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ISSN 2729-7640

ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0006

Editorial 2/2023

Eglė Navickienė

Building bridges between past and future is the common thread that connects the articles in the present issue of Architecture Papers of the Faculty of Architecture and Design STU (ALFA). The research approaches span from retrospective to future-oriented ones, as they cover the respect for inherited artefacts, identification of their significance and values, and repositioning them into contemporary life; re-questioning of the modern patterns and tackling their negative outcomes by inventive ways.

The wide range of topics analyzed in this issue reflects the environmental concerns that the 21st century people face because of the turmoil brought by modern progress and the break from traditional and sustainable lifestyles. In the 20th century, the values and aspirations of modern societies were changing at an extreme rate. The balanced inherent evolution following the traditional patterns was transformed by the trust for applied science and technology as an engine for development. The built environment was experiencing the growth of a gap between living tradition and progressive modernity that dismissed the self-regulating and self-reproducing systems of traditional cultures and settled modern town-planning principles. As Stefano Bianca states in his paper *Historic cities in the 21st century: core values for a globalizing world* (2010): "In a way, the organic integrity of living cultural traditions was disrupted and its demise gave rise to two equally unviable spectres: that of a fossilized heritage, and that of a utopian brave new world. As a result, the divide between nostalgic 'conservation' and futuristic 'development' concepts emerged, singling them out as two diametrically opposed approaches". At the extreme point of drawing apart of two approaches, the narrow-minded protection of the material heritage of built environment significant for its historic and aesthetic values ('old' and 'beautiful') was implemented by freezing its fabric; the large-scale development in towns and cities threatened historic legacy by destruction, deterioration, and neglect on urban planning level; on architectural level, the modernist attitudes manifested as the preference for contemporary design and new materiality instead of adaptability of the existing building stock.

During the last decades, contemporary societies have made many efforts to stabilize the side effects of progress and unprecedented changes that go far beyond humankind's activities. The main direction is expressed by sustainability principles and sustainable development goals. Recent initiatives like Baukultur (2018), and New European Bauhaus (2020) call to revise and update the ways of creating a high-quality built environment; they hint to be aware of the past while searching for solutions to the unknown Anthropocene future. Among major goals, these ideological movements aim to balance the abovementioned extremes between progressive modernity and traditional patterns.

How to preserve historical buildings that feature cultural significance and adapt them to the needs of contemporary society, is the conceptual question examined by Kamila Gołąbek, Marek Gosztyła, and Agata Mikrut-Kusy in the article *Rzeszow Castle: History and Contemporaneity - proposal for a new interior adaptation*. It focuses on the strategy that brings the disciplines of architecture and conservation together—adaptive reuse, as a way to introduce new functions driven by the respect for cultural significance of an architectural object. The authors deepen into the history, architectural value, and the current state of Rzeszow Castle, analyzing the latest trends in conservation and reuse concepts. Theoretic considerations rely on the research-based new functional program and modern interior design solutions.

The article *Transdisciplinary collaboration in architecture: Integrating microalgae biotechnologies for human and beyond-human perspectives* by Veronika Mišković and Jiří Masojídek is a piece of ground-breaking research that brings creative disciplines, microbiology, and technologies together. The authors investigate the potential application of microalgae biotechnologies in architecture and design, like small-scale objects, living systems on building exteriors, and urban and rural scenarios. The article overviews interdisciplinary projects and research that involve microbiology, architecture, and design, and hypothesizes various experimental scenarios.

The inconsistent urban development of towns, widespread in former socialist countries, that results in underutilized abandoned urban areas, concurrently featuring significant potential for urban renewal, is the research subject in the article *The typology of terrain vague and emergence mechanisms in post-communist, post-industrial small and medium-sized towns in Slovakia: Case study of Humenné, Strážske and Vranov and Topľou* by Romana Hajduková and Alžbeta Sopirová. The authors analyze terrain vague, as they call such territories, in three small and medium-sized towns in Slovakia: Humenné, Strážske, and Vranov and Topľou. The typology of the causes that led to the emergence of terrain vague and distinctive patterns identified would serve as a basis for future revitalization strategies.

Marek Lüley goes deeper into the topic of the changeability of architecture in a conceptual way, seeing the continuance of usage and maintenance of an architectural object as a non-linear process. In his captivating article *Ephemeral occupancies: Non-linear approach to adaptable architecture* he claims that adaptability as a strategy to prolong convenient responsive usage of architecture, is one of the answers to sustainability. The author discusses adaptability in diverse ways, from the basic understanding of flexibility to comprehended polyvalence, and its application—as non-linear strategies such as narrative, feed-back, and interpretation, with a deeper focus on one of the proposed strategies called ephemeral occupancies.

Lívia Búliková in her article *Innovations in sacral architecture: The resettlement churches of Emil Belluš* searches for the key approach to understanding the background and design of sacred buildings and acknowledging its impact on future. She chooses to deepen into sacral architectural objects as the outcomes of specific historical, political situations, and social policy, and as the innovative achievements in spatial concepts, morphology, and the use of new constructions, materials, and building technologies. Her approach is revealed in the case studies of two evangelical churches in Nesvady and Senec, designed by outstanding Slovak architect Emil Belluš and built in the 1950s.

The potential of personal influence on the development of a city is disclosed by an example of impactful activities by construction entrepreneur Rudolf Frič in the article *Contribution of Rudolf Frič to the social architecture of interwar Czechoslovakia* by Matúš Kiaček. Frič's contribution to urban development and social welfare of interwar Bratislava is evident in the expansion of social housing that stabilized urban structure and urbanized the outer city, and the improvement of housing conditions for citizens. The study focuses on works designed or constructed by Frič that accelerated modernization of Bratislava metropolis: projects of housing cooperatives, private rental blocks, and examples of city social housing.

Thought-provoking articles contribute to recurring topics of adaptability and responsible use of urban, architectural, and interior spaces, in tracing past innovations, and searching for progressive approaches that contribute to strategies toward a sustainable and balanced future. Enjoy your reading!

ISSN 2729-7640

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2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0007

Rzeszow Castle: History and Contemporaneity - proposal for a new interior adaptation

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Article information
Sent: Jan 23, 2023
Accepted: Jun 2, 2023

Abstract: This paper discusses the adaptation of Rzeszow Castle in Rzeszow, Poland (also called the Castle of the House of Lubomirski in Rzeszow), which is a key building on the Subcarpathia's map of monuments. The objective of the project was to identify the latest trends in conservation art, and, subsequently, to create a proposal for a contemporary interior arrangement for the castle and its site development. The aforementioned design work focused on creating new, innovative concepts for the revalorization of historical buildings, oriented towards development and modernity. The work presents bold, novel – and most importantly – workable solutions for a new functional programme for Rzeszow Castle. The main premise of the future modification of the monument was a complete change of use of the building: from administrative and office space (the current court) to a cultural facility with complementary functions. The proposals presented in the paper are aligned with new principles of cultural environment preservation, and primarily emphasize ideas that facilitate the development of culture and art, social engagement, and support new initiatives. The aforementioned new functional programme complements cultural facilities and events offered by the city of Rzeszow - the capital of the Subcarpathia Voivodeship (one of Poland's sixteen provinces). The article is based on thorough scientific and historical research. The characteristics of the building are presented, with focus on its architectural value, and the current state of preservation of the monument is described. The analysis of the functional-utility program became the basis for creating a contemporary and modern interior design. The final version of the interior plan was developed based on field studies and source research.

Keywords: castle, architecture, heritage conservation, revalorization, culture

INTRODUCTION

There can be no doubt that Rzeszow Castle in Poland is one of the most significant monuments in the city. The building stands out because of much more than just its colourful history – its current form is especially telling, as it is an uncommon testament to the nineteenth- and twentieth-century conservation trends. The building is also a key monument of defensive architecture and an architectural landmark of Rzeszow's historical district, as mentioned by Joanna Malczewska (Malczewska, 2015). Due to the importance and societal value of the building, which was extensively analysed by Jolanta Sroczyńska based on selected documents (Sroczyńska, 2021), this paper presents an attempt to prepare a proposal of contemporary interior arrangement aimed at establishing an innovative centre of culture and art in Rzeszow in combination with plans to transfer the castle under the administration of the City Hall and make its space available mainly for cultural purposes, as currently the castle is the seat of the District Court, and access to the interior of the institution is restricted. In order to create a new concept for the adaptation, a building survey and field research were conducted, along with a review of the available sources and publications, and an analysis of register files and survey documentation, archival queries and an iconographic analysis with a historical outline and a photographic survey (Fig. 1). The survey was summarized with conclusions concerning the building's existing state.

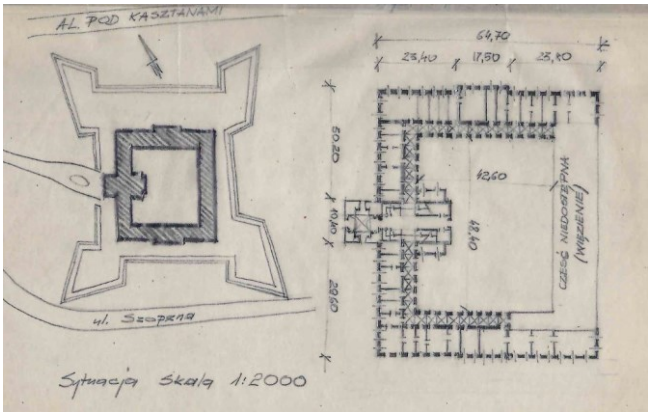

Fig. 1. Rzeszow Castle in Rzeszow, Poland: Site plan and floor plan; register file card from 1950. (Source: Office of the Municipal Conservator of Monuments in Rzeszow, Poland)

OUTLINE OF THE CASTLE'S HISTORY

The history of Rzeszow Castle dates back to the turn of the seventeenth century, when Rzeszow was under the rule of Mikołaj Spytko Ligęza, who commissioned the construction of a castle and its fortifications (Pęckowski, 1913). The structure was given a form perceived as modern at the time – a *palazzo in fortezza*. In 1638, after the end of the rule of the House of Ligęza, Rzeszow became the property of the House of Lubomirski. Towards the end of the seventeenth century, after the rebellion of Jerzy Sebastian Lubomirski, the castle was modernized by Hieronim August Lubomirski (Janczykowski, 2015). He commissioned Tylman of Gameren (also called Tielman van Gameren) to remodel the castle. The implementation of van Gameren's design, and thus supervision of the construction, was first assigned to architect Pietro Martire Belotti, and later to his son – Giovanni Battista Belotti (Gosztyła, Mikrut, 2017). The castle was extended into a quadrangle and a second floor was added, while the fortifications consisted of four pentagonal bastions and a gate protected by a ravelin (Żurawska, 1959). Afterwards, in 1733, Prince Jerzy Ignacy Lubomirski ordered his court architect, Karol Henryk Wiedemann, to reinforce the castle's fortifications and to remodel the castle itself (Nabywaniec, Zych, 2002, 2003). Due to a fire in 1735, the castle had to be remodelled (Gosztyła, Mikrut, 2017). Initially, the castle was mostly used for residential and defensive purposes, but in the early nineteenth century it was taken over by the Austrian government and converted into a prison and courthouse. The castle did not suffer major damage during the Second World War (Żurawska, 1959).

SITE OVERVIEW AND STATE OF PRESERVATION

The current form of the castle is from 1906 (Fig. 2). The structure consists of the castle massing and Dutch-school bastion fortifications with a dry moat and four corner bastions with irregular faces, extended from the west and east. The lower parts of the bastions are lined with stone. The corners of their faces feature four guard towers with cartouches (Kuś, 2021). The state of the bastions has been determined to be good. At present, one of the bastions serves as a car park; another has been redeveloped, while two remain undeveloped. The castle massing has a rectangular floor plan with four wings and a quadrangular courtyard (Fig. 3). A six-storey, square-based tower topped with a dome and spire abuts the west wing. Cornices divide the tower's facades into three parts gradually narrowing towards the top. Above the cornices, there are narrow galleries with balustrades and at their level there are wide and glazed arched doors. The tower's corners are accentuated with pilasters. The uppermost storey is topped with triangular gables with clock faces. The tower's windows are square-shaped.

Fig. 2. Rzeszow Castle: Aerial photo. (Photo: Marcin Ziobro, 2021; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

Fig. 3. Rzeszow Castle: Photo of the courtyard. (Photo: Wojciech Woś, 2021; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

The castle's wings have two storeys each, and feature basements and attics with potential for adaptive reuse as modern exhibition spaces (due to the lack of partitioning into smaller rooms). The west wing has a doubled, pronounced avant-corps which houses the main stairwell. The central parts of the north, east and south wings have slightly extended avant-corps from the internal side. The wings are covered with gable roofs covered with ceramic tiles. The building was built with a masonry structural system made of brick. The rooms in the tower on the first floor, the hallways of the ground floor and the first floor feature groin vaults and Klein's ceilings, while above the basements there are segmental ceilings. The castle's facades feature rustication on the ground floor, and are horizontally divided by cornices with simple profiles. They also end with a pronounced cornice in the form of an entablature. The inter-window strips feature pilasters. On the side facing the courtyard, at the ground floor level, there is a rusticated arcade decoration. The windows in the wing facades are wooden, double casement windows with rectangular outlines, transom cornices and sills. In the centre of the layout there is a courtyard with low greenery: grass and flowerbeds. A square-shaped courtyard with rounded corners is situated in the centre. It is paved with paving stone in two colours. At present, most of the castle's interiors serve as a courthouse. On the second floor of the north and south wings there is a formal meeting hall and a chapel that serves as a courtroom (Fig. 4).

Fig. 4. Rzeszow Castle: Photo of the formal meeting hall. (Photo: Wojciech Woś, 2021; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

Some of the rooms are unused. In the centre of the west wing there is the main, formal stairwell with a stone balustrade. The doors inside are wooden, the walls are plastered and painted, while sanitary spaces feature tiles up to the height of around 200 cm, above which the walls are painted as well. The flooring in most rooms is made of parquet, which requires repair in many places. The hall and stairwells feature terrazzo or ceramic tile flooring (Fig. 5). The state of the castle can be described as good. The facades were covered with smooth plaster and painted using bright, cream-coloured paint. In some places there are patches of dirt of varying size, as well as signs of slight damp, yet they are not significant and have no impact on the castle's positive visual perception. The interiors require more extensive work, as many were unused and suffered damage (delaminated plaster, discoloration, weathered paint, damp, dirt, damaged flooring), and should undergo general renovation.

Fig. 5. Rzeszow Castle: Photos of the formal stairwell, 2021. (Photos: Agata Mikrut-Kusy; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

PROPOSALS FOR ADAPTATION AND MODERNIZATION OF THE CASTLE

Placing a courthouse in the castle resulted in the building becoming inaccessible to the public, as, despite its undeniable value both in terms of architecture and culture, it is neither an often-visited place, nor is it open to tourists. Due to the site's significant value, no effort should be spared to restore the castle to a state of greatness and increase its popularity both locally and nationally. A new, innovative proposal for the site's revalorization should be designed, one that would reflect current global trends in contemporary conservation thought. Based on extensive analyses, a contemporary vision of a use plan for the castle has been created, one that casts a new light on the opportunities that the Rzeszow palace complex can offer. This idea presupposes a complete relocation of the District Court to a new building, followed by the adaptive reuse of the castle to feature contemporary functions, specifically those associated with culture, art and the promotion of local heritage. In the administrative parts of the court, there will be places with cultural heritage expositions. The value of the castle's historic interiors will be restored.

Starting from the castle's main entrance: the formal hall is supposed to invite people to enter the interiors of the residential complex, guide visitors, and concisely present the content of all museum exhibitions and their layout. The proposal suggests equipping it with multimedia screens that would present each storey. Box offices should be located nearby, as they could also serve as information desks, as well as cloakrooms for visitors. On the ground floor, as it is the part of the castle that is most accessible to visitors, the proposal presupposes a restaurant and a coffee shop, which could act as gastronomic establishments for the entire castle complex and for visitors. Such a place could attract the interest of a wide range of customers attracted by its services, who, by increasing traffic at the castle, would further enhance its attractiveness and popularity. Furthermore, a museum, which would be the main function of the space based on the newly designed arrangement of the entire castle, could be situated at this level. Thus, the ground floor's spaces could be used by beginning artists, e.g. from the visual arts high school in Rzeszow, as well as by individual artists. The proposed exhibitions should be temporary and follow a 'talent show' model, giving beginning artists an opportunity to present their work and for talented individuals to gain recognition. As one of the castle's main uses would be a museum, the ground floor should feature a space for a store that would offer original, handcrafted souvenirs associated with the themes of presented exhibitions. It would also be a way for promoting local artisans who produce various handmade products. Besides the aforementioned ideas, level 0 would also feature a space for seminars and conferences (with infrastructure that enables projecting presentations), a part of which could serve as lecture halls for universities of the third age.

In addition, the proposal presupposes that the building will be adapted in line with current modern utility standards and international conservation principles, with specific needs in terms of physical, cognitive, and social accessibility taken into consideration (Walter, 2022; Pietroni, Pagano, Biocca, Frassineti, 2021). This includes adapting the building to meet the needs of the disabled by: adding an elevator (situated to the right of the main entrance) and redesigning hygiene and sanitary facilities - toilets for the disabled on each floor. In accordance with the idea of universal design (Filová, Rollová, Čerešňová, 2022) the building will be made accessible to a wide public of different ages and with different types of physical or disability-related limitations, and utilize contemporary design and technological solutions, including interactive solutions. Ideas discussed in international publications, such as the adaptation of the interiors of historic buildings that allow for showcasing cultural heritage and modern functional programs (Gaczoł, 2015; Janowski Z., Janowski M., 2009) need to be taken into account. The priority is to propose such a new functional program that, first of all, would give both residents and tourists the opportunity to use the historical building, while respecting its cultural and historical value.

It should be noted that the problem of adapting historical buildings to new functions (Szmygin, 2009) may involve a varying degree of interference in the historic structure. In addition to new interior divisions or rearrangements of existing functional-utilitarian plans, interference also involves the replacement of damaged building elements, or even entire structural systems, as well as technical equipment of the object (Szmygin, 2009). In accordance with international trends, each action should be based on knowledge of the monument, assessment of its historical value, conservation value, and ultimately only necessary interventions in the historic structure of the object should be conducted (Janowski Z., Janowski M., 2009). The former function of the court caused changes in the original layout of the castle's rooms. Majority of the halls have been divided into much smaller office spaces. The proposal to adapt the castle's space mainly for museum purposes involves opening up the space and restoring the former structure. With regard to the aforesaid, the plan includes, among other things, the demolition of secondary division walls (Fig. 6). The new functional program has been proposed in such a way as to interfere with the original historic substance as little as possible, and rather to restore its former cultural and historical values.

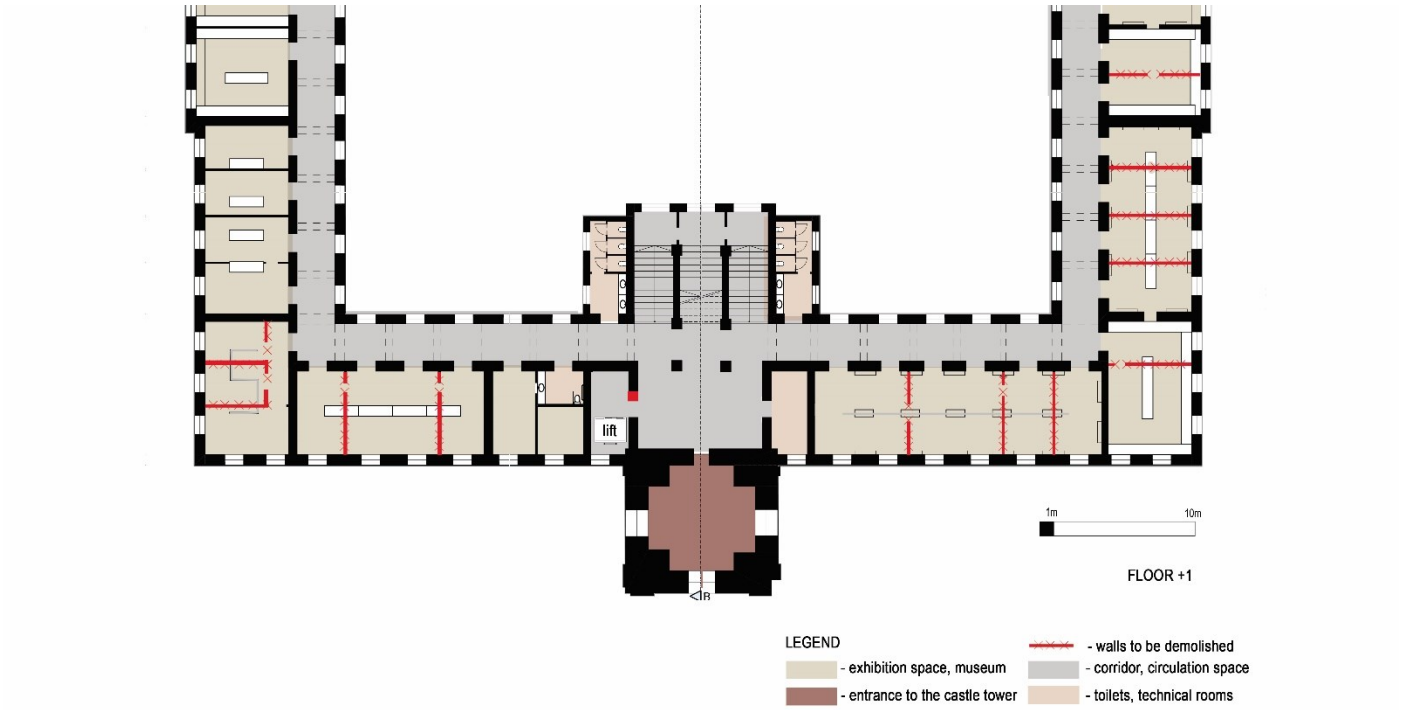

Fig. 6. Fragment (west) of the floor plan of level 1+ with marked intervention in the historic substance, i.e. walls to be demolished. (Prepared by: Kamila Gołąbek, Karolina Kowal, Aleksandra Kośla, supervised by Agata Mikrut-Kusy; Source: Gołąbek, Gosztyła, Mikrut-Kusy - authors)

Rzeszow Castle's formal courtyard is its undoubted asset which, despite its potential, is not used for public or commercial purposes. Therefore, the creation of a small, seasonal amphitheatre there, which could host spectacles or concerts, can be proposed. Such an arrangement would also allow for the use of the space and walls of the courtyard as a background for light shows (Fig. 7). People attending a light show could experience unique visual sensations that could transport them into an unconventional world of light effects that appear to be three-dimensional. This idea could attract a new group of visitors, not only from Rzeszow itself, but from all over Poland. It is a solution that is widely used in large metropolises – European cities – yet it is still not very popular in Poland, especially in relation to using spaces of historical structures, which is why, due to its uniqueness, such an attraction could become a major symbol of the city. A scheme showing a plan of level 0 along with arrangement proposals is presented in Fig. 8.

Fig. 7. Proposed arrangement for light shows in the castle courtyard. (Drawing: Kamila Gołąbek; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

As to the main massing of the castle, a continuation of the first-floor level for museum use can be proposed, with a uniform theme of artistic exhibitions, including works associated with the Rzeszow region. The museum could also exhibit, among others, artistic photos by the Janusz family – Leopoldyna Januszowa and Edward Janusz, who left a sizeable photographic legacy – around 30 thousand artefacts (including glass plates and photo copies). This collection is one of the largest and best preserved photo collections in Poland (Rzeszow Foundation, no date). A selection of the photos depicting the development of the city of Rzeszow could be exhibited alongside contemporary frames, thus showing the clash between the past and the present, illustrating the striking contrast of the changes that have taken place in the region around Rzeszow.

Temporary screenings of the film *Rzeszowskie Janusze. Rodzina* could also be included, as the film, to quote the authors, 'is a documentary about First-World-War Rzeszow and about regaining independence described using old photographs based on the history of the Janusz family' (Rzeszow Foundation, 2018). Such screenings could complement the photos on display. Furthermore, the proposal includes exhibitions organized in cooperation with Rzeszow's New Town Synagogue, which houses the Offices of Artistic Exhibitions and the creative house of the Association of Polish Visual Artists and the Association of Polish Artists, Painters and Graphical Artists. The collections shared by the courtesy of the Associations could be arranged into interesting and unconventional exhibitions of the works of local artists, thus promoting their work. There should be a continuation of use of other spaces of the first floor for conference and educational purposes, where seminars for the university of the third age could be held; they should be adaptable to alternatively serve as rentable conference spaces.

Moving on to the second floor, due to the assumption that the new use programme would focus especially on museum use, a new, high-potential subject matter needed to be found so that subsequent exhibitions could be dedicated to it. Therefore, a review of relevant publications and other available sources was performed. The research led to the conclusion that Rzeszow features a large number of smaller museum branches, each

specializing in a different main theme, which led to the idea for suitable use for the castle's second floor in line with the museum theme as presented above - to integrate several branches of Rzeszow's museums into a single, larger museum institution, which could potentially be much more popular due to the single location. Out of the existing branches, the Museum of the History of Rzeszow was selected, as it depicts the life of the city's residents from the medieval period to the end of the First World War (this subject matter is also partially related to Rzeszow Castle that has always played a significant role in the city's history) (Subcarpatian Cultural Guide, no date). Furthermore, the authors proposed to create an exhibition entitled 'Rzeszow's Architecture and Urban Layout' that would show the development of the city's urban layout over the years and present Rzeszow's architectural works. In addition, the space could be extended to host workshops and educational activities (museum lessons) for schools and other institutions interested in engaging in such events in cooperation with the museum.

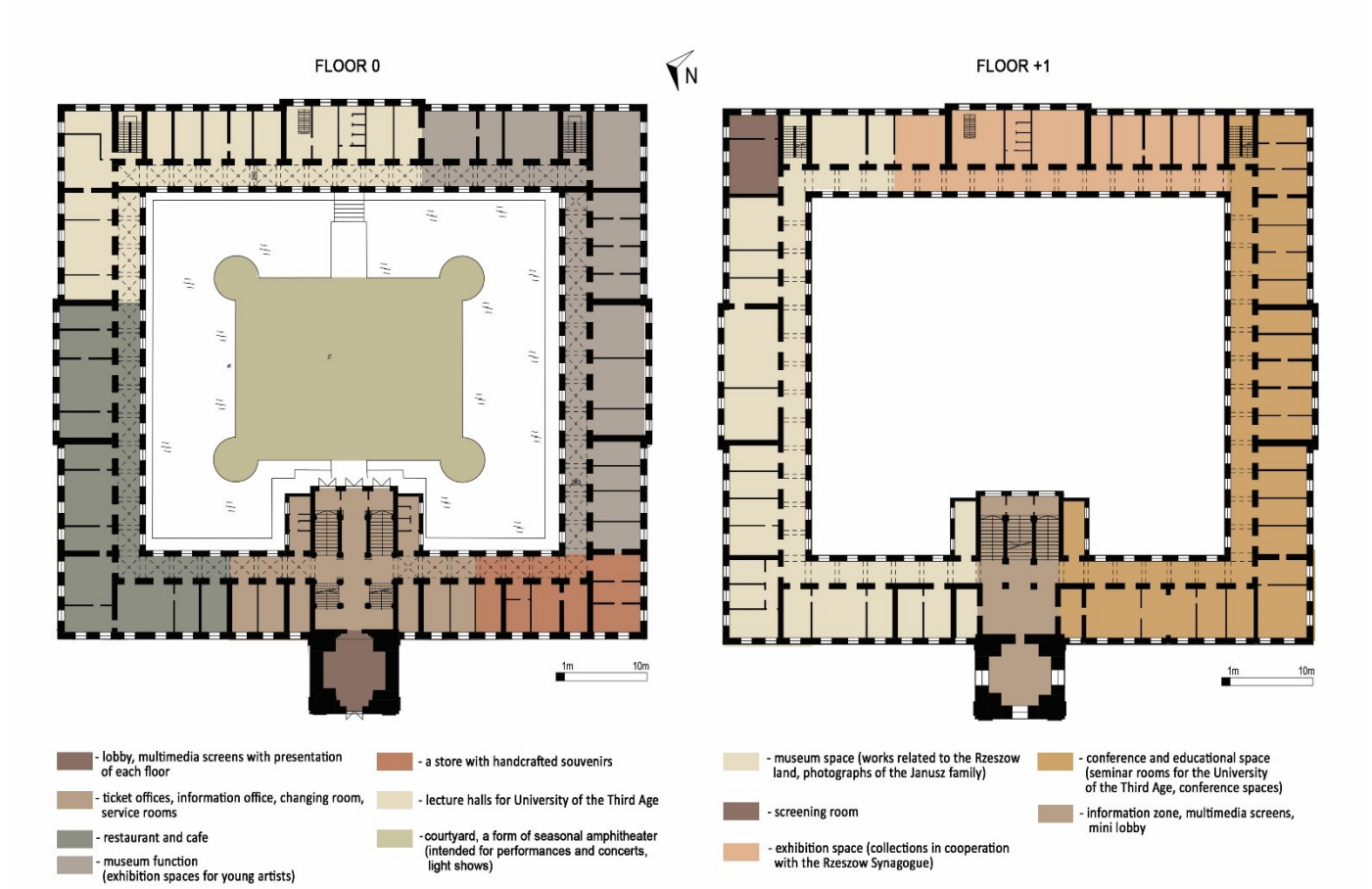

Fig. 8. Floor plans of levels 0 and +1 with the use programme marked. (Drawings: Kamila Gołąbek, students Karolina Kowal, Aleksandra Kośla, supervised by Agata Mikrut-Kusy; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

The uppermost floor of the castle – the attic – is a place that is currently undeveloped. It is thus the only part of the castle that is not partitioned into smaller spaces and has a lot of potential for exhibitions, allowing for the creation of stories leading the visitors through an entire sequence of events (Fig. 9). This is why it is worth to dedicate this level to creating an exhibition on the castle's history and the history of two noble houses that had strong ties to it – the Ligęzas and the Lubomirskis. In this context, one could use not only traditional exhibition forms, but also all types of animations, illumination, the play of light and shadow, utilize multimedia potential offered by the contemporary technology to create a unique mood and atmosphere. While surveying the building, we learnt that Rzeszow Castle has a basement – in the early nineteenth century the building was taken over by the Austrian government and a jail was set up there. During the German occupation, the castle – especially its underground section – was the site of executions of thousands of Poles at the hands of the Nazis. Due to the location's tragic history, we recommend that the place be turned into a memorial to those times.

Apart from the massing itself, the castle's surroundings in the form of four bastions and the dry moat should also be mentioned. The area of the bastions could be used for a variety of open-air attractions. The uniqueness and originality of proposed solutions should play a significant role here. Hot-air balloon rides are an interesting attraction, offered in many cities, but, so far, not in Rzeszow (this concerns only the take-off site). Such an option could allow people not only to look at the castle itself, but also to see all of Rzeszow from a completely different perspective, which would undoubtedly enhance the castle's popularity. A conceptual presentation of this idea is shown in Fig. 10. The remaining bastions should feature an arboretum facility with interestingly arranged flowers, flowerbeds, bushes, flowery meadows, and a network of paths near which numerous seats should be planned so that visitors could use both the space in the castle and around it (sensory visualizations).

The dry moat is an area of varying height, which offers a wide range of opportunities as to its arrangement and utilization of its potential. This is why it has been suggested to locate a proscenium there, in the form of modern, light foldable structures with rounded shapes and numerous curves and domes, designed to create a modern and interesting architectural form. This space could be used for seasonal public events and shows of both local and national significance. It should be noted that

the concept of the article and the presented new proposal for the adaptation of the castle space into a cultural and art centre does not take into account the issues and energy needs of the facility. However, this issue should be addressed in the next stage of the project that involves developing the presented concept.

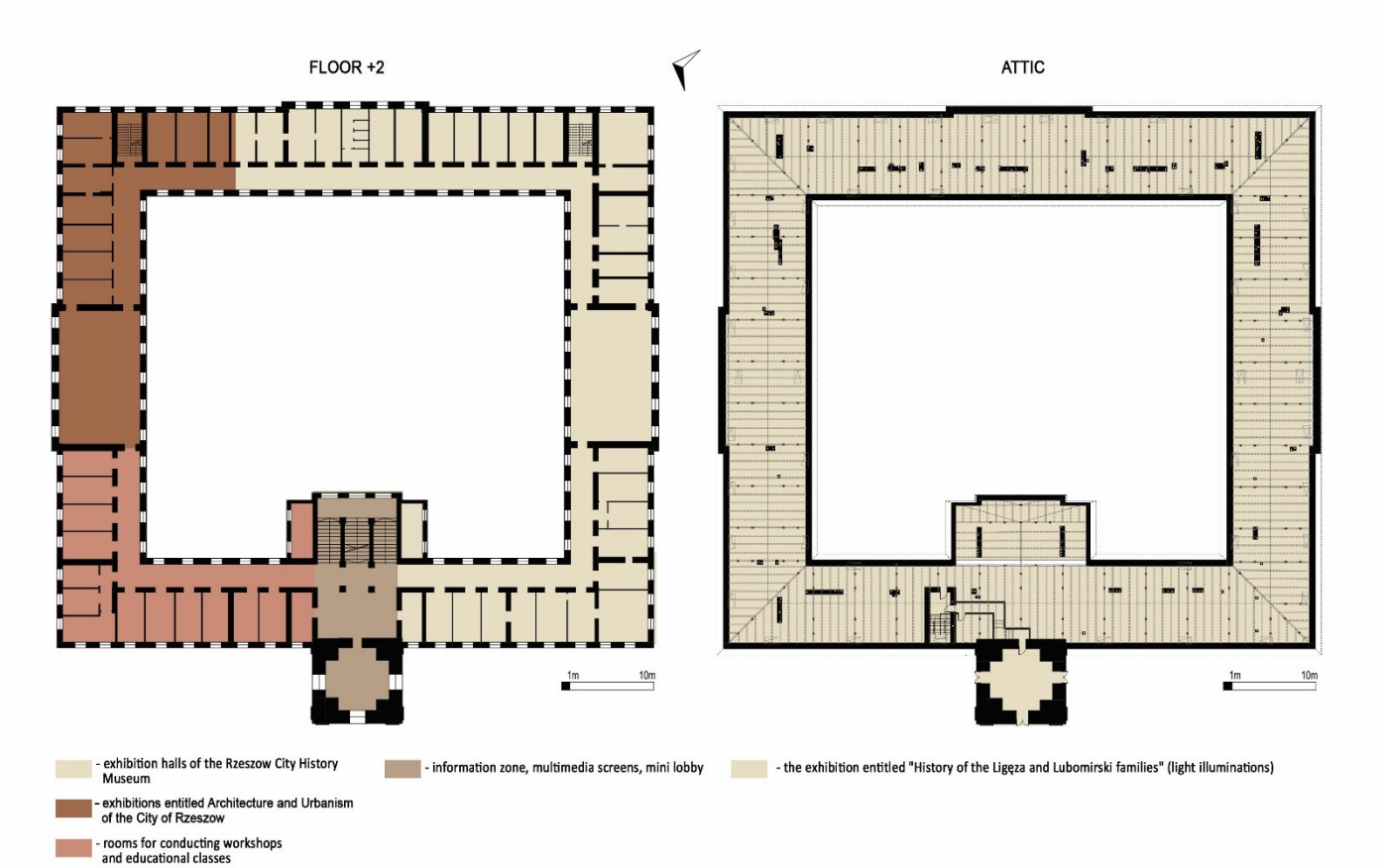

Fig. 9. Floor plans of level 3+ and the attic with the use program marked. (Drawings: Kamila Gołąbek, students Karolina Kowal, Aleksandra Kośla, supervised by Agata Mikrut-Kusy; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

Fig. 10. Vision of hot-air balloon rides starting at the castle bastion. (Drawing: Kamila Gołąbek; Source: Gołąbek, Gosztyła, Mikrut-Kusy – authors)

CONCLUSIONS

The study of available sources and an analysis of collected empirical material allowed for highlighting just how great and undeniable the potential offered by the castle is, not only in relation to the city itself, but also nationally. Rzeszow lacks such a clear culture-forming point that could define new, innovative directions for its development. Thus far, numerous more-or-less bold proposals have been put forward as to the adaptive reuse of Rzeszow Castle. Some of those less grounded in reality include establishing an opera house and a theatre, whose very nature would clash with the historical and heavily partitioned interior of the castle (Rzeszow News, 2021). The idea of using the castle primarily as a museum and for promoting culture and art appears to be the best proposal for this valuable and unique heritage site. It is undoubtedly necessary to allow a wider range of visitors to access the monument – both Rzeszow's residents and tourists who visit the city.

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ISSN 2729-7640

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ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0008

Transdisciplinary collaboration in architecture: Integrating microalgae biotechnologies for human and non-human perspectives

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Article information
Sent: Apr 14, 2023
Accepted: Jun 12, 2023

Abstract: This article investigates the role of architectural research in addressing the current ecological, geopolitical, and socioeconomic challenges by exploring the potential of symbiotic ecosystems, particularly microorganisms such as microalgae, in architectural and design applications. Microalgae biotechnologies have the potential to offer a wide range of applications in architecture and design, encompassing small-scale objects, living systems on building exteriors, as well as urban and rural scenarios, thereby allowing for systematic research. When using these biotechnologies in architectural designs, it is crucial to consider maintenance requirements, environmental impacts, and the potential for enhancing public spaces and society across various dimensions in both short-term and long-term perspectives, and potential environmental impacts before implementing microalgae-based systems in real-life scenarios. This study describes a collection of interdisciplinary projects and research that involve microbiology, architecture, and design and proposes various experimental scenarios concerning the integration of both human and non-human perspectives. Through collaborative academic efforts, these projects demonstrate the potential for combining microalgae cultivation with architectural applications. The projects include Photosynthetic Landscape, a modular photobioreactor system, Synthesizing/Distancing which addresses coexistence in global epidemics, Biotopia, a permanent interior installation incorporating microalgae, Exchange Instruments, a semi-closed cultivation system, and Cultivated Environment, a small-scale microalgae cultivation apparatus. The article highlights the implication of controlled environments, maintenance, and interdisciplinary cooperation while showcasing the potential for these systems.

Keywords: architectural research, environmental challenges, symbiotic ecosystems, microorganisms, microalgae, interdisciplinary collaboration, biotechnologies, public education, integrated problem-solving

INTRODUCTION

Architectural research in the context of the current ecological, geopolitical, and socioeconomic situation should open new possibilities for coexistence with the surrounding environment on all scales. Today, we can find a direct correlation between the rise of fossil fuel-dependent technology and the degradation of the environment in which humans and non-humans exist (Karyono, 2015). The long-term unsustainability of these sectors results in excessive greenhouse gas emissions, air pollution, and an increase in the overall harmfulness of our environment, which includes ever-increasing global temperature fluctuations (Eurostat Statistics Explained, 2023). A special report published in Nature Climate Change (Raupach, Davis, Peters, Andrew, Canadell, Ciais, Friedlingstein, Jotzo, van Vuuren, Le Quéré, 2014) demonstrates that urgent and rapid system remedy is needed to achieve global emission reductions and slow down associated global warming. According to the above-described systems, processes and their consequences affect the media of air, soil, and water and have a direct impact on all living organisms (European Environmental Agency, 2019).

Given the current technological developments and the impact of industry in all areas of our lives, and the priorities of the European Commission's new Green Deal, which declares achieving climate neutrality by 2050, protecting biodiversity, and developing a circular economy (Araújo, Vázquez Calderón, Sánchez López, Azevedo, Bruhn, Fluch, Garcia Tasende, Ghaderiardakani, Ilmjärv, Laurans, Mac Monagail, Mangini, Peteiro, Rebours, Stefansson, Ullmann, 2021), it is necessary to find new ways of forming and maintaining symbiotic ecosystems and to continually develop their potential. This article focuses on the research and potential of microorganisms, especially microalgae, and their possible application to architectural and design objects and structures. It also aims to analyse and compare different approaches using algal biotechnologies, primarily focusing on them as tools in public education. This understanding is also critical for addressing global challenges such as biodiversity loss, which require a holistic and integrated approach to problem-solving.

Sympoietic interactions

The term "growth" is widely (mis)used and applied with respect to our current socioeconomic models. On the contrary, "de-growth" refers to a paradigm that seeks to reduce the human environmental impact by promoting equitable use of resources. In the context of microbiology, this might involve developing microbial technologies that can help to promote new, non-invasive, and sustainable agriculture scenarios, reduce waste and pollution, and support biodiversity conservation. However, these often presume a conflicting relationship between our society and nature. In the artwork Endosymbiosis: Homage to Lynn Margulis by Shoshana Dubiner, diverse creatures interact with each other, forming organisms, cells and clusters. Sympoietic relationships are characterized by a distributed agency and a shared responsibility for creating and maintaining a system where the parts are not pre-existing but rather emerge through their interactions (Haraway, 2016).

Deconstructing human-centred knowledge and recognizing the company of non-human actors is essential to forming and maintaining relationships between humans and non-humans on our planet (Davis, Turpin, 2014). When we acknowledge that all beings, including non-human ones, are active participants in these processes, we can diverge from the utilitarian view of nature and technology and develop more collaborative relationships with the environment and technologies of use instead. Recognizing the importance of organisms and processes on all scales, it is essential to understand the overall complexity and interconnectedness of Earth's mechanisms. At the micro-scale, single-celled organisms, such as bacteria or fungi, play critical roles in nutrient cycling and decomposition, influencing the biogeochemical cycles that regulate our planet's climate (Lowenfels, Lewis, 2010). These processes have significant impacts on larger-scale phenomena, such as the formation of soils and the maintenance of ecosystem health and biodiversity.

Why microalgae?

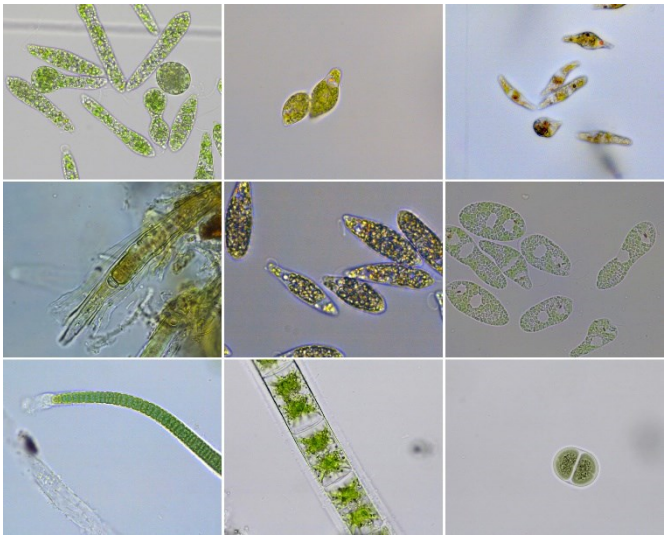

Fig. 1. Various types of cyanobacteria and microalgae. (Source: Lenka Hutárová, Andrej Jedlička, University of Ss. Cyril and Methodius, Faculty of Natural Sciences, Trnava, Slovakia, 2022)

Microorganisms, such as microalgae (including prokaryotic cyanobacteria and eukaryotic and microalgae – Fig. 1) are photosynthetic organisms that can be found in a wide range of environments, from oceans to freshwater systems and even in the soil. They are photosynthetic organisms, similar to higher plants. In economic terms, microalgae can be described as a 'cell factory' having the ability to harness the sun and convert its radiant energy into crucial products (biomass and oxygen) using natural resources, such as nutrients and carbon dioxide. For example, microalga Chlorella (Fig. 2) has a spherical microscopic cell with a diameter of 5-10μm and many plant-like structural elements. Within 24 hours, a single cell of Chlorella and similar green microalgae strains grown under suitable conditions reproduce by dividing, which is the most common asexual reproduction of microalgae. This gives rise to daughter cells, usually two to four inside the mother cell. These processes can involve the interplay between non-human and human, blurring the boundaries by their interaction. As microalgae can also occur and grow in man-made environments, they are intertwined with broader social and environmental issues, such as food and energy security, and climate change.

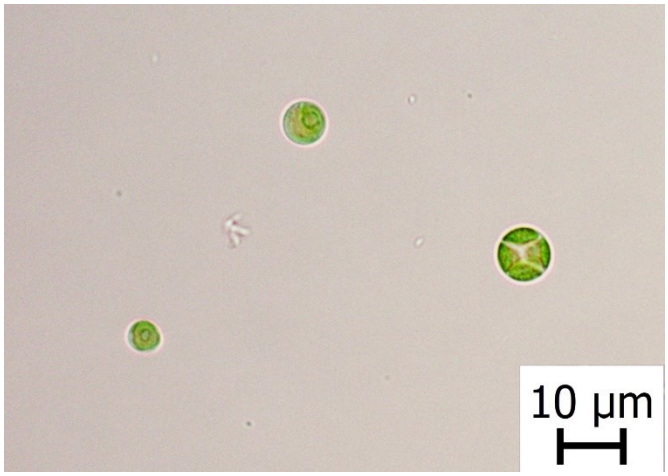

Fig. 2. Chlorella Vulgaris. (Source: Czech Academy of Sciences, Institute of Microbiology, ALGATECH Centre, Laboratory of Algal Biotechnology, Třeboň, Czech Republic, 2020)

Cultivation systems and possible applications

Microalgae can be cultured in various kinds of technological man-made systems – bioreactors, which result in potential applications, aiming to substitute current invasive and destructive industrial sectors. One of these applications is the potential to use refined biomass for the production of biofuels as it contains energetic compounds like lipids and hydrocarbons. Microalgae can be used to produce biodiesel, bioethanol, and biogas, which can (potentially) replace fossil fuels and reduce greenhouse gas emissions. Another sector is nutrient recycling as microalgae can recycle nutrients from wastewater and other sources, reducing pollution and recovering water quality. As concerns carbon capture and storage, microalgae can also catch carbon dioxide from the atmosphere via photosynthesis, reducing greenhouse gas emissions.

Biotechnology can optimize the cultivation process, nutrient recycling, improve the efficiency of harvesting and processing, and develop new methods for converting microalgae biomass into added-value compounds. Detailed exploration and understanding of the natural habitat of various microalgae species can potentially promote interaction between humans and these non-human organisms, leading to innovative solutions in the biotech industry. Microalgae have unique characteristics, such as high growth rate, high lipid content, or versatile cultivation options, that make them suitable for biomass-to-energy conversion. By studying and understanding their natural habitat, including the technical and environmental conditions in which they prospect, we can develop technologies that mimic these features to harness the energy potential of microalgae efficiently.

Several economic models based on fast growth could be relevant to the potential boom of biotechnologies in replacing current industrial sectors. One such model is the "disruptive innovation" model, which posits that new technologies or business models can replace established industries and lead to rapid growth in new sectors. Another potential model based on growth is the "network effect" model, which suggests that the value of a technology or product increases as more people use it. This could apply to biotechnologies because as more people adopt and use them to develop new products and services, their value and potential for growth increase. In the realm of biotechnologies, there lies the potential to revolutionize industrial sectors such as crop agriculture and energy production. The question remains open regarding the scope and timeline for biotechnology's involvement in developing more efficient and resilient new crops or creating biofuels that surpass fossil fuels in terms of their environmental impact.

Who do they work with?

To gain some insights into the behaviour of non-humans, including microorganisms, it is crucial to highlight their potential for existence and resilience within existing systems. For instance, mushrooms and other fungi can help to break down toxins and pollutants in contaminated soil with the potential for bioremediation and other forms of "green" technology that utilize the power of non-human organisms to solve environmental problems (Tsing, 2015). Within this framework, we can recognize microorganisms as active agents shaping our world and potential allies in pursuing more sustainable and equitable life forms. Research into biopolitical citizenship includes human subjects and the many more-than-human actors that shape our lives and environments while questioning the human-centred point of view.

This concept is relevant to collaborating with microorganisms in fields such as design, architecture, and various tech fields because it involves the understanding of how these entities are connected and how they can be worked with to shape our societies and environments. For example, collective work with microorganisms in bioremediation or wastewater treatment can help to decrease environmental pollution, while using probiotics and other microbial supplements can promote overall health. At the same time, it is essential to mention that using microorganisms for profit can also raise questions about power, inequality, and social justice. The development and commercialization of microbial products may disproportionately benefit particular groups or exclude others and raise ethical concerns around safety, consent, and environmental impact. Thus, working with microorganisms requires careful consideration of the ethical, social, and political implications of these technologies, and a commitment to understanding how they intersect with questions of biopolitical citizenship and social justice.

Large-scale cultivation

According to the results of a recent study aimed at mapping microalgae production in Europe (Araújo, Vázquez Calderón, Sánchez López, Azevedo, Bruhn, Fluch, Garcia Tasende, Ghaderiardakani, Ilmjärv, Laurans, Mac Monagail, Mangini, Peteiro, Rebours, Stefansson, Ullmann, 2021) that involved 225 companies in twenty-three countries, about two-thirds of them were found to be focusing on macroalgae cultivation (67%) and one-third on microalgae cultivation (33%). Germany, Spain, and Italy ranked in the top three by the number of microalgae production units. Microalgae have thus become an ideal platform for large-scale biomass production as they are fast-growing in aquaculture, highly efficient, and powered by solar energy. A dense, well-mixed mass culture of microalgae (>0.5g biomass per litre) with sufficient nutrition and optimized growth conditions represents a system whose photosynthetic efficiency is 10-20% compared to 1-2% for terrestrial plants. Some microalgae species can double their biomass in a period of up to 3.5 hours during exponential growth (Singh, Ahluwalia, 2013).

The two main types of large-scale microalgae cultivation are open and closed systems with different technological characteristics and maintenance requirements. Semi-closed or closed systems, the so-called photobioreactors (PBRs), have a significant advantage – the ability to control the entire assembly's carbon dioxide supply, air, and overall individual variables (Koller, 2015). The most common types of PBRs are tubes, columns, or flat panels, made of transparent or translucent materials such as laboratory glass, plexiglass, or foil, positioned horizontally or vertically and arranged in systems of loops, helixes, coils, or fences according to the desired purpose or spatial conditions (Acién, Molina, Reis, Torzillo, Zittelli, Sepúlveda, Masojídek, 2017; Leong, Chang, Lee, 2023). Closed systems have minimal direct contact with the surrounding environment, reducing the likelihood of culture contamination, but making them more maintenance-intensive than open systems.

In open systems, tanks, shallow ponds, raceways (shallow racetracks mixed by paddle wheels) and sloping cascades, the culture is in direct contact with the environment. They are technologically easier to operate and maintain (Narala, Garg, Sharma, Thomas-Hall, Deme, Li, Schenk, 2016). The simplest types of open systems are ponds or air-bubbled containers. Depending on the local climatic conditions and the materials required, optimal cultivation depth can vary. Depending on the size and technological complexity of the units, the mixing and aeration system (enriched with carbon dioxide) can range from local air bubbling to mixing by blades, rotating arms, paddle wheels, or other types. The advantage of this type of cultivation is that, compared to closed systems, they can produce considerable amount of biomass due to the large culture volume.

Application scenarios

Different application scenarios exist depending on the focus and the result, process, or product to be marketed in algal biotechnology. The most widespread is biomass production and its subsequent use within various industry types, such as food supplements, bioplastics, biopesticides, and biofuels, all with active absorption of greenhouse gases or, in some cases, the purification of waste water (Fabris, Abbriano Raffaela, Pernice, Sutherland, Commault, Hall, Labeeuw, McCauley, Kuzhiuparambil, Ray, Kahlke, Ralph, 2020). Algal biotechnologies also offer numerous potential applications in the fields of architecture and design while incorporating these technologies in the built environment on all scales. Microalgae can be incorporated as a living cladding system on building facades. These elements may absorb sunlight and provide natural shading, which helps to control building temperature and generate energy biomass. “Worldwide first façade system to cultivate microalgae” (Arup, 2013) was built in Hamburg, Germany with the concept of bioreactive façade with cultures of microalgae capturing carbon dioxide from the environment and producing biomass.

Urban and rural agriculture scenarios also include growing microalgae on various sites, building walls and rooftops. The harvested biomass can be used to produce food, fodder, biofuels, or other useful bioproducts, boosting local industry and reducing emissions caused by transportation. The installation of Culture Urbaine by Cloud Collective (Peruccio, Vrenna, 2019) implemented closed tubular PBRs as part of a temporary installation over a busy stretch of the motorway. They served to actively absorb carbon dioxide from the air and produce biomass.

Integration of polycultures related to agriculture and water management was implemented within a temporary installation called Floating Fields by architect Thomas Chung (Ezbahn, 2019), which was installed in the area of the mills and flour production. It was a demonstration of the concept of returning agriculture to Shenzhen Bay through the use of floating agricultural fields with various types of installations, including, among others, open cultivation ponds.

This approach raises the question: Could the integration of water areas with non-human life within urban landscapes contribute to the revival of biodiversity in our environment? Water habitats provide a unique ecosystem that can support a variety of flora and fauna, from aquatic plants and invertebrates to fish and birds. Integrating water areas into urban environments also offers opportunities for creating ecological corridors, connecting fragmented habitats, and facilitating the movement of species. It can provide refuge for aquatic organisms, promotes water conservation and purification, and enhances the overall aesthetics and liveability of the urban landscape on every scale – from single-celled microorganisms to complex planning and transformation.

Still under review

Even though microalgae offer a great potential with their applications, there are a few important factors that must be considered. First of all, large-scale microalgae farming in outdoor ponds consumes a lot of water, land, and energy, which could potentially deplete the resources. Moreover, the growth of microalgae with synthetic fertilizers might worsen water pollution and other environmental issues (Christenson, Sims, 2011). Secondly, large-scale microalgae cultivation requires considerable upfront investment in infrastructure, such as photobioreactors or open pond systems, and ongoing expenses incurred for inputs like water, nutrients, and energy. Thus, reducing production costs is crucial for microalgae farming. Lastly, although microalgae are a great source of nutrients, it is important to carefully consider how they might affect both human health and the environment. More research is required to determine how large-scale microalgae cultivation affects biodiversity and aquatic environments (Wijffels, Barbosa, 2010).

Overall, microalgae biotechnologies require a sizeable financial investment to support research, development, and prototype scale-up (Loke Show, 2022). As a result, the distribution of resources frequently favours technologies with the highest anticipated return on investment, potentially moving projects with broader societal implications aside. The bias towards profit maximization may result in research that disproportionally focuses on applications aiming for the needs and interests of a specific segment of society, perpetuating existing socioeconomic disparities. Similar aspects should be considered regarding the application of these biotechnologies in various architectural and design solutions, e. g. the previously discussed building facades (Santos, Mendes, Mendes, 2020).

Project 1: Photosynthetic Landscape

At the Algatech Centre (a part of the Institute of Microbiology of the Czech Academy of Sciences) at Třeboň, Czech Republic, algal biotechnology has been developed since the 1960s. The establishment of cooperation between a research institution and an architecture studio at the Academy of Arts, Architecture and Design in Prague (UMPRUM), Czech Republic, was considered with a focus on microalgae as a key point for expanding theoretical and practical knowledge of the topic. The first direct collaboration with the Algatech Centre was started in 2020. Within the framework of the Photosynthetic Landscape project (Fig. 3, 4), the overlap with microalgae biotechnology was realized by a team of students (Vojtěch Kordovský, Adam Varga, Anna Östlund) of the Architecture III Studio supervised by Prof. Imrich Vaško and Assistant Prof. Shota Tsikoliya at UMPRUM.

As an outcome, a modular PBR system was constructed and placed outdoors. The project's primary objective was to assess the technical aspects of closed cultivation units. To achieve this, the outdoor installation ran continuously for two months, allowing for the evaluation of the overall health and efficiency of the culture. The executive team responsible for the project consisted of researchers and Ph.D. students of architecture as part of the Architecture III Studio at UMPRUM, and the tasks have been regularly consulted with the studio professor. The team explored new spatial configurations for exterior closed PBR units, which could provide shade and enhance the system's performance.

Fig. 3. Photosynthetic Landscape installed in the courtyard of Nevan Contempo Art Gallery in Prague, Czech Republic. (Photo: Eva Rybářová, 2020)

Fig. 4. Photosynthetic Landscape, workshop at the Algatech Centre. (Photo: Veronika Miškovičová, 2020)

At the initial workshop at the Algatech Centre (Fig. 4), supervised by Prof. Jiří Masojídek, the cultivation techniques and practices were worked out. According to that, the initial concept and model for the exhibition project Photosynthetic Landscape was designed and constructed, consisting of an aluminium scaffolding carrying transparent PVC tubes. The idea was tested in various spatial settings and installed at the Landscape Festival 2020 in Prague, Czech Republic, in the exterior of the Nevan Contempo Gallery. Within the installation, 17 pyramid-like loops were connected and intertwined with the tubes. The overall structure demonstrated a manifold PBR system – an interconnected network of tubes exposed to direct sunlight to facilitate photosynthesis (Fig. 5). The system, connected by water and air pumps to the central reservoir (Fig. 6), was maintained continu-

ously for two months. Microalgae from the reservoir were distributed to the transparent tubes through the loops to receive light and circulate.

Fig. 5. Photosynthetic Landscape, detail. (Photo: Eva Rybářová, 2020)

As this was an outdoor installation with daily temperatures of above 30 degrees Celsius, the system was interfaced with a cooling unit to ensure physiological temperatures. By the end of the installation and after optical measurements, the colour and density indicated approximately three times higher concentration of microalgae biomass. Subsequently, the project was reinstalled in a different spatial configuration using three modules in the interior of the Jaroslav Fragner Gallery in Prague, Czech Republic (Fig. 7, 8). Since the gallery space had no natural light, the use of the artificial lighting source had to be investigated and tested. Firstly, estimating the overall light intensity was essential, after which the light source was placed underneath the main reservoir. Due to the sedimentation of microalgae cells, the light source placement was not optimal. Combined with the contamination of the cultures, they separated and proved a colour change, which resulted in the need to clean the system and change the cultures.

The project adopted a methodological approach that involved workshops in developing cultivation techniques, consultation with microbiologists, technicians, electricians, and other PBR specialists, designing and constructing the installation, testing it in different spatial configurations, addressing environmental factors, and implementing sanitation and cleaning protocols to ensure optimal microalgae growth and minimize contamination risks. During the project, the working group consulted with experts from various fields, including microbiologists, engineers, electricians, and other PBR specialists. Their expertise and insights contributed to refining the technical aspects of closed cultivation units. This collaborative approach enabled the project team to learn through on-site experience. One potential limitation of the approach was its seasonality. Chlorella cultures perform well within a temperature range of 15-25 degrees Celsius. Therefore, operating the structure seasonally outdoors is necessary. Running the system during warmer seasons offers enhanced photosynthetic efficiency advantages, as it can utilize natural sunlight instead of relying solely on artificial lighting, which would require additional electricity.

Fig. 6. Photosynthetic Landscape, detail of the culture reservoir and degasser. (Photo: Eva Rybářová, 2020)

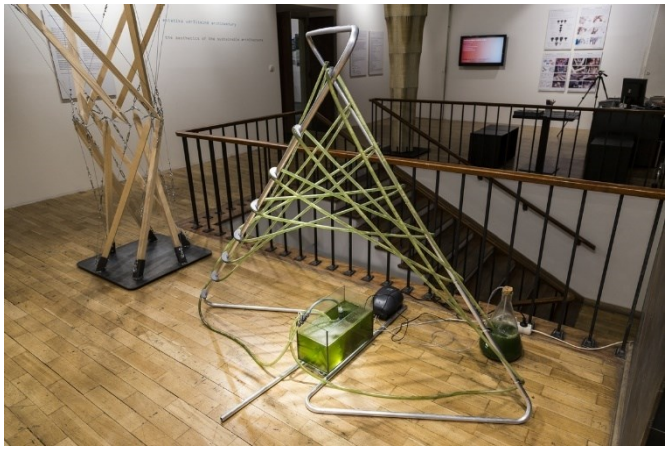

Fig. 7. Photosynthetic Landscape, Jaroslav Fragner Gallery, installation. (Photo: Jiří Straka, 2020)

The goal was to utilize the power of natural sunlight, airflow, and water to facilitate photosynthesis and create an efficient microalgae cultivation system, which would also be capable of being reinstalled by using essential tools and technical knowledge. In conclusion, when cultivating microalgae, it is essential to limit the contact between the cultures (in this case, the main reservoir, which was covered with perforated lid) and the outer environment. As these systems provide a controlled environment for microalgae growth, it is crucial to provide a protective barrier allowing precise control of variables like light exposure, temperature, and nutrient supply. To minimize the possibility of contamination, proper sanitation and cleaning protocols have to be followed, as well as regular monitoring of the cultures and maintaining suitable growth conditions.

Fig. 8. Photosynthetic Landscape, Jaroslav Fragner Gallery, detail. (Photo: Jiří Straka, 2020)

Projects 2 and 3: Synthesizing/Distancing

Referring to the recent questions concerning new ways of coexisting and living in the era of global epidemics, the Photosynthetic Landscape project aimed to address some concerns and offered potential scenarios to the ongoing environmental and epidemiological crisis. To explore the relationship between nature and technology, the same working team undertook the installation for the Ars Electronica 2020 festival in the courtyard of the Pragovka Gallery (Fig. 9). Located in a former industrial area in Prague-Vysočany, Czech Republic, the installation, capable of maintaining photosynthesis, facilitated essential processes, such as oxygen production and carbon dioxide assimilation from its surrounding environment. During the relocation and reinstallation of the modules from the Photosynthetic Landscape project, the team showcased the modularity and reusability of the concept, which also highlighted the project's adaptability and the potential for its application in various contexts. The project still included a phase of continuous evaluation and optimization. The team ran the outdoor installation for one month, monitoring the health and efficiency of the microalgae culture. Data regarding biomass concentration, colour, and density was measured to assess the project's success and identify areas for improvement.

Building on the methodology employed in the previous project entitled Photosynthetic Landscape, the main objective of the new endeavour was to introduce and evaluate the effectiveness of water and air piping systems within different spatial configurations while keeping the culture alive and healthy. The Synthesizing/Distancing and Photosynthetic Landscape projects focused on natural environments and posed practical challenges for algae cultivation and maintenance. The exposure to varying weather conditions and external factors necessitates robust strategies to ensure the health and resilience of the microalgae cultures. This project is a valuable reference for understanding the practical implications and complexities of maintaining algae cultures outdoors. Overall, the Pragovka Gallery courtyard installation symbolized the team's attempt to address the complex relationship between human, non-human, and technology applications as the bridging element. It served as a tangible representation of the need to create cohesive systems that have the potential to coexist with the natural environment and the demands of current societal challenges. The bacterial and fungal contamination, which occurred to the medium in the last week of the installation, also paralleled, as a metaphorical reflection, the vulnerability and fragility experienced during this unprecedented time of social distancing and isolation.

Fig. 9. Photosynthetic Landscape, Pragovka Gallery, installation. (Photo: Eva Rybářová, 2020)

Microflows (Fig. 10) was a site-specific installation during the COVID-19 pandemic as part of the Designblok 2020 event in Gabriel Loci Monastery in Prague, Czech Republic. The team transformed the exhibition room into a fictional forest, utilizing PVC pipes suspended from a ceiling mesh. The installation featured three main reservoirs, one containing the mother culture and the other circulating within the loops of pipes. The overall design of the installation resembled a tree or a forest, aiming to symbolize and represent the photosynthetic efficiency achieved by utilizing a 30-litre medium. The purpose was to highlight the efficiency of this medium compared to that of a mature tree, emphasizing the potential of microalgae-based systems in sustainable and efficient biomass production. While the team reused and developed the same microalgae culture in the Photosynthetic Landscape and Synthesizing/Distancing projects, they faced a setback due to contamination when installing Microflows. As a result, the team had to replace the cultures with new ones cultivated in laboratory conditions at the Algatech Centre. Microflows sought to evoke a sense of wonder and visitors' curiosity by creating a representation of a fictive landscape within the installation while drawing attention to the importance of harnessing nature's potential for novel biotech solutions, even in challenging times such as the COVID-19 pandemic.

While testing the installation in different weather and spatial conditions in previous projects allowed us to keep other variables, such as light (natural or artificial), technology (water or air pumping system), the density of the cultures, spatial configurations, materials use, and other, the team further applied the collected knowledge in the Microflows project. Overall, the project employed a combination of experimentation, adaptation, and creative design, to demonstrate the remarkable photosynthetic efficiency of the 30-litre medium and emphasize the potential of microalgae and efficient biomass production. The topic of Microflows resonated deeply with the event attendees, as it

addressed the topic of potential air purification during a time of heightened global insecurity. With the COVID-19 pandemic affecting communities worldwide and raising concerns about air quality and health, the installation's focus on the potential of microalgae to contribute to cleaner air excited the visitors. After installing Microflows, the cultures were maintained in the interior space and aerated for two months, serving as a valuable plant fertilizer for the indoor plants.

Fig. 10. Microflows, Designblok 2020. (Photo: Tomáš Zumr, 2020)

When evaluating the previous research, the team concluded that the most serious issue was the overall maintenance of the system, the inability to reuse some components (long-term unsustainability of the concept), and the lack of on-site laboratory equipment and technical support. The optical density of the medium was monitored during culturing in the laboratories of the Algatech Centre, and we have consulted the cultivation process and maintenance of these systems, including microalgae nutrition; however, instrumental quantification of the data in these projects was not possible online.

Project 4: Biotopia

The concept of microalgae exploitation has been well-known to the world's professional community. Still, there are only few examples of long-term cultivation outside the laboratory. This is also because the maintenance of these systems is still relatively challenging – all systems require regular maintenance. On the other hand, it must be remembered that this is the culturing of living microorganisms, and the priority is to maintain suitable conditions in all systems. Long-term or permanent installations of PBRs can improve the overall quality of the local environment, based on the photosynthetic efficiency and given or created conditions. These installations can be tailored to serve various purposes. When incorporating PBRs as permanent fixtures, several factors need to be considered, such as system maintenance, as long-term installations require regular maintenance to ensure optimal performance. This includes monitoring and controlling variables like temperature, pH, light exposure, and nutrient supply, as well as periodic cleaning and sterilization to prevent contamination. Secondly, it is the integration with existing building systems, such as heating, ventilation, air conditioning, electrical systems and other, if necessary, to ensure proper functioning and energy efficiency. Lastly while naming a few, it is aesthetics and functionality: the design should complement the building's or space's overall aesthetics while maintaining functionality.

The system called Biotopia (Fig. 11) is a permanent interior installation created for ITB Development (ITB, 2022) and located in the lobby of the Wallenrod Business Centre in Bratislava, Slovakia. Finding a suitable local technical partner capable of maintaining and cultivating the seed culture of microalgae was dictated by the project's location. The fabrication process of the Biotopia system involved a dedicated team of three individuals, all based at UMPRUM Studio Architecture III: Veronika Miškovičová, Daniel Sviták, and Adam Varga, who designed and constructed the installation. Throughout the development process, they received valuable support and consultations from Prof. Imrich Vaško and engaged in regular discussions with the clients from ITB Development. The team collaborated with experts, including microbiologists, engineers, electricians, and technicians. These specialists played a crucial role in supporting the research and development of the project's microalgae cultivation and 3D printing aspects. Their expertise contributed to the successful implementation of the on-site installation. The Biotopia system was commissioned as a permanent interior installation for ITB Development, located in the lobby of the Wallenrod Business Centre in Bratislava, Slovakia.

Fig. 11. Biotopia, Wallenrod Business Centre in Bratislava, Slovakia. (Installation design and construction: Veronika Miškovičová, Daniel Sviták, Adam Varga, mentoring: Imrich Vaško, Igor Lichý, Tomáš Šebo; source: ITB Development, 2022)

Due to the specific requirements of the project's location, the team sought a local technical partner capable of maintaining and cultivating the microalgae seed culture. In this context, knowledge was shared across our research interests and specialists, resulting in a partnership with the University of Ss. Cyril and Methodius, Faculty of Natural Sciences (Department of Biology) in Trnava, Slovakia. The team led by Prof. Juraj Krajčovič consisted of Lenka Hutárová, Dominika Vešelenyiová, and Andrej Jedlička. The team is dedicated to research in the field of microbiology, genetics, and evolutionary biology. The project has combined two approaches, one incorporating algal biotechnologies in architectural and design objects, and the other using the technology of 3D printing with a robotic arm. The project was implemented after more than a year of research and technology testing while searching for the optimal design solution in cooperation with the developer.

After the investigation and test samples, the relief structure was fabricated using the technology of automatic printing from transparent PLA granulate with manually added green pigmentation, which resembled the natural colours of the microalga Chlorella. The printed structure was designed to support the glass vessels with microalgae (Fig. 12). The system was mounted on a suspended wall, with a light and air pumping system located behind. We used the generative algorithm simulating differential growth with the primary input of the geometries of the glass reservoirs, placed on the wall in various coordinates to reach the optimal light mode. This algorithm allowed us to adapt the object's angles to the lobby's space, tangling around the reservoirs with microalgae and the other fabricated curves. The structure was also optimized into smaller pieces for production, transport, and installation efficiency (Pišteková, Tholt, 2022).

While still incorporating algal biotechnologies, the project primarily focused on creating an interior installation within the given space of the lobby. The project aimed to merge applied research into microbiology and 3D printing technology to develop an aesthetically pleasing and functional system. The main priorities were to design an installation that symbolized the photosynthetic efficiency of microalgae and facilitated air purification in an indoor environment. The project's main goals encompassed various aspects, such as technological advancements, aesthetic integration, and potential functional applications within various interiors in the future. Contrasting with previously mentioned projects, the Biotopia project prioritized the integration of algal biotechnologies in the interior and enhanced their visual aspect.

Fig. 12. Biotopia, Wallenrod Business Centre - detail, Bratislava, Slovakia. (Installation design and construction: Veronika Miškovičová, Daniel Sviták, Adam Varga, mentoring: Imrich Vaško, Igor Lichý, Tomáš Šebo; source: ITB Development, 2022)

The main goal was to create a permanent indoor installation showcasing microalgae's potential in a fully controlled environment. The methodology focused on the installation's design, fabrication, and optimization to achieve a visually captivating and functional structure. While the project aimed to highlight the overall photosynthetic efficiency of the microalgae, practical issues related to algae cultivation and maintenance were considered to be less prominent due to the controlled nature of the installation. The methods employed in the Photosynthetic Landscape and Biotopia projects played a pivotal role in achieving their respective goals and priorities. While the previously mentioned projects tackled the practical challenges of algae cultivation in natural environments, Biotopia showcased the integration of algal biotechnologies in a controlled setting. By conducting a comparative analysis between these projects, a deeper understanding of the implications for algae cultivation and maintenance can be gained, further enhancing future research and applications in this field.

Long-term or permanent installations using algal biotechnologies have the potential to enhance interior spaces. When conducting the research, it is also important to search for real-scale applications and demonstrations to prove and test the proposed ideas and their feasibility. While architects and engineers can develop answers to environmental problems – increasing the built-up environment's appearance and functionality by incorporating these systems into architectural design, it is still important to consider the overall functionality and benefits for the society. Even though the Biotopia project has been designed and produced for the private sector, it was important to maintain it usable for the public, while placing it in the entrance lobby, where it is visible from the street level.

These factors, together with the fact that the project was conducted as cross-disciplinary research among the Academy of Arts, Architecture and Design in Prague (UMPRUM) – Studio Architecture III, led and mentored by Prof. Imrich Vaško, in two architectural research projects (Veronika Miškovičová and her research on microalgae, Daniel Sviták and Adam Varga with their research on the robotic arm 3D printing), in collaboration with the Czech Academy of Sciences, Czech Republic, and the University of Ss. Cyril and Methodius in Trnava, Slovakia, contributed to comprehensively exploring the relationship between material and technological research, advanced fabrication techniques, and collaboration with scientific fields.

Project 5: Exchange Instruments

The Exchange Instruments project (Fig. 13) has allowed using the results of two years of discussion and research in semi-closed cultivation systems and their potential applications. The outcome was the production of two spirals made of laboratory glass. Here, the spirals serve as a "photo stage" (Fig. 14) and thus a kind of light-harvesting system for the culture medium – the spiral houses a light bar with LED illumination of sufficient intensity for optimal microalgae growth regardless of the natural light supply. The lower part consists of the main culture vessel (Fig. 15) with a circulation pump and a stainless-steel base with a chamber housing the air pump and electrical wiring. The assembly functions as a complete unit and continuously circulates twenty litres of microalgae culture functioning photosynthetically as a tree: it "inhales" carbon dioxide, "exhales" oxygen, and continuously bioremediates the environment. The tools of exchange are not meant to be a simulation of the natural environment but a reflection on the potential interdisciplinary cooperation.

The project combined various disciplines and crafts to create a functional and aesthetically appealing installation. The employed methodology revolved around fostering collaborations with glassmaking and welding companies, allowing to integrate their expertise into the fabrication process. A collaboration with a glass-making company was established to bring the concept of the one-meter-high glass spiral structure to life. Through continuous discussions with the artisans, the spiral design was given specific dimensions based on the company's technical abilities. The glass spiral had a specific function and served as a light-harvesting system for the culture medium while being edgeless to avoid sedimentation in the crevices. It housed a light bar with LED illumination, providing optimal light intensity for microalgae growth regardless of the natural light supply.

Fig. 13. Exchange Instruments, UM Gallery - installation, Prague, Czech Republic. (Photo: Markéta Slaná, 2022)

Integrating glass-making techniques into the project added a visually captivating element while ensuring the installation's

functionality by utilizing laboratory glass, which possesses essential properties for various applications. These properties include high resistance to chemical corrosion, excellent transparency for observing cultures, and the ability to withstand extreme temperature variations, ensuring the integrity and durability of the installation throughout its lifespan. On the other side, working with laboratory glass with such specific geometry was problematic in terms of maintenance and fragility, as the spiral had to resist constant vibrations and motion of liquid pumping in and out of the attached water pump. That, with the overall weight of the liquid, caused several cracks in the glass, which had to be fixed during the exhibition, and later maintained.

Fig. 14. Exchange Instruments, UM Gallery - detail, Prague, Czech Republic. (Photo: Markéta Slaná, 2022)

In addition to the collaboration with the glass-making company, discussions were held with a construction (welding) company to adapt the structure to the needs of the glass spiral and accommodate the necessary technological chambers for the pumping systems and lighting. The methodology involved ongoing dialogue with the construction (welding) team to ensure seamless integration between the glass spiral and the supporting structure. This collaborative approach created a cohesive and functional unit that effectively circulated the microalgae culture and facilitated photosynthesis. The methodology employed in the Exchange Instruments project exemplified the importance of interdisciplinary collaboration and craft integration. The project successfully merged different disciplines by establishing partnerships with glass-making and construction (welding) companies to create a visually captivating and functional installation. The continuous discussions and adaptations throughout the fabrication process ensured a seamless integration of the glass spiral and supporting structure, showcasing the potential of interdisciplinary cooperation in artistic and scientific endeavours.

Fig. 15. Exchange Instruments, UM Gallery - detail, Prague, Czech Republic. (Photo: Markéta Slaná, 2022)

Project 6: Cultivated Environment

The most recent Cultivated Environment project (Fig. 16) has applied the gained knowledge and dialogues with other disciplines from previous projects. It is considered a small laboratory and a thought-invoking element to make us think about the value of water and its infinite possibilities of use, using the example of the cultivation of photosynthetic organisms. The project addresses creation and maintenance of an apparatus that can be operated easily by non-professionals. The support frame is designed as a one-piece stainless-steel construction and visually complements the series of closed systems from the Exchange Instruments project. On the contrary, it offers a solution with simplified technology and intuitive operation in comparison to previous projects.

Ten litres of microalgae culture are continuously lifted by an air pump in the glass container. The installation and deinstallation of the system is simple and can be performed in 10 minutes by dismantling the stainless steel “U” pipe from the rest of the steel structure. At the bottom of the stainless-steel tubular container there is a "technology control box" for the air pump or other necessary parts, such as the light source, tubing, wiring and electronics. The design of the support frame with the integrated technology control box aimed for simplicity and an intuitive setup, allowing an easy installation, maintenance, and operation.

The installation included an airlift system for the microalgae culture. An air pump continuously lifted a ten-litre culture of microalgae, ensuring an efficient flow and exchange of nutrients and gases.

Fig. 16. Cultivated Environment, Maker Faire - detail, Prague, Czech Republic. (Source: Vulca NGO, 2022; photo: Alex Rousslet, 2022)

This setup enables easier testing of other types of microalgae and has the ambition to test various types of PBRs for potential biomass production. The project built on previous dialogues and knowledge acquired from other disciplines and projects. Insights and experiences gained from previous installations and research were leveraged to inform the design and development of Cultivated Environments. Building on the concept of simplicity and accessibility, the Cultivated Environment project drew inspiration from the widely popular and DIY-friendly airlift systems used in microalgae cultivation. These systems offer an inclusive approach, allowing individuals of various backgrounds and expertise to engage with technology. By utilizing essential components such as an air pump and, if necessary, additional extensions for aeration or added artificial light, these units can be easily operated by anyone interested in experimenting with microalgae cultivation. The apparatus provided a platform for experimentation and innovation in photobioreactor systems. By employing these methods, the Cultivated Environments project successfully integrated microalgae biotechnologies into architecture, emphasizing accessibility, user-friendliness, and the potential for future research and application.

DISCUSSION AND CONCLUSION

The practical work described in this article focuses primarily on technical, scientific and design aspects of microalgae biotechnology, while taking into consideration the educational aspect of the artefacts. Integrating biotechnological artefacts and systems, particularly research on microalgae, into future application scenarios requires an interdisciplinary approach that combines academic and applied research. This process is vital to fostering multidisciplinary collaboration between researchers from various fields, such as biotechnology, microbiology, architecture and design, engineering, sociology and environmental sciences. By exchanging information and approaching the topic from different points of view, researchers can develop innovative ideas and address potential challenges from multiple perspectives via collaboration.

The scalability of the projects is an important consideration; however, it is contingent upon the specific task and site for which the project is designed. For example, the Photosynthetic Landscape project was initially conceived as a modular and scalable system comprising multiple loops. Similarly, Biotopia demonstrates a continuously operated photobioreactor (PBR) system, with its technical aspect capable of scaling up. In contrast, the design aspect is subject to individual preference, allowing for variations in the size and geometry of the glass reservoirs and the "support structure," which can be 3D printed but is not mandatory. The authors recognized the significance of developing these projects in tandem to gain a comprehensive understanding of maintaining optimal conditions for living organisms while creating solutions that could be applicable outside of laboratory settings.

Similar to the Biotopia project, the Microflows project offers a range of design interpretations, providing the flexibility to scale up or down in terms of the total cultivated biomass. The design concept of Microflows, inspired by a fictional forest, utilizes PVC pipes suspended from a ceiling mesh. The installation consists of three main reservoirs, one containing the mother culture and the other circulating within the pipe loops. This adaptable design allows for variations in the size and number of reservoirs, enabling the project to accommodate different scales of cultivation. By incorporating this scalability, Microflows demonstrates the potential to adjust and adapt to various spatial contexts and desired biomass production levels while still maintaining its conceptual and aesthetic integrity.

The Exchange Instruments project is also designed to incorporate one or multiple units within the system. With its unique geometry, the spiral photo stage can absorb a significant amount of light. The main reservoirs connected to the spirals offer flexibility in size and quantity. It can be a single large vessel or multiple individual ones. This project draws inspiration from industrial tubular photobioreactors that typically operate on large quantities of biomass. However, incorporating glass elements assumes a dual role as both a design object and a light object. The Cultivated Environment project embraced this user-friendly philosophy to make the technology accessible to a broader audience.

By simplifying the design and operation of the system, the project emphasizes the democratization of microalgae cultivation. It encourages individuals, regardless of their technical proficiency, to explore and experiment with the technology, fostering a culture of curiosity and innovation. Therefore, the scalability of this project could be improved in terms of the total volume of cultivated biomass. However, it is possible to scale up in terms of knowledge distribution and public education on this topic. This project demonstrates that even with minimal equipment and resources, individuals can engage with microalgae cultivation and contribute to exploring its potential applications. By integrating the concept of simplicity and the DIY ethos, the Cultivated Environment project empowers individuals to become active participants in microalgae biotechnologies, further expanding the possibilities and impact of this emerging discipline.

Conducting a comprehensive literature review in all the topics is essential for using the microalgae research in future applications. This analysis will help to identify knowledge gaps, explore possible methods for further investigation, and develop novel approaches toward specific issues. In addition, investing in developing new biotechnological techniques for optimizing microalgae cultivation, and processing is crucial. For instance, researchers could focus on improving growth conditions, selecting high-yield strains, exploring new designs and materials, and employing engineering methods to enhance specific properties of microalgae.

The effects of climate transformation are not purely based on ecological factors. More than other fields, architecture is characterized by its ability to reshape the local and global environment

and integrate scientific and technological knowledge into the surroundings in which we live. In this way, it is possible to transform the environment into a sustainability tool and see these implementations as a positive direction in improving the climate. Continuous education of the general public and dissemination of scientific and technological knowledge is vital for the various groups of our society, including the applied and private spheres. Through the example of the creation of individual small-scale biotechnological artefacts, functional prototypes, and site-specific installations, it is possible to gradually deepen this knowledge while testing new methods, in this case, of cultivating microalgae within different geometric or technological systems whose primary benefit is the active absorption of carbon dioxide from the air and the production of nutritionally rich biomass.

Although these systems are being developed for immediate application in the professional sphere and require further research, individual projects provide partial knowledge on the subject that can be a pathway to their implementation and cutting-edge research. A key point and a necessary aspect is the interdisciplinary approach and the intersection of various sectors. These collaborations are most effective when they take place locally, with opportunities for networking, joint research, and meetings. Still, cross-border cooperation and knowledge exchange on the problems being addressed is also necessary. The last essential aspect is a continuous and critical debate. By doing so, it is possible to connect – horizontally and vertically – various groups of our society, in the professional and other than professional spheres and, ultimately, in practical application.

Acknowledgements

This project was funded by the European Structural and Investment Funds (NERD grant programme, UMPRUM, 2022). We extend our gratitude to Prof. Imrich Vaško for his guidance and assistance in architectural research and prototyping, and to Klára Brůhová for her mentorship in the architectural theory.

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ISSN 2729-7640

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2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0009

Typology of terrain vague and emergence mechanisms in post-communist, post-industrial small and medium-sized towns in Slovakia: Case study of Humenné, Strážske and Vranov and Topľou

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Article information
Sent: Apr 17, 2023
Accepted: May 18, 2023

Abstract: There have been many problems associated with underutilized areas in towns, although they also offer significant potential for urban renewal, especially in post-communist, post-socialist countries, where a series of key historical events has caused socio-economic and political changes leading to urban decay. The underlying feature of unused areas is their apparent abandonment, absence of use, lack of identity but high potential. However, not all unused areas should be labelled as brownfields; therefore, we studied the terms commonly used to describe underutilized areas. We chose the term terrain vague to map and describe all apparently empty but still intriguing spaces in our model towns of Humenné, Strážske and Vranov and Topľou, in eastern Slovakia. Our paper aims to create a typology of terrain vague to better understand its manifestation in our conditions. It also aims to determine the causes that led to its emergence or as we call it the emergence mechanisms, in the context of post-industrial small and middle-sized towns in Slovakia. We combined field survey and desktop analysis methods to map terrain vague based on set criteria. We evaluated mapped terrain vague and, using the data, created a typology of terrain vague consisting of nine types and identified three key emergence mechanisms and their subcategories. We based them on commonly used terms that fit within the specific context of our model towns. By using the new typology and emergence mechanism, we can identify patterns running along towns with similar backgrounds that result in similar problems and develop solutions accordingly. Results of our research could be generalized and serve as a basis for future research aimed at finding strategies for revitalizing terrain vague in shrinking post-industrial towns facing different problems than prosperous cities.

Keywords: terrain vague, typology, post-communist, post-industrial, small and medium-sized towns

INTRODUCTION

The importance of brownfield regeneration and reuse of abandoned and vacant land is crucial for sustainable development and redevelopment in built-up areas of towns (de Sousa, 2008). However, labelling all unused areas as brownfields does not provide a comprehensive picture of the current urban structure in any town. The idea is to view towns, especially their urban structures, from a different perspective, through inverse urbanism (Haluzík, Pokorný, Storch, Meduna, Ajvaz, Pauknerová, Bušková, Říha, Sádlo, Juřičková, Gibas, Pokorná, Schmelzová, Epos 275, Lacinová, Šturma, Špoula, Veselý, 2020). From that point of view, we can discover the many unused areas interwoven in the urban structure and creating gaps in the urban fabric. They are difficult to label because they can fulfil their primary function and still appear as vague areas without any function at all. The feeling of emptiness of terrain vague is caused by the surplus of perceptions, not the lack of them (Boeri, 1998). The spaces with their many characteristics are inherent to every city in the world, which has led to using various terms to describe them. As Sergio Lopez-Pineiro writes in his book A Glossary of Urban Voids (Lopez-Pineiro, 2020), there are over 200 regularly used terms to name unused areas. Some of them are pop-science rather than academic terms.

Terrain vague was firstly used by Catalan architect Ignasi de Solà-Morales (de Solà-Morales, 1995), who defined it as areas dominated by nature with remnants of buildings where "the memory of the past seems to predominate the present" and only "few residual values seem to survive", represented by "marginal spaces, industrial areas, ports, unsafe residential neighbourhoods, contaminated places" (de Solà-Morales, 1997, p. 24). Karen A. Franck (Franck, 2014) even argues that public spaces are distinguished from terrain vague only by the state of abandonment. Terrain vague is the strange configuration of buildings and their remnants, overgrown greenery, and clues to the past (and sometimes present) uses. Regardless of the fact whether the site is an empty building, its remnant, an empty plot, or some combination of them, they are frequently abandoned, deteriorating, and possibly overgrown. This term perfectly describes the complex relationship between architecture and the current town where paradoxes between negative and positive influences on towns, the need to revitalize these areas but refusal of interventions often meet. In terrain vague, the present

and the past meet, it being the last uncontrolled area in towns with remarkable potential (de Solà-Morales, 1997).

This type of spaces, which American landscape designer Roger Trancik (Trancik, 1986) called lost spaces, emerged in northern America during the second half of the 20th century. Trancik defined them as *"undesirable urban areas that are in need of redesign – antispaces, making no positive contribution to the surroundings or users"*. (Trancik, 1986, p. 3-4) Their existence is caused by deindustrialization, high dependence on individual automobile transportation, the design of open space areas during the Modern Movement, functional zoning dividing the city, and unwillingness of both the public and private sector to take responsibility for public spaces. Our interconnectedness in the world has led to extensive parking lots, roads, highways, airports, and buffer zones near them. Non-places, as defined by French anthropologist Marc Augé (Augé, 1995), are the product of globalization, increasing dependency on car transportation and tourism (e. g. landscape in protection zones of highways, gas stations). Citizens and passers-by do not identify with these spaces, which, as a result, become underutilized. Based on this, we can state that place identity or lack of it is a strong determinant of whether a space will or will not become a non-place (Augé, 1999).

We can relate the above-mentioned buffer zones to the term voids or urban voids, which *"are not just mere gaps in the urban landscape, but also leftover buffer zones without clearly defined functions and boundaries."* (Jonas, Rahmann, 2014). Authors mention voids when referring to areas near transport corridors, reclamation sites, "fragmented strips of land" and "fantasy play spaces" (Jonas, Rahmann, 2014, pp. 99, 143) in the case study of Tokyo. They defined the typology of voids in Tokyo based on their spatial appearance and emergence mechanisms: *"residential sites prior to construction, sites undergoing zone readjustment, demolition sites, deserted buildings, and reclaimed land"* (Jonas, Rahmann, 2014, p. 116). Anna Jorgensen (Jorgensen, 2014) suggests that there is no difference between regulated and unregulated or wild spaces but rather "a continuum ranging from "wilderness" to apparently ordered spaces" (Jorgensen, 2014, p. 2). They exist at all scales, from pavement cracks to more extensive urban landscapes, woodlands, river corridors or brownfield sites. Urban wildscapes have environmental protection potential when properly managed (Nassauer, Raskin, 2014). Another name for urban wildscapes in scholarly literature is wastelands (Lynch, Carr, 1979), sometimes referred to as brownfields or contaminated areas. Other commonly used terms are urban fallow or vacant land used to describe unused urban areas, or white areas and SLOAPs – "Space Left Over After Planning" describing unintended gaps in urban fabric (Doron, 2007).

The common denominator of the emergence of unused areas are political and socioeconomic changes after transitional periods (e.g. post-communism, deindustrialization, urban shrinkage), which all the above-mentioned authors refer to. However, geographic, political and cultural nuances play a huge role in defining and naming unused areas. In Central Europe, there are few studies focusing on terrain vague within the context of post-communist cities after the 1950s (Cosgrove, 2012; Grešáková, Tabačková, 2020; Háblová, 2019; Haluzík, Pokorný, Storch, Meduna, Ajvaz, Pauknerová, Bušková, Říha, Sádlo, Juřičková, Gibas, Pokorná, Schmelzová, Epos 275, Lacinová, Šturma, Špoula, Veselý, 2020; Moravčíková, Szalay, Haberlandová, Krišteková, Bočková, 2020; Neumann, Zuchowicz, 2019; Petri, 2019). The Czech research on terrain vague is closest to ours because of the similar urban development strategies during the Czechoslovak Republic era. A. B. Háblová (Háblová, 2019) summarizes many terms regarding nonplaces, as she named them, in her book Nemísta měst (Non-places of cities). She describes them as transit, landfill, temporary and virtual spaces emphasizing the transience, meaning constant emergence and disappearance of the nonplaces. However, she does not study any specific town or typology of nonplaces in the Czech Republic.

In their book Město naruby, Haluzík et al. (Haluzík, Pokorný, Storch, Meduna, Ajvaz, Pauknerová, Bušková, Říha, Sádlo, Juřičková, Gibas, Pokorná, Schmelzová, Epos 275, Lacinová, Šturma, Špoula, Veselý, 2020) identify terrain vague in their case study city - Prague. They refer to the term, as defined by de Solà-Morales (de Solà-Morales, 1995), but use Prague's social, economic, and political context to describe it. According to the authors, the existence of terrain vague is the result of six emergence mechanisms relating to the lack of activity, contemporary masterplans and unfinished fragments of designs, traumas materialized after revolutionary political changes. They recognize that "the character and number of terrain vague has changed with spatial-historic, socio-economic and current globalization social contexts in which they have developed and emerged." (Haluzík, Pokorný, Storch, Meduna, Ajvaz, Pauknerová, Bušková, Říha, Sádlo, Juřičková, Gibas, Pokorná, Schmelzová, Epos 275, Lacinová, Šturma, Špoula, Veselý, 2020) The term brownfield does not include the vast variety of neglected areas we see in modern towns, but the term terrain vague includes (among others) brownfield areas. Therefore, in our research we will use the term terrain vague as defined by de Solà-Morales (de Solà-Morales, 1995; de Solà-Morales, 1997), because it best describes all visible and non-visible qualities of neglected areas that we encounter.

As we have been mapping terrain vague in model towns for three years during doctoral research, we recognized the need for creating a typology of terrain vague. The model towns of Humenné, Strážske and Vranov nad Topľou (Fig. 1) were chosen for their close geographical location, similar regional characteristics, and the fact that in each of them there was a chemical factory that influenced the similar growth and decline of urban structure since the second half of the 20th century until the present. Currently, these towns have declining population, which means they are "shrinking towns" (Hajduková, Sopirová, 2021b). The lack of job opportunities, their low quality (and low pay) and environment pollution are the causes of migration into more prosperous regions (Rumpel, Slach, 2014). The migration from our model towns within the country is mainly headed to Bratislava, Trnava and Nitra regions (Kakaš, Káčerová, 2012). The typology of terrain vague will provide us with a better understanding of areas that are unused, underdeveloped, and poorly designed. The identification of emergence mechanisms will help us understand the process behind the emergence of terrain vague and thus to design strategies to tackle their negative impacts more quickly.

Fig. 1. The location of model towns (Source: Authors, 2023)

MATERIALS AND METHODS

Our paper aims to create a typology of terrain vague and to identify the emergence mechanisms of terrain vague in the

context of post-communist, post-industrial small and middle-sized towns in Slovakia using the case study towns of Humenné, Strážske and Vranov and Topľou. Our focus is on the development of urban structures after the Czechoslovak coup d'état in 1948 until the present and the terrain vague originating in this period (Fig. 2). We use the combination of field survey (Debord, 1958) and desktop analysis (Kropf, 2017) to map terrain vague using an ortho-photo map and cadastral map in the freeware program QGIS, described in more detail in previously published papers (Hajduková, Sopirová, 2021a; Hajduková, Sopirová, 2021b). Mapping (Tab. 1) and evaluating (Tab. 2) of terrain vague in model towns was based on set criteria. We use the results to create a typology of terrain vague and to identify the emergence mechanisms. It is important to state that despite the set criteria, phenomenological aspects like perception of vagueness, state of abandonment, etc. play a huge role in mapping and evaluating terrain vague. The focus is mainly on the communist and post-communist period and effects of key factors influencing the development of urban structure (Hinse, 2014) with an emphasis on typical development in that period. The typology could be later generalized and used in all small and middle-sized towns in Slovakia with similar post-industrial background. Furthermore, it is necessary to evaluate the mapped terrain vague and partially categorize it. We use partially modified methodology for identifying emergence mechanisms as set by Haluzík et al. (Haluzík, Pokorný, Storch, Meduna, Ajvaz, Pauknerová, Bušková, Říha, Sádlo, Juřičková, Gibas, Pokorná, Schmelzová, Epos 275, Lacinová, Šturma, Špoula, Veselý, 2020) that suits our research and the context of model towns. Because of our phenomenological view of terrain vague, we did not set any criteria.

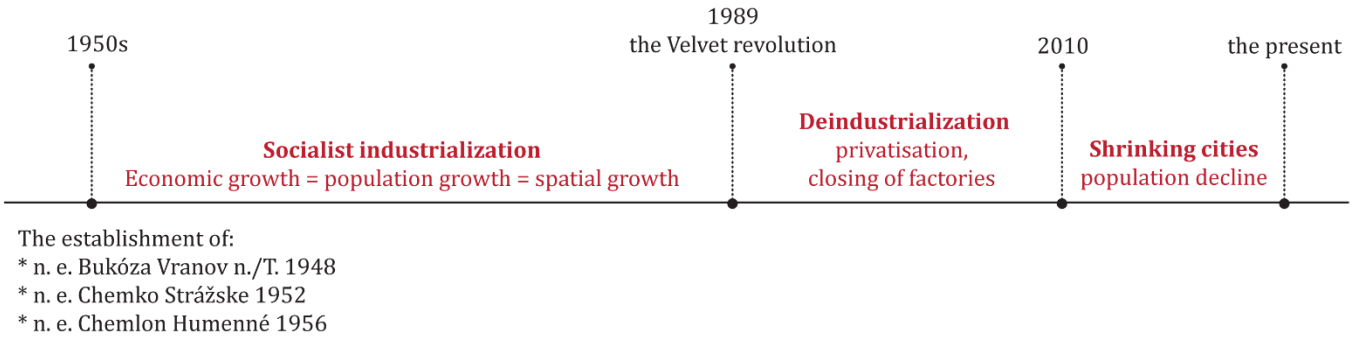

Fig. 2. The timeline of key historical events that have affected the development of urban structure in model towns. (Source: Authors, 2023)

Tab. 1. The criteria for mapping of terrain vague. (Source: Authors, 2023)

Category	Criterion	Description
Quantitative	Area	minimum area is 10 m², maximum area is unlimited (max. up to 70% of the built-up area)
Qualitative	Location within the town	mapping terrain vague only in the built-up area (within the actual borders of the built-up area)
	Non-utilization rate of objects and areas	recording objects and areas that have at least 50% of the area unused (percentage of the land area), the important factor is the actual functional use of the object or area, regardless of the function assigned by the masterplan,
	Vagueness rate	the elusiveness of the space or object, its form, function, etc.

Tab. 2. The evaluation criteria for terrain vague. (Source: Authors, 2023)

Category	Criterion	Description
Quantitative	Area in m²	small – 10-399 m², medium – 400-800 m², large – 801 m² and more
Qualitative	Current use / former use	% rate of active functional use (if it no longer fulfils the original function)
	Location within the town	the center, the inner and outer city, and a periphery
	Terrain configuration	steep slope, slope deformations, waterlogged areas, inundation areas[1]
	The construction and technical condition of the buildings (if relevant)	satisfactory, partially satisfactory, and unsatisfactory
	Buildability	buildable and non-buildable
	Period of emergence	from the 1950s to the present by decades
	Environmental burdens	according to the Information Portal of the Ministry of Economy SR
	Registered National Cultural Monuments and Landmarks	according to the Register of National Cultural Monuments and local government websites
	Ownership structure	private, state, municipal, institutional, unknown or in restitution
	Masterplan regulation	functional use
	The transformational potential	Scenarios "A", "B", "C" and "D"[2]

[1] according to the State Geological Institute of Dionýz Štúr in Slovakia
[2] according to the Real Estate Cadastre in Slovakia; scenarios were defined in previous research (Hajduková, Sopirová, 2022b)

Mapped and omitted phenomena

Even though many spaces could be identified as terrain vague (e.g. parking lots, green spaces in industrial areas), we decided to exclude them because of their low importance for our research. Car parking is part of every city, regardless of the country and its size. The issue is not the appearance of parking lots, the size or area, but long-term neglect of parking policies and public transport. Parking lots (Fig. 3) are just a consequence, and rather than improving their appearance, it is necessary to lower the dependence on car transport, which will ultimately lead to fewer parking lots. In contrast, terraced garages are easily identified issues forming larger zones in any city with a potential for transformation into a more effective parking solution. The society shifted from the need to park in a private garage to parking as close to the house, workplace, shopping mall, etc. as possible. Owning a car is now easier than before. The same applies to industrial areas and their green and paved spaces. They may seem vague to the employees there, but in the bigger picture they do not affect the city image, because they are part of industrial zones with limited right of entry. However, neglected industrial areas are a citywide issue, so we include them in our mapping.

There are also some specific types of architecture or spaces from the examined period, such as heat distribution exchangers, nurseries, medical facilities (health centres, hospitals), school facilities, public amenities (e. g. shopping centres, cultural centres, etc.) that we did not include in our typology, but they were part of the mapping process. They often fulfil their function, and in many cases, they have been reconstructed of transformed for other functional uses, therefore we decided to omit them from our typology and include specific sites only if they are completely or partially neglected in one of the 9 types. When mapping terrain vague, we identified surplus of specific areas with a little occurrence in model towns such as military areas, unfinished objects, unused sport fields and uncultivated landfills. Their presence is more of a coincidence than a rule, thus we identified them with one of 9 types in our typology.

Fig. 3. Parking lot in Humenné, Slovakia, with terraced garages in the background. (Photo: Romana Hajduková, 2021)

RESULTS

The processes of creating a typology and identifying the emergence mechanisms cannot be separated, thus we can link at least one emergence. When defining every individual type, we took into consideration the underlying emergence mechanism.

Typology of terrain vague

While creating a typology of terrain vague (Tab. 3, 4), we decided to use some terms defined in scholarly literature (urban wildscapes, white areas, voids, vacant land), with 3 types dedicated to green spaces (residential greenery, public green spaces and restricted (campus) green spaces) and lastly, to use a descriptive name – terraced garages. This approach allows us to capture the diversity of terrain vague, while also classifying it into distinct categories. It will help us better understand the dynamics of the urban structure and the way these different types interact with one another. They were derived from initially more than 30 types identified throughout the urban structure of model towns. Their description is based on a set of typical characteristics and the emergence mechanism.

Areas completely dominated by nature that are excluded from construction because of terrain configuration are urban wildscapes. Under the term white areas we understand transportation protection zones, which are formally planted with some greenery. Voids (Fig. 4) represent a wide range of spaces difficult to describe in one word (instead of naming it descriptively as abandoned entries, abandoned atriums, etc.) (Fig. 5), but all being underutilized transit areas with similar appearance. We identified the variety of abandoned areas (even brownfields) that are commonly described as vacant land. Although we use the term vacant land to describe currently buildable land that is undeveloped. Such spaces may be present in industrial, residential or mixed-use areas and they may be privately or publicly owned with possibility of intensifying urban structure in built-up areas. They are often seen as liabilities and rarely utilized to their full potential. The name of the type of unused buildings and land is self-explanatory, describing areas with at least 50% of unused areas.

Fig. 4. The back side of Námestie Slobody in Humenné, Slovakia. A shopping mall on the right and a leisure centre on the left. (Photo: Romana Hajduková, 2021)

Fig. 5. The Cinema Chemik in Strážske, Slovakia, and its entry area. (Photo: Romana Hajduková, 2021)

Other 3 types are related to green spaces in urban environment are divided into residential greenery, public green spaces and restricted (campus) green spaces. We paid special attention to green spaces due to their significant share in the urban environment, generally neglected appearance, and potential for revitalisation. Specifically, residential greenery is an integral part of housing estates, but often abandoned due to the lack of maintenance, and also low interest of inhabitants. It significantly affects the overall image of housing estates and residential environment. Public green spaces are often perceived as areas where no activity is allowed, therefore inhabitants lose their interest in them and local governments lack funding. And restricted (campus) green spaces play an important role mainly in educational facilities (e. g. schools and kindergartens), but a very small role in industrial zones. This can lead to healthier, more attractive and liveable cities. The above-mentioned types

were chosen according to the availability and primary function of green spaces. The last type are terraced garages with a high share in urban areas forming entire zones, therefore we decided to use a descriptive name. Placing terraced garages in the type of unused buildings and land would not provide a comprehensive picture of how the entire zones of terraced garages are affecting urban structure. To address this issue, we need to consider terraced garages as a whole and their impact on the urban environment.

Tab. 3. Summarized types of terrain vague with the definitions, examples and emergence mechanisms. (Source: Authors, 2023)

Type of terrain vague	Definition	Example (areas included in the type)	Emergence mechanisms
Urban wildscapes	Areas taken over by nature. Spaces with overgrown greenery, anemochoric greenery, etc. that have not been developed for various reasons, e. g. slope deformations, steep terrain, flood areas, etc.	Urban wildscapes, steep terrain, flood areas	The cycle of urban development (Areas excluded from construction)
Vacant land	Vacant land and urban fallows in built-up areas of towns which are suitable for development.	Urban fallow, vacant land	The cycle of urban development (Spatial reserves)
Unused buildings and land	Areas with 50% of unused area (% share of the land area) at minimum	Unused industrial, agricultural and military areas and objects (brownfields), unfinished objects (long term), unused sport fields, non-reclaimed landfills	Political and socio-economic changes (Deindustrialization), The cycle of urban development (temporarily) unused objects)
White areas	Buffer zones of transport and technical infrastructure, flooded areas, accompanying greenery of transport and technical infrastructure and watercourses	Accompanying greenery of transport and technical infrastructure, accompanying greenery of watercourses, abandoned waterfronts	Unintended product of urban planning (Places (deliberately) deprived of a function)
Voids	Transit areas (supply, entry and exit zones of buildings), Areas with the potential for a public space, spatially undefined parking lots	Abandoned transit areas near buildings (public amenities), abandoned entries, abandoned atriums (schools, hospitals)	Unintended product of urban planning (Place without function)
Residential greenery	Publicly accessible residential greenery in residential areas including housing estates	Residential greenery	Unintended product of urban planning (Remnants of the urban-renewal days)
Public green spaces	Publicly accessible green spaces excluding residential greenery and public parks	Public green spaces (excluding parks), accompanying greenery around public amenities	Unintended product of urban planning (Remnants of the urban-renewal days)
Restricted (campus) green spaces	Campus green spaces accessible to certain groups of people (employees, patients, kids, and parents)	School, industrial, hospital campus green spaces	Unintended product of urban planning (Remnants of the urban-renewal days)
Terraced garages	Terraced garage areas with associated parking and transport areas	Terraced garage (area)	Political and socio-economic changes (Socialist industrialization, deindustrialization)

Tab. 4. Evaluation criteria for terrain vague types with marking of occurrences of criteria for every type. (Source: Authors, 2023)

Evaluation criteria / Type of terrain vague		Urban wildscapes	Vacant land	Unused buildings and land	White areas	Voids	Residential greenery	Public green spaces	Restricted (campus) green spaces	Terraced garages
Location within the town	The centre		•	•	•	•	•	•	•	•
	The inner city	•	•	•	•	•	•	•	•	•
	The outer city and a periphery	•	•	•	•	•	•		•	•
Terrain configuration	Steep slope, slope deformations	•			•					
	Waterlogged and flood areas	•								
	None		•	•	•	•	•	•	•	•

The construction and technical condition	Satisfactory			•						•
	Partially satisfactory			•						•
	Unsatisfactory			•						•
	No objects	•	•	•	•	•	•	•	•	
Buildability	Non-buildable	•			•					
	Buildable		•			•	•	•	•	
Period of emergence	1950s	•	•		•	•	•	•	•	
	1960s	•	•		•	•	•	•	•	
	1970s	•	•		•	•	•	•	•	
	1980s	•	•		•	•	•	•	•	
	1990s	•	•	•	•	•	•	•	•	•
	2000s	•	•	•	•	•	•	•	•	•
	2010s	•	•	•	•	•	•	•	•	•
	2020s	•	•	•	•	•	•	•	•	•
	Unknown									
Ownership structure	Private		•	•		•	•		•	•
	State	•	•	•	•	•		•		
	Municipal	•	•	•		•	•	•	•	
	Institutional		•	•		•		•		
	Unknown and in restitution	•	•	•	•	•			•	•
The transformational potential	Scenario "A"			•						•
	Scenario "B"	•	•	•	•	•	•	•	•	•
	Scenario "C"		•	•		•	•	•		•
	Scenario "D"			•					•	•

Emergence mechanisms of terrain vague

In our research, we identify 3 main emergence mechanisms (Tab. 1), which we further divide into 2 to 3 subcategories. We chose this approach based on the key factors influencing the development of urban structures since the second half of the 20th century until the present. There are only 3 main emergence mechanisms, because subcategories describe specific events, not the mechanisms themselves. The first emergence mechanisms are political and socio-economic changes in the context of post-communist, post-industrial towns: socialist industrialization (1948-1989), deindustrialization (1989 – the present) and urban shrinkage (2010 – the present). They have had the opposite impact; socialist industrialization served as a catalyst for economic, demographic and spatial growth (Fig. 6), while deindustrialization and urban shrinkage have directly caused an overall decline. In some cases, we cannot completely identify the emergence mechanism because of the mutual connection and continuity in the processes. The construction of terraced garages is linked to positive economic growth, but at the same time to the lack of cars. Their moral and physical depreciation is linked to the higher availability of cars and the need for frequent and quick accessibility. For those reasons, we identify both socialist industrialization and deindustrialization as the emergence mechanism for terraced garages. The same applies to unused buildings and land, but due to the high number of industrial brownfields, we will identify them only with deindustrialization.

The second emergence mechanism is an unintended product of urban planning with the following subcategories: remnants of the urban-renewal days, places (deliberately) deprived of a function, places without function. These processes are closely related to spatial planning and a contemporary image of an ideal industrial city. Remnants of the urban-renewal days and places without a function emerged between 1948 and 1989, when only fragments of proposals were finished or there was not enough money for the whole concept. Places (deliberately) deprived of a function are, in contrast, the result of a (too) consistent effort to organize cities leading to protection zones near transport and technical infrastructure. With these mechanisms, identification is clear because the common denominator is spatial planning. All the above-mentioned types of terrain vague related to green spaces (residential greenery, public, restricted (campus) green spaces) are part of the subcategory remnants of the urban-renewal days. These areas are mainly located near objects of public amenities and in campus areas and only intended to fill in the "residual" areas after the design of buildings and pedestrian routes (Fig. 7). They were designed without any activities in mind; therefore, they are neglected. As regards residential greenery on housing estates and near single apartment build-

ings, there is a lack of areas with benches and playgrounds. On the contrary, greenery in protection zones has clearly defined functional uses in the masterplan, which is the root of many issues (Fig. 8). We identify them as places (deliberately) deprived of function. Places without a function represent previously mentioned transit areas (for suppliers, visitors, assembly areas), entry (or exit) areas in front of public amenities such as cinemas, without the qualities of public space and unregulated parking lots.

The last emergence mechanism is the cycle of urban development, which is inherent to every town regardless of the context. It is a common, even inevitable part of the urban development of cities as living, constantly evolving organisms. This category includes unused buildings and objects, spatial reserves and areas excluded from construction. The emergence of unused objects is a common phenomenon (Fig. 9), until they are not neglected for a long period of time and do not emerge suddenly in huge numbers (e. g. industrial brownfields after deindustrialization). They can be abandoned family houses, small shops, etