelevant in the linear model of time that the Middle Ages formed: the future was predetermined in the paradigm of the providential of the end of the world and the Last Judgement (Savelyeva, 1997). However, starting from the Renaissance, a distinction between past, present, and future as modes of time began to emerge in the public consciousness. The appeal to antiquity was part of this process: antiquity became a shining unattainable ideal that was "hidden" and "distorted" by the dark ages of the Middle Ages: "But if this shining and sacred antiquity can be said to have since become something of an ideal model for imitation, then it can be argued that it is at this point that it (this antiquity) is distinguished and understood as 'otherness' – that is, its difference is manifested and defined through its distance in time. In other words, the concept of historical distance begins to emerge" (Shlipchenko, 2009). This "distance" created by the Renaissance "deprived antiquity of its reality, the classical world became an object of passionate nostalgia, which finds its symbolic expression in a newly emerging, revived – after fifteen centuries – such a charmingly alluring image... The classical past was now, perhaps for the first time, looked at as an integrity cut off from the present, as an ideal to be strived for". In other words, "the world of antiquity has died, but the dead and later resurrected souls have the advantages of 'immortality and omnipresence'" (Ikonnikov, 1997). The Renaissance rediscovered Antiquity, which had become a distant but important past, and its development was interrupted by the Middle Ages. Thus, in the fifteenth century, a new cyclical concept of time was formed: where times of prosperity could alternate with times of decline. The Renaissance was interpreted as a time of new prosperity, and the idea was formulated that "the Renaissance can approach the level of the spiritual conquests of antiquity" (Graschenkov, 1977). In the historical consciousness, the present is also reinterpreted as a transition from the past to the future. This understanding, in turn, became an impetus for a specific attitude towards the heritage of Ancient Rome: it is an ideal that needs to be imitated.

A new understanding of one's time as a link in a continuous historical process became a defining moment in the formation of the Renaissance worldview. Recognition



of antiquity as a perfect ideal stimulated the active involvement of ancient examples in architectural practice, however, a methodology for their use was developed. L. Batkyn (1989) introduces the term “stylisation” for this: “Here, of course, is the necessary term. The people of the Renaissance did not use it, because they did not use the term “personality”. They did not discuss the problems of personality, but they were interested in ‘diversity’. They did not discuss the problems of “stylisation”, but their focus was on free imitation to achieve their own goals, self-expression through the medium of a well-calculated paraphrase. This was neither epigoneanism nor following an ancient canon that was accepted without discussion, attributing a text to an anonymous author, nor subconsciously substituting, distorting, or barbarizing ancient structures in the Western and Byzantine Middle Ages. It was something fundamentally different from all of the above, namely stylisation”. Stylisation served as an “extremely successful historical solution” to the problem of imitation, and it constructively linked the “discovery of antiquity” with the justification of sovereign individual creativity: “It is easy to see that the Renaissance invention “for antiquity” was significantly different from what stylisation was later, what it became in the nineteenth and twentieth centuries. But one way or another, the Renaissance used it, apparently for the first time in the history of world culture, pushing away from antiquity for the sake of its rapid rise” (Batkyn, 1989).

Thus, G. Romano’s mannerism was historically grounded and reflected the worldview of the creators of his time. Romano’s “manner” was not only his stylisation. The formation of the architect’s “manner” was also influenced by the current political situation, which was discussed above, and by personal characteristics. In this aspect, the architect’s mannerism appears as a deeply subjectified reflection of the current cultural, political, and ideological situation. This complexity translated into internal drama, tension, and deep individuality of artistic images. It is impossible to deny the fact that the artistic tasks were fulfilled exclusively aesthetically: the scenographic nature of the idea, the effectiveness and originality of the solutions, and the admiration for the “speciality” of the artistic solution.

Analysing the stylistic techniques used by G. Romano in his work, which characterised his style, it is possible to distinguish the following:

- abstraction of order elements;
- exaggeration and distortion of the scale of elements;
- visual destruction and deprivation of tectonic elements;
- uneven and dynamic rhythms;
- the contrast between “natural” and “artificial”, “rough” and “refined”;
- imitation of instability and uncertainty, destruction and imperfection.

The architect’s prototypes are recognisable but interpreted in a particular way. This is an architecture that reflects “complexities and contradictions” (Venturi, 1965) and is an example of the so-called “double coding”. Romano’s art would have remained interesting only to a narrow circle of

specialists if it had not been for the postmodernism of the second half of the twentieth century. The legacy of Mannerism turned out to be not only an exciting discovery, but architects also adapted methods of interpreting the ancient heritage. One of the theorists and practitioners of Proto-Mannerism, the American architect R. Venturi, wrote: “...an aesthetic revolution made sense through Renaissance architecture that was a stylistic revival of an ancient vocabulary”, thus praising Mannerism as a significant aesthetic revolution. He compares the period of Mannerism in the architecture of the sixteenth century with the second half of the twentieth century – with postmodernism, and defines the characteristics of postmodernism, among others, as the principles found in G. Romano. These include contradiction, ambiguity, contrast, paradox, and diversity (Venturi & Brown, 2004). R. Venturi’s work demonstrates adherence to these principles, for example, the paradoxical ways of interpreting the order system are demonstrated by the completion of the wing of the National Gallery in London in 1987-1991 (Fig. 18).



Figure 18. Completion of a wing of the National Gallery in London (*Sainsbury Wing, National Gallery*)

Note: architect P. Venturi, 1987-1991

Source: author’s photo

On the façade of the building, it is possible to observe the confused rhythm of the pilasters, the paradoxical interpretation of classical details, visual authenticity, and an imitation of the imperfection and instability of the order system.

CONCLUSIONS

Romano’s art is an example of how architecture reflects the complexities and contradictions of his era, full of tragic military events and profound cultural transformations. The analysis of the most significant objects by G. Romano, realised in Mantua, such as the Palazzo del Te, the Cavalerizza in the Palazzo Ducale, and the architect’s house, made it possible to see how the ideological and cultural vicissitudes of his time were reflected in the architecture of the architect. This was visualised in specific formal techniques





of architectural composition and interpretation of architectural detail, such as abstraction, distortion of scale and exaggeration of elements; visual destruction and deprivation of tectonicity; uneven and dynamic rhythms; special dramatic contrast between “natural” and “artificial”, “rough” and “refined”; imitation of instability and uncertainty, destruction, and imperfection.

In this context, the art of the Mannerist architect appears as a much deeper phenomenon than just a search for “his style”. This is an artistic reflection of the contradictions of his time, methodologically based on the involvement of forms and motifs of the architecture of the past in the current creative process. However, the Renaissance architects’ understanding of their time as one that not only reaches but also surpasses the masters of the past (antiquity), and their awareness of the idea of permanent development as the basis of the historical process, created a new methodology for using the heritage of the past, which can be described as “stylisation”. G. Romano appears as one of the most brilliant

stylists of his time, whose work was defined by emotionality and innovation. Architects saw progress in architecture in the maximum deviation from classical architecture, in the courage and unpredictability of interpretation.

The methods of interpreting the order system proposed by G. Romano have not lost their relevance to this day, as exemplified by the work of postmodern architects. The ideological basis for the transformation of the classical order has changed, but formal techniques are actively involved in the creative process of contemporary architects. Further study and comprehension of the methods of interpreting the order system in their relationship with semantic aspects is an interesting creative task for future research.

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CONFLICT OF INTEREST

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Маньєризм Джуліо Романо: новаторство і драматизм образів

Анотація. Джуліо Романо – видатний італійський архітектор-маньєрист з Мантуї доби Пізнього Відродження, який зробив значний внесок у розвиток архітектурних процесів, а також запропонував методи інтерпретації ордерної системи, що використовуються у сучасну добу. Саме тому метою статті є представити діяльність архітектора як закономірний крок у розвитку класичної ордерної системи. Для цього було використано методи систематизації, порівняльного та синхронічного аналізів. У дослідженні проаналізовано з художнього аспекту найзначніші реалізовані об'єкти Джуліо Романо: палаццо дель Те, Кавалеріцца в Палаццо Дуккале, власний будинок архітектора у Мантуї. Показано, яким чином митець інтерпретував ордерну систему для формування індивідуального архітектурного стилю, сповненого драматизму та напруженості композиції. У статті запропоновано концепцію, що пояснює причину виникнення маньєризму, яка базується на уявленні архітекторів епохи Ренесансу свого місця в історичному процесі. Показано, що розуміння архітекторами свого часу, як такого, що перевершує майстрів античності, та усвідомлення ідеї перманентного розвитку, як основи історичного процесу, створили методологічну та методичну передумову для маньєризму, яку можна окреслити терміном «стилізація». Також у статті доведено, що методи інтерпретації ордерної системи, запропоновані у період Пізнього Ренесансу, знайшли свій розвиток у практиці постмодернізму і не втратили свою актуальність і у теперішні часи

Ключові слова: маньєристична архітектура; трансформація ордерної системи; Мантуя; стилізація



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The city of the future in the European Commission's documents: A comprehensive analysis

Abstract. The study analyses a holistic vision of the city of the future, which is scattered in various documents and programmes of the European Union. The research relevance is predefined by the need to create a holistic vision that can act as an attractive representative of all current urban values in the mass culture and promote the qualities of environmental friendliness, inclusiveness, cohesion, sustainability, self-sufficiency, etc. The research aims to outline a holistic vision of the city of the future supported by EU documents necessary for the crystallisation of its historical identity. The research results were obtained by using the synthesis method. This study proposes to synthesise the following main conceptual groups of the discourse around the city of the future aimed at the ideals of optimal density, renewable self-sufficiency, techno-biosphere symbiosis, participatory cooperation, social cohesion, and multi-age valorisation. Each of these groups is first considered separately as a field of scientific attention, its main characteristics are given and evaluated in terms of usefulness for improving the urban environment. Next, an attempt is made to combine these groups employing a comprehensive analysis, the methodology of which is aimed at identifying common content nodes in the concepts and tools of each group. Subsequently, they are combined into a common conceptual system, an essential feature of which is the expansion of the interpretation of the features of each group as part of the features of other groups. This allowed to avoid the division of the current discourse around the image of the city of the future into different sectors and to work more effectively with the implementation and promotion of the values of the city image, which is supported by official documents of the European Commission, which is relevant for Ukraine, which seeks EU membership. In addition, the findings can be used in the education of students majoring in architecture and urban planning, as well as design

Keywords: vision; synthesis; urban planning; identity

INTRODUCTION

The main EU documents that define the vision of the city of the future, although comprehensive, mainly look like a mechanical combination of several large research areas related to density, sustainability, environmental friendliness, cohesion, participatory, and age inclusiveness. This can be considered evidence of the actual fragmentation of modern urban planning, which has arisen as a result of the entry of various fields of knowledge into the urban planning level.

Thus, it is necessary to acknowledge this aspect when scrutinising the source materials and assess each of these areas separately. Concerning the concept of “optimal density” and limiting urban sprawl, which is supported by EU programmes (European Commission, 2011), several studies are worth mentioning. S. Lehmann (2016) explores the relationship between urban density and environmental problems and provides recommendations on how to achieve optimal urban density. The book by D. Sim & J. Gehl (2019)

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presents approaches to increasing urban density while ensuring convenience, comfort and safety for residents and visitors. Meanwhile, G. Duranton & D. Puga (2020) investigated the role of density in shaping the urban economy, in particular its impact on the real estate market, transport, and business development. The topic of sustainable development in European cities is a large and complex area of discourse. Within this topic, we can highlight the article by Zhang *et al.* (2020), which identifies the need to reduce dependence on hydrocarbons and increase the use of renewable energy based on a study on air pollution. Another important analysis is presented in the article by H. Kaur & P. Garg (2019), in which the authors provide a comprehensive review of scientific research on this issue and emphasise the unequal attention paid to different aspects of sustainable development). The issue of the environment, despite its fragmentation in recent decades, remains an important area of research for understanding the modern urban environment (Chen *et al.*, 2020). Similarly, the concept of cohesion, which originates from socio-demographic science, has become a self-sufficient field of knowledge that develops independently of other segments of urban planning in creating the city of the future. For example, the study by D. Rauhut & A. Humer (2020) summarises the existing discourse, which to some extent diverges from the principles of other urban planning concepts. In addition, the ideology of participatory design is being reconsidered, and recent research challenges previous optimistic notions of community participation in the creation of urban spaces (Clarival *et al.*, 2020). Participatory mechanisms and experiences, which were initially driven by political calculations aimed at strengthening civil society, have proven unsustainable and need to be improved (van Hoof & Marston, 2021). A certain interdisciplinary synthesis can be observed in the book by G. de Roo & D. Miller (2019), which analyses the advantages and disadvantages of compactness in the context of environmental protection, social equality, and economic sustainability of cities. The authors explore various integrated urban planning tactics to promote sustainable development in urban areas. The issue of environmental sustainability has largely receded into the background of European professional discourse, giving way to the concepts of resilience and self-sufficiency.

The existing analysis of the discourse shows that the development and complexity of the above-mentioned sectors contribute to the further erosion of the comprehensive vision of the future city supported by the European Commission. The study aim was to outline the possibilities of creating a holistic picture of the desired urban environment, which will give it an identity more accessible to the wider society. A new methodology has been used that simplifies and summarises the content nodes, enabling a fundamental approach to work with the EU-supported values for the city of the future.

MATERIALS AND METHODS

A key element of the methodology of this study was the synthesis of “semantic nodes” and the hypothesis that a

holistic vision of the image of the future city is possible (as confirmed by EU documents). This means that instead of the traditional approach, where each aspect of the city is studied separately, the city can be viewed as a single complex object where different aspects interact with each other and influence each other. This approach can contribute to solving complex urban planning problems and ensuring sustainable urban development. The use of the proposed methodology to synthesise knowledge from various fields that create the concept of the city of the future (ecology, sustainability, cohesion, density, and inclusiveness) allows for more comprehensive and balanced urban development strategies. The environmental aspect ensures the preservation of the environment and improves the quality of life of residents. The sustainability aspect considers the long-term consequences of any decisions and actions, which helps to ensure the sustainable development of the city. The cohesion aspect promotes the formation of communities and interaction between them, which increases social interaction and the development of the city as a whole. The density aspect helps to increase the efficiency of the use of the city’s territory and infrastructure, which in turn reduces the cost of building and operating the city’s infrastructure. The inclusiveness aspect contributes to the formation of a city that considers the needs of all population groups and allows them to actively participate in the life of the city. Such a comprehensive approach allows us to understand urban organisms that will be efficient, sustainable, pleasant to live and develop and provide a high quality of life for residents. Such a version of the city can contribute to its competitiveness and accessibility for the positive participation of the wider population for business development and investment and overcoming external challenges.

Researching the aforementioned areas, fundamental conceptual and descriptive terminology, which in this context is referred to as “semantic nodes”, was prioritised. The key terminology of each of these nodes, applied to specific concepts or ideas, is considered in terms of its commonality and recurrence in other nodes. Thus, the connections between terms and their semantic dependencies became the basis for a comprehensive synthesis. By comparing the conceptual and descriptive terminology used in different areas of the vision of the city of the future, it is possible to determine which terms are common to many fields of study, as well as which are different, and to what extent they differ from each other.

The basis for the material analysis in this study was the European Commission’s documents related to urban planning, including legislation, agreements, and decisions, as well as EU-supported strategies and charters that outline the principles and priorities of urban development. Scientific materials that reflect the European consensus on the desired image of the city of the future and its implementation in local projects were also considered (Urban Agenda for the EU..., 2016; European Commission, 2011; The New Leipzig Charter..., 2020 and others). Key themes and ideas from the documents were differentiated and analysed.





RESULTS AND DISCUSSION

The modern vision of the city of the future, which is confirmed by the documents of the European Commission mentioned in the methodology, is the result of a critical rethinking of the values of the modernist era, as manifested in the Charter of Athens of 1933 (Gold, 2019). The focus on functionalist and rationalist priorities, which were retrospectively compared to medieval reality, gradually led to excessive uniformity and pragmatism of urban space. In addition, local authorities have not always been able to fully ensure that their decisions comply with the principles of the Charter. The rapid development of transport and production has led to new problems in urban space related to pollution, noise, inefficient use of time, etc. (Hamel, 1993). The functionalist approach, which operated on the concepts of large-scale “zoning”, did not always provide sufficient flexibility to adapt to advances in technology and social relations (Rossi, 2002).

The origins of modern ideas about effective urban space can be seen in the environmental movement of the 1960s and 1970s (the first reflection on this topic was the book *Silent Spring* (Carson, 1962), which was reflected in urban planning. The book by I. Mcharg (1995) introduces the concept of “overlay analysis”, a method of mapping and analysing multiple layers of data, such as geology, topography, hydrology, and vegetation, to make land use decisions. The book also proposes an approach to regional planning that considers the entire natural system of a region, not just individual sites or projects. Platt *et al.* (1994) examine the idea of the city as an ecological system and explore how cities can be designed and managed to promote environmental sustainability, arguing that the traditional view of cities as separate entities from their natural environment has led to many of the environmental problems facing urban areas today and that a more integrated approach is needed for cities.

The issue of urban density gained widespread attention in the 1970s and 1980s when urban planners and architects began to question the low-density suburban sprawl that had dominated urban development since World War II. In response, many theorists and practitioners began to promote the benefits of compact, dense urban forms. The ideas of the Danish architect and urban planner J. Gehl (2010), summarised in his book *Cities for People*, became influential, where the author talks about the importance of building dense urban structures on a human scale. He believes that the needs of people, not cars, should be at the centre of cities, emphasising the importance of creating pedestrian, bicycle, mixed-use districts, active streets, and public spaces. Other theorists since the 1970s have also contributed to the development of the ideas of density, community, and participation, including P. Calthorpe (1995) and C. Alexander (1977).

The concept of participatory architecture emerged in the 1970s and gained considerable attention during the 1980s. It represents a shift towards a more democratic and inclusive design process that respects the needs and

aspirations of the local community. The participatory architecture was intended to help build stronger and more resilient communities by promoting a sense of ownership and pride in shared spaces. It can also help to overcome social and economic inequalities by giving marginalised groups a voice and considering their needs in the development process (Krier, 2009). The concept of an age-friendly city was introduced by the World Health Organization (WHO) in 2007 with the launch of the Global Age-Friendly Cities project (World Health Organization, 2007). The project aimed to promote the development of cities and communities that are more inclusive and accessible to older people, focusing on improving their quality of life and well-being. Since then, the concept of age-friendly cities has gradually spread, and many urban communities have adopted the principles and strategies outlined by the WHO to better serve their ageing populations, such as Silver Spring, Boston, Raleigh, Pittsburgh and others (Fitzgerald & Caro, 2014).

Interest in urban cohesion policies began to emerge in the 1980s and 1990s, especially in Europe, in response to problems of social and economic inequality in cities. The concept was officially introduced by the European Union in 1986 to reduce disparities between regions and promote greater social and economic integration in the EU (Hannequart, 1992).

This chronological overview is important for the development of approaches to creating a holistic vision of the city of the future, as it allows to see the dependence of these concepts on the search for an alternative to modernist urbanism. Thus, two main blocks of rethinking can be distinguished – one of them concerns the life support system (density, sustainability, ecology), and the other concerns the human collective (participatory, cohesion, age-friendly cities).

Accordingly, a chain of semantic nodes will be formed first concerning the topic of life support, and then – the human collective. Density, sustainability, and ecology as interrelated categories were discussed by Platt *et al.* (1994). The authors argue that a city can only be truly sustainable if it is environmentally sound and has a high density of people and activities. In this triad, sustainability is the link – it equally explains the need for density and sustainability, although the latter two do not necessarily justify each other. At the same time, sustainability is mainly focused on the unlimited and safe self-reproduction of the resources necessary for life. In the traditional discourse, the link between sustainability and environmental resilience is more explicit (Benton-Short *et al.*, 2017), where density is seen as a technical tool to achieve the necessary performance to reduce negative impacts. If density can be achieved through other means, it may no longer be a fundamental value for the city of the future. One example of this is the development of immersive presence environments (van Leeuwen *et al.*, 2018), which can reduce the burden on transport networks and create new opportunities for communication without physical presence (Allam & Jones, 2021).

The issue of environmental sustainability emerged as a direct result of the industrial revolution and the use of



harmful fossil fuels. In response, modernism was criticised for damaging the environment, and there was a call for a return to the state of harmonious coexistence with nature that was believed to have existed before. On the other hand, the concept of self-sufficiency emerged as a new phenomenon, leading to a plethora of research, programmes, and strategies in the early 21st century.

The issue of environmental sustainability, which was once universally recognised, has gradually lost its position in the mainstream of opinion. This is not only due to the exhaustion of its ideological significance or the ineffectiveness of the proposed measures. It is largely the result of a change in the economic model, which has moved from an industrial to an information-based one. The service sector has come to dominate production in terms of quantity, while hazardous production has been moved to other countries (China, Vietnam, India, etc.). In Eastern Europe, uncompetitive industries were also restructured and eliminated (Landesmann & Székely, 1995). These and other factors have contributed to the improvement of environmental quality and the reduction of environmental problems.

The fundamental basis of this part of the concept of the future city is the sustainability of the life support system. With the proliferation of immersive environments, the importance of the density category, which is highly valued today (Gaglione *et al.*, 2022), may diminish. However, environmental friendliness will remain an obvious standard that stems from the peculiarities of the economic model and the consensus of society on the quality of the living environment. At the same time, the methods, and forms of achieving sustainability will mainly depend on technological progress and the initiative of local communities, as well as on climate characteristics. Given this, it can be argued that in the context of a comprehensive analysis, the concept of “self-sustainability” is an essential node that should be considered as a multilevel category. In the city of the future, it functions in different ways, for example, the city itself seeks to be autonomous from globalised and monopolised life support systems. This applies not only to the energy component but also to other aspects, such as food production, water supply, etc. In addition, self-sufficiency also applies to a more localised level, such as individual residential areas or complexes, self-organised communities, etc. The concept of self-sufficiency extends to the level of individual homes and citizens, who can create their independent life support systems using renewable and clean sources. This approach can have a significant impact on urban design rules, such as avoiding shading of solar panels and controlling wind flows. Future advances in energy supply technologies and food production cycles may lead to different methods of achieving self-sufficiency. For example, current European strategies emphasise the use of peri-urban areas to supply agricultural products to cities, but in the future alternative methods such as agricultural skyscrapers in urban areas may be implemented (Masterson, 2022).

The part of the conceptual image of the future city that relates to the human collective (participation, cohesion,

age-friendliness) is more complex and reflects a deeper improvement of the modern social model that emerged in Europe and North America in the late 18th century and replaced feudalism. The principles of universal equality and shared responsibility have both collective and individual levels, which closely interact with each other. The development of social communication technologies and increased horizontal interaction have led to a significant improvement in the ways people participate in civic initiatives. As a result, citizens have become more engaged in urban issues and can advocate for their communities in more powerful ways. Social media has also made it easier for citizens to hold government officials and urban planners accountable, as they can quickly disseminate information and mobilise support for their causes.

The topic of participation in architecture gained considerable attention during the 1970s and 1980s. Many prominent figures contributed to the development of this topic during that period. C. Alexander (1977), an architect and theorist, proposed a participatory design approach called “pattern language”, which allowed communities to participate in the design of their built environment by creating their own design rules. Giancarlo De Carlo, an Italian architect, and urban planner advocated democratic design processes that involved all stakeholders in the decision-making process (Charitonidou, 2021). Cohesion in urban planning and design has evolved and become increasingly important. In the 1970s, the concept of social capital was introduced by sociologist James Coleman, who emphasised the importance of social networks and relationships in creating cohesive communities (Marsden, 2005). In the 1980s and 1990s, scholars such as R. Putnam (2001) and R. Sennett (2007) explored the idea of social capital in more depth, looking at how it can be built through civic engagement and community participation. In the 2000s, the concept of social sustainability gained popularity with a focus on creating communities that are socially inclusive and promote equity. The United Nations Sustainable Development Goals also emphasise the importance of social cohesion as a key factor in creating sustainable cities and communities (United Nations, 2011).

Both cohesion and participatory approaches call for a participatory approach to urban planning that involves working with a variety of stakeholders, including residents, community groups, business owners and local government officials. They both recognise the importance of creating inclusive urban environments that support social, economic, and environmental sustainability. By combining the principles of cohesion and participatory design, urban planners can create cities that are both vibrant and equitable, reflecting the needs and aspirations of all community members.

Considering the entire spectrum of the human collective part of the vision of the future city, it should be noted that the pair of social cohesion and participation are the closest. These two concepts, despite their differences, activate the horizontal links of the social system. Their function is to mitigate the likelihood of conflicts between those





who hold power and those who are governed. In addition, they promote the use of commonly accepted categories in the governance of the urban community, thereby allowing a diverse range of citizens to feel involved in the process. By promoting age-friendly attitudes, people can avoid the anxiety caused by a loss of purpose and develop a more holistic self-image that considers their entire life cycle. Age-friendly, along with participation and cohesion, is part of a larger agenda known as anthropo-axiology. This term can be used as an umbrella term for the whole human collective block of envisioning the future of the city.

The identification of common semantic nodes allows to assess the probability of a holistic definition of the European Commission's urban ideal. The theoretical basis for this is the combination of the supercategories of "self-sufficiency" and "anthropo-axeology". In practice, there are several markers associated with this ideal, such as the aestheticisation of renewable energy systems (Ioannidis *et al.*, 2019), the increasing importance of green spaces and natural elements (Panlasigui *et al.*, 2021), and the use of forms that mimic nature, such as asymmetry, spontaneity, and curvature (Abdelsabour, 2019).

The European Commission's vision of the city of the future already has a strong theoretical, practical, and regulatory basis. To make it more popular and attractive, it needs a recognisable visual identity that can be easily shared both in Europe and beyond. A holistic approach to analysis can be a starting point for a new understanding of urban spaces as complex and unified systems that reflect a modern idea of ideal existence. In this context, it is worth mentioning some attempts by individual authors that reflect this intuition, such as Sandberg & Rönnblom (2016). In a broader sense, the concepts of ideality are utopian, but when they acquire certain visual and semantic parameters, they can become an effective means of popularisation and motivation.

The holistic narrative of self-sufficiency and anthropo-axiology as a deterministic basis for the vision of the future city, which is supported by the European Commission, has significant potential for further research and practical efforts. The main focus should be on overcoming the sectoral limitations of graphic utopias, which often express only one of the main value concepts. Generalising attempts such as "integrated strategy" and "smart city" (Berrou *et al.*, 2020) seem to be still hampered by sectoral isolations. The proposed method of holistic analysis opens up the possibility of more efficiently achieving the goals of the utopia of the future city, focusing on a new anthropological ideal – a self-sufficient person of high value and quality of life.

The emergence of immersive presence technologies is prompting a reassessment of current notions of ideal density, with more attention being paid to individual living

spaces and their modern functionality. The integration of virtual and physical environments provides greater flexibility and fluidity in urban spaces, opening up significant opportunities for theoretical and practical research into an expanded vision of the future city. This type of city will facilitate more effective holistic generalisations and promote widespread visual and semantic identities.

CONCLUSIONS

This study outlines a holistic approach to analysing the main concepts of the modern city by identifying their substantive nodes. The method involves the integration of several sectoral areas, including optimal density, renewable self-sufficiency, techno-biosphere symbiosis, participatory cooperation, social cohesion, and age-valorisation. The origins of these trends are traced in different fields and analysed chronologically, emphasising their emergence and connection with the critique and rethinking of modernist principles that dominated 20th-century urban planning. This approach offers a comprehensive understanding of the modern city and its key components.

Based on the analysis of the conceptual idea of meaningful nodes, two main blocks of rethinking have been identified, which can be distinguished as follows: one of them concerns the life support system (density, sustainability, ecology), the other concerns the human collective (participatory, cohesion, elderly-friendly cities). These two blocks, although originally from different fields, are linked by a common logic of social development that aims to remove human labour from routine and repetitive activities.

As a result of the urbanist interpretation of the above blocks, the conceptual image of the future city supported by the European Commission is proposed to be seen as a combination of the supercategories of "self-sufficiency" and "anthropo-axeology". In practice, there are various indicators associated with this ideal, including renewable energy systems in aesthetic design, the increased importance of green spaces and natural elements, and the integration of forms that emulate nature, such as asymmetry, spontaneity, and curvilinear design. On this basis, the holistic analysis approach can be a starting point for a new understanding of urban spaces as complex and unified systems that reflect a modern idea of ideal existence. By putting a new anthropological ideal at the forefront – a self-sufficient personality of high value and quality of life – it allows to achieve the goals of the utopian city of the future more effectively.

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CONFLICT OF INTEREST

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Місто майбутнього у документах Європейської Комісії: комплексний аналіз

Анотація. У статті розглянуто проблему цілісного бачення міста майбутнього розпорошеного у різних документах та програмах Європейського Союзу. Актуальність цієї теми пов'язана із необхідністю створення холістичного цілого, яка може виступати привабливим репрезентантом всіх нині актуальних урбаністичних цінностей у масовій культурі та пропагувати якості екологічності, інклюзивності, згуртованості, сталості, самодостатності та ін. Метою статті було окреслити холістичну візію міста майбутнього підтриманого документами ЄС необхідної для кристалізації її історичної ідентичності. Результати дослідження отримані за допомогою використання методу синтезу. В даній роботі запропоновано синтезувати такі основні концептуальні групи дискурсу довкола міста майбутнього спрямованого до ідеалів: оптимальної щільності, поновлюваної самодостатності, техно-біосферного симбіозу, партисипаційної спільноти, соціальної згуртованості, різновікової валоризації. Кожна з цих груп спочатку розглянуто окремо, як галузь наукової уваги, дано її основні характеристики і оцінка з точки зору корисності для вдосконалення міського середовища. Далі зроблено спробу поєднати ці групи за допомогою комплексного аналізу, методика якого спрямована на виявлення спільних змістових вузлів у поняттях та засобах кожної з груп. Згодом здійснено їх поєднання у спільну концептуальну систему, суттєвою ознакою якої є розширення тлумачення ознак кожної з груп як частини прикмет інших груп. Це дало можливість уникати розділеності сучасного дискурсу довкола образу міста майбутнього на різні галузі та більш ефективно працювати з реалізацією та популяризацією цінностей образу міста, який підтриманий офіційними документами Європейської Комісії, що є актуальним для України, котра прагне до членства у ЄС. Крім того, отримані висновки можуть бути використані у освіті студентів спеціальності «архітектура та містобудування», а також «дизайн»

Ключові слова: візія; синтез; містобудування; ідентичність

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Renovation of residences from previous historical eras and styles

Abstract. The central part of historic cities is developed by ordinary residential buildings that do not correspond to the current architectural and functional requirements and building codes, and therefore require comprehensive reconstruction. Therefore, it is essential to explore the types of residential development in historic cities and the current state of the planning structure of historic apartments, which will allow for professional restoration in the future. The purpose of this research was to determine the current state of historic buildings, and their architectural features, and to propose the basic principles of reconstruction of residential buildings of different historical eras. The research used general scientific research methods (method of comparison, method of analysis) and special methods: typological classification, architectural and planning, three-dimensional, stylistic and retrospective analysis, and graphic comparison. It has been established that in modern urban development today there is a significant share of residential buildings from previous historical eras and styles, consisting of: detached urban estates with their courtyard, ordinary street buildings of 2-4 floors with courtyards, offices and entrance gates, multi-storey buildings, etc. Detached urban estates have now lost their original function as housing and are mainly used as public facilities. Residential buildings of street-level construction have several disadvantages, from the chaotic redevelopment of apartments with access to bathrooms through kitchens or the development of dark rooms to the loss of structural stability of the buildings. Thus, to improve the comfort level of existing apartments in residential buildings from previous historical eras, it is advisable to develop comprehensive programmes for the reconstruction of this type of housing. The practical value of this research is that the recommendations for the reconstruction and preservation of residential buildings from previous historical eras can be used in the reconstruction of existing residential buildings in the central historical cities of Ukraine, and considered in strategies for the reconstruction of residential buildings after the end of the Russian-Ukrainian war

Keywords: residential row housing; redevelopment; planning structure; development strategy

INTRODUCTION

Most of the historical buildings in Ukrainian cities are residential buildings of the 1860s-1910s (Onyshchuk, 2004). It is this period of industrial growth that is responsible for the dramatic changes that resulted in a significant change in the architectural environment of many historic cities in just half a century. The main element of urban complexes and

ensembles was the tenement house (the western version of the term is “chynszowy”, from the Polish “czynsz” – rent, lease).

An apartment building is a type of multi-apartment housing intended for rent, widespread in the development of cities in the second half of the 19th and early 20th centuries (Subin-Kozhevnikova, 2016). The foundation of the

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planning and spatial structure of an apartment building is a vertical multi-storey volume, which, having a specific spatial and functional autonomy, unites apartments in one staircase.

The processes of renovation of ordinary buildings and the massive spread of tenement houses were common to all European regions. Although the tenement house as an architectural type first appeared in Eastern Europe in the late 18th century, its heyday dates back to the second half of the 19th and early 20th centuries. Dense perimeter buildings consisting of tenement houses were established over large areas in such European metropolises as Warsaw, Vienna, and Berlin (Zakharov *et al.*, 2019).

Historic cities in Ukraine are characterised by high building density. However, as of 2023, such buildings do not correspond to the architectural and planning requirements for housing and require comprehensive reconstruction. According to the Law of Ukraine No. 525-V (2006), the reconstruction of a residential building is the reconstruction of a residential building to improve living conditions, operation, change the number of residential apartments, total and living space, etc. due to changes in geometric dimensions, functional purpose, replacement of individual structures, their elements, and key technical and economic indicators.

The issue of reconstruction of historic residential buildings is relevant enough that it has been raised by many scholars. O.P. Pekarchuk (2013) and I.H. Novosad (2015) analyse foreign experience in the reconstruction of typical residential buildings in European countries. Three main methods of housing reconstruction can be distinguished, namely: the addition of attic floors and the establishment of energy-saving facades; partial dismantling of an existing building and the completion of new volumes; demolition of an existing building and construction of a new one.

D.Ye. Prusov (2014), Iu.S. Sokolan & L.V. Kucherenko (2021) in their works propose the concept of reconstruction of urban residential buildings, which has an integrated approach to its planning based on scientific and technical justification of its implementation to preserve historical buildings and structures and protect the surrounding areas.

The problem of using historical buildings in the context of intensification of the urban environment in the period of increasing urbanisation is covered in the work of B.S. Cherkas *et al.* (2018). Due to the population growth in Ukrainian cities in the early 20th century, there was a need to provide housing for the general population. During this period, large multi-sectional residential buildings with architectural volumes and courtyard out-buildings developed deep into the plot. The second option is single-section single-family houses, which were intended for wealthy tenants. They can be called mansion-type apartment buildings, as each floor was a kind of mini-mansion with 10-12 rooms. The functional set of premises in such buildings is significantly expanded by

the front apartments and rooms for servants. Externally, such buildings often imitated the image of a mansion by using characteristic details such as lavishly decorated portals, porticos, colonnades, sculptural decor, and small front gardens.

However, nowadays tenement houses are used as apartment buildings with separate apartments and, accordingly, must comply with building provisions established at the legislative level. The purpose of the study was to identify the basic principles of residential development in historic cities of Ukraine, explore its features, analyse the structural schemes of such buildings and, based on this analysis, develop recommendations for the reconstruction of residential buildings of different historical eras. This purpose can be achieved by performing the following tasks outlined in the research: to analyse the features of historic residential buildings, to explore foreign examples of reconstruction of historically established housing stock, to characterise the current technical condition of historic buildings and to identify the main types of reconstruction of this type of building.

MATERIALS AND METHODS

General scientific and special methods of scientific research have been chosen for the research, and a research methodology has been developed, which is necessary for the implementation of the tasks set in the research of historical residential buildings and the definition of the basic principles of reconstruction of this type of object.

The primary objective in the research of residential buildings of previous historical eras was to examine State construction norms of Ukraine 360-92** "Urban planning. Planning and construction of urban and rural settlements" (1992), State construction norms of Ukraine V.3.2-2-2009 "Reconstruction, repair, restoration of construction objects. Residential buildings. Reconstruction and overhaul" (2010), scientific literature and determining the level of research on this subject. For this purpose, such general scientific research methods as comparison, analysis and synthesis were used.

Using the sampling method, a list of cities was developed, the central part of which was developed by historic residential buildings. After selecting the objects of research, the state of preservation and the nature of using these objects were analysed, and the architectural characteristics of the palaces were determined. The following methods were used during the desk research: analytical, systematisation, generalisation and comparison.

Using special research methods, namely: methods of visual inspection and system analysis, methods of graphic comparison, and architectural-compositional and architectural-planning analysis, the basic principles of reconstruction of residential buildings from previous eras and styles are proposed. For example, the method of visual inspection was used to determine the state of preservation and explore the architectural features of buildings. This method allows mapping losses on the facades of historic



residential buildings, identifying problems of use, and subsequently developing proposals for the restoration of facades and reconstruction of buildings in general. After compiling a list of cities based on a comprehensive analysis and graphical comparison, the architect's creative method was explored.

The research of historic residential buildings was conducted according to two criteria – architectural and planning and constructive analysis. For the former, a comprehensive methodology for analysing the architectural and planning elements of apartments was used, and for the latter, a methodology for analysing the structural scheme of buildings and their volumetric and spatial features was used.

RESULTS AND DISCUSSION

Most of the ordinary street buildings in the major historical cities of Ukraine (Kyiv, Lviv, Ternopil, Ivano-Frankivsk,

Vinnitsia, etc.) are formed by residential buildings of the historicist or secession period (Fig. 1). The buildings that were constructed in the central part of historic cities during the Austrian Empire in the late 19th and early 20th centuries designed the background urban development. They established street ensembles, were located close to the red lines, and in rare cases, there could be curtain walls with landscaping in front of the house. Depending on the width of the parcel, the facade composition was developed by 3, 5, 7, or 9 window axes. In narrow parcels, the entrance gates were placed in the side parts, and if the width was sufficient, they were placed in the centre. It resulted in a building layout that had a configuration with a right or left gate or established a closed courtyard (Demkiv & Pohranychna, 2022). Floor plans and apartment plans can be seen on the inventory plans of residential buildings, which, in addition, demonstrated the structural diagrams of foundations, load-bearing walls, partitions, etc.



Figure 1. View of a street with ordinary residential buildings in Lviv

Source: Mapio.net. Lviv (n.d.)

Such rooms as lavatories were not designed in each apartment but were shared by the residents of the building and placed in the courtyards, later in offices on floors with access from the galleries, which oriented the position of the staircases with exit platforms to the gallery.

After the Second World War, there was modernisation, division of large apartments, and later privatisation of residential apartments (Subin-Kozhevnikova, 2016). The apartments were redesigned many times in an attempt to improve living conditions, and bathrooms were installed instead of kitchen sinks. Accordingly, the bathroom was located next to the kitchen, sometimes without a brick partition separating the two rooms. This type of bathroom and kitchen layout is not acceptable today and requires a comprehensive reconstruction. When reconstructing individual apartments, if structural and engineering systems allow it, it is permissible to increase the area of apartments by combining several apartments, redeveloping existing apartments, etc. When reconstructing a building, it is generally permitted to install additional staircases, lifts, extensions

and additions to the premises, etc. However, to perform all these works, it is necessary to conduct a visual inspection of the building and the adjacent territory, analyse the existing planning structure, collect analogues of residential building reconstruction, perform a pre-design analysis of the building, analyse the structural scheme of the building, its technical condition and possible reconstruction options, conduct stages of sketching, where the main concepts for reconstruction are developed, their presentation and approval, develop a reconstruction project, including interiors (drawing furniture on the house plans).

The main types of reconstruction: without changing the physical size of the house (reconstruction is performed by redeveloping the premises, arranging a residential attic within the attic, redeveloping the basement, etc.); reconstruction with an extension (Fig. 2); reconstruction with a superstructure (Fig. 3); combined (with an extension and a superstructure) (Fig. 4). Any type of reconstruction is necessarily accompanied by requirements and provisions for the performance of the relevant works (Table 1).





Figure 2. Reconstruction with an extension

Source: A. Griffiths (2014), M. Slatalla (2016), A. Waligore (2018)



Figure 3. Reconstruction with a superstructure

Source: Stuttgart daily photo (2010), A. Griffiths (2015)



Figure 4. Reconstruction of a residential building with an extension and a superstructure

Source: Ch. Hosea (2013)

**Table 1.** Requirements for the construction of extensions and additions to historic residential buildings in Ukraine

| Requirements for adding floors to an existing historic residential building | Requirements for additions to the established facade of historic residential buildings |
|--|---|
| 1. The superstructure should be performed if the existing street panorama allows it, to ensure that the building does not discord with the existing historical environment. | 1. The planting should be performed in a suitable location (preferably the courtyard of a residential building). |
| 2. The construction should be performed within the existing width of the external dimensions of the existing building. | 2. The existing original members of the facade must be retained in the attached part of the building. |
| 3. The vertical and horizontal divisions of the existing building should be preserved in the newly designed part. | 3. In the second half of the year, the position for the largest volume of membership and the actual decision of the central crop will be used. |
| 4. In the most frequent years, try to maintain the rhythm of the facade's decorative finishes (pilasters, columns, rallies, etc.). | 4. For a harmonious and architectural solution, the extension should be designed using the existing building's existing details. |
| 5. Composite window axes should be placed above the existing ones in the lower part. | 5. The annual passages should be provided for at the same level as in the previous section. |
| 6. The window fenestration is to be designed in a fashionable manner, using the authentic window divisions, the original stylistic design and building materials of the historic part. | 6. Window and door framing is recommended to be designed using the previous solution in the older version. |
| 7. The porch cornice of the historic part of the residential building should be preserved for easy access to the overall view of the spire, and the superstructure should be extended higher with a slight deviation from the overall plane of the facade. | 7. The porch cornice in the attached part should be extended at the level of the historic building, and its overall characteristics should be repeated within the existing one. |
| 8. It is allowed using the fronts, sunroofs and small windows to complete the position of the acquired volume. | 8. During the professional arrangement of the extension, gables, skylights and skylights are used to stylistically combine the two parts of the object. |
| 9. The gift should be designed in such a way that it captures the configuration of the plan and the strategy of the actual decision. | 9. The added part should be designed in such a way that it does not exceed the volume of the original part. |
| 10. The rooms are recommended to be designed as a small architectural detail, thus, they are the logical conclusion of the building. | 10. The rooms are designed to be similar to the existing ones so that the extension looks like a logical completion of the existing building. |

Source: State construction norms of Ukraine V.3.2-2-2009 (2010)

To determine the type of reconstruction, it is necessary to conduct an architectural and engineering survey of the object. A detailed inspection of a residential building usually begins with an external inspection of all external, facade walls, followed by an inspection of the interior. During the inspection, photographs of the building's facades are taken with the date of the photo. In addition to the main photographs, the expert may take large-scale photographs of individual fragments and details of the facades.

Photography allows obtaining a documentary image within the shortest possible time and with great accuracy and frequently with sufficient completeness. Therewith, it is unacceptable to photograph buildings from a strong angle, which establishes a false impression of the proportions of buildings. Sharp contrasts between light and shadow should be avoided, as details are captured much better in diffused light. It is advisable to capture details and fragments, and if possible, entire facades, in close to orthogonal images. In addition, it is advisable to place a person next to the object being photographed to determine the proportions of the building or its size.

While photographing a building, it is not necessary to limit oneself to the exterior and interior views of the building and its details. Everything that indicates the condition of the building and the situation in it should be photographed. Older parts of the building and remnants of its decorative finishes that have been preserved in attics,

inside later additions, etc., and places where alterations and distortions are visible, or building materials, or deformations and destruction of individual elements.

A detailed examination of cracks and other damage to the masonry of the facade walls is conducted at the next stage of the building inspection, when determining the technical condition of its supporting structures. During the inspection of the building, the surviving technical documentation is checked against the actual site, and, if necessary, corrections are made to it, and the places of damage to individual structures and parts of the building are recorded. In addition, the presence of water supply, sewerage, gas supply, heating, ventilation, heating and ventilation networks, telephony networks, boiler rooms, etc. in the building is established.

The time of construction is determined. The facades of many buildings have inscriptions on the date of construction. Sometimes these inscriptions are made on floors and balcony railings. A critical approach should be taken to assessing the appearance of a building. Many old buildings have been built on, rebuilt, sometimes repeatedly. It is not always the case that sufficient care was taken to ensure the composition of the facades and their stylistic unity. Identifying the need to change the architecture of facades is a task of the survey. It is very important to establish whether any reconstruction work has been performed in the building before: the addition of floors, extensions, deepening of



basements, whether the purpose of the building, the roof, the design of its facades and other works that caused the punching or sealing of window and door openings in the main walls, and other alterations to the supporting structures.

The next step is to analyse the existing planning structure and identify existing problems. When examining the internal layout of buildings, it is necessary to examine the layout of apartments, the location of load-bearing walls, columns, and pillars on all floors. In the course of this survey, the existing floor plans and sections of the building should be compared with the actual building. If necessary, the drawings are adjusted. Only after a detailed examination of the technical condition and the existing architectural and planning solution of the apartments can the design of the redevelopment of the apartments and the design of the courtyard reconstruction be started (Fig. 5).

The drawing of the adjacent territory improvement should be combined with an open plan of the first entrance in M 1:100. Such a drawing is made with an indication of the object's reference to the reference points on the territory, detailed planning of pedestrian and transport links, main entrances, fire passages and exits, orientation of the design site by the cardinal points, with conventional designations of coating and decoration materials (lawns, flower beds, bushes, trees; different types of pavement (concrete elements, asphalt, natural stone, paving, pebbles, pitch, poke, etc.)), highlighting the functional zoning of the territory (representative, recreation, sports area, maintenance area, etc.). In addition, the plan for the improvement of the adjacent territory should indicate the existing and projected elevations, with the beginning and end of the staircases, pans, terraces, platforms, etc.



Figure 5. Improvement of the courtyard of a historic residential building

Source: L. Lloyd & S. Allen (2022)

In addition, an important element of the reconstruction of a residential building is the drawing of the existing state of the facade with a mapping of losses and, accordingly, the development of a passport for the facade finishing after reconstruction.

DISCUSSION

The research of Yu.I. Zakharov *et al.* (2019), which identifies the features and characteristics of historical residential buildings, and analyses the foreign experience of reconstruction and the principle of subsidisation in housing reconstruction, is supplemented in the present research. The author agrees with the opinion that this approach is relevant and will be widely used in Ukraine.

In addition, the research clarifies the current state of preservation and use of historic residential buildings in Ukraine. The compositional, planning, and structural schemes of the objects presented in the research by

M.V. Demkiv & I.I. Pohranychna (2022) have been supplemented. It has been determined that the most common structural scheme of buildings was a scheme with longitudinal load-bearing walls, sometimes with transverse or mixed walls. Additionally, the structure of the house was developed by the design of the staircase and transverse diaphragms. The load-bearing and outer enclosing walls were brick, which decreased in width along the height of the building. Smoke and ventilation ducts were located in the middle load-bearing wall and the walls of the stairwell load-bearing structure. The boundary walls between the buildings are mostly self-contained, ending at the roof level with a firewall. The floors in historic residential buildings were made of wooden beams with a spacing of 800-1300 cm. The ceilings between the basement and the first floor were vaulted, and made of brick or metal beams (klein). At the end of the 19th and early 20th centuries, the ceilings in kitchen and bathroom areas were



already made of reinforced concrete, as were the stairwell platforms in Secessionist buildings. The roofs were single or double-pitched, with roofs with slopes in case of large widths. The roofs were ventilated by dormer windows or vents. Structural elements were made of wood. The rafters are supported by maurlats, supported by chairs with braces. The roof design for each house depended on its configuration and possible water runoff. The roofs were covered with wooden battens. The roofing material used was tiles or metal sheeting.

However, it is not uncommon to notice the deterioration or destruction of structural elements in historic buildings. Therefore, this research confirms the assumptions of scientists I.H. Novosad (2015), O.S. Bezlyubchenko & T.M. Apatenko (2019), V.V. Kovalov *et al.* (2019) about the necessity of an integrated approach to the reconstruction of historic residential buildings and the renovation of the adjacent territory. Based on a comparative analysis of the historical and actual state of apartment buildings, the research confirms the opinion of T.A. Tsimbalova (2015) about the inconsistency of outdated classification characteristics with modern building requirements for the living environment.

Considering the above, to select the most optimal option for the reconstruction of a residential building, it is necessary to develop a comprehensive method of qualitative assessment in terms of technical, architectural, planning and economic indicators (factors).

CONCLUSIONS

Having analysed the features of historical residential buildings and studied foreign examples of reconstruction of the historically developed housing stock, it is determined that the reconstruction of residential buildings requires a comprehensive approach.

Before developing a comprehensive project for the reconstruction of a historic residential building, a technical inspection of the building is conducted. During the inspection of the object, the following should be established: geometric parameters of the building, type of building structures, type of building materials, condition of building elements as of the date of the inspection, and previous

repair work. The inspection begins with the examination of the existing technical documentation, inventory materials, building passport, and technical expertise materials, and is conducted by individual component elements, including underground structures foundations, basement walls exterior and interior walls, floors, stairs, elevators, extractors, roof, windows and doors, floors, facades and their finishes, interior decoration, internal engineering equipment and networks (water, electricity, sewerage, ventilation, heating, etc.), the presence of stoves and fireplaces in the premises. In addition, it is necessary to examine the internal layout of the house, landscaping, etc.

The current technical condition, architectural and planning design, condition of the facades and decorative elements of the historic buildings is unsatisfactory and requires professional restoration of the facades (with the development of a facade decoration passport), changes (redevelopment) of the architectural and planning scheme of existing apartments, and adaptation of existing historic buildings for convenient use by less mobile groups of the population.

The scientific originality of the obtained results lies in the systematisation and supplementation of the general picture of the technical condition of historical residential buildings, clarification of the current state of preservation of historical buildings, and the basic architectural, planning and functional principles of reconstruction of residential buildings of different historical eras.

Prospects for further research include conducting detailed surveys of historic residential buildings (probing walls, ceilings and other structural elements to identify decorative paintings, etc.; performing 3D scanning of such objects and establishing an electronic fund with detailed drawings of facades and decorative elements of historic residential buildings). The following scientific developments will be devoted to the solution of this problem.

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CONFLICT OF INTEREST

None.

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<https://orcid.org/0000-0002-4164-6110>**Реконструкція житлових будинків
з попередніх історичних епох і стилів**

Анотація. Центральну частину історичних міст формує рядова житлова забудова, яка не відповідає теперішнім архітектурно-функціональним вимогам та будівельним нормам, а тому вимагає комплексної реконструкції. Через це актуальним є питання дослідження типів житлової забудови історичних міст та сучасного стану планувальної структури історичних квартир, що в подальшому дозволить провести фахову реставрацію. Метою даного дослідження було визначити сучасний стан історичної забудови, її архітектурні особливості та запропонувати основні принципи реконструкції житлових будинків різних історичних епох. Під час дослідження було використано загальнонаукові методи дослідження (метод порівняння, метод аналізу) і спеціальні методи: типологічної класифікації, архітектурно-планувального, об'ємно-просторового, стилістичного і ретроспективного аналізу та графічного зіставлення. Встановлено, що в сучасній міській забудові сьогодні існує значна частка житлових будинків з попередніх історичних епох і стилів, які складаються з: окремо розташованих міських садиб з власним подвір'ям, будинків рядової вуличної забудови в 2-4 поверхи з внутрішніми дворами, офіцинами і в'їзними брамами, багатоповерхових будинків тощо. Окремо розташовані міські садиби зараз втратили свою первісну функцію житла і переважно використовуються як громадські об'єкти. Житлові будинки вуличної рядової забудови мають ряд недоліків, від хаотичного перепланування квартир з входом до санвузлів через кухні чи формування темних кімнат, до втрати конструктивної стійкості об'єктів. Саме тому для підвищення рівня комфорту існуючих квартир в житлових будинках з попередніх історичних епох доцільно розробляти комплексні програми з реконструкції такого типу житла. Практична цінність даного дослідження полягає в тому, що рекомендації щодо реконструкції та збереження житлових будинків з попередніх історичних епох можуть бути використані під час реконструкції існуючих житлових будинків в центральних історичних містах України, а також враховані в стратегіях відбудови житлової забудови після завершення російсько-української війни

Ключові слова: житлова рядова забудова; перепланування; планувальна структура; стратегія розвитку



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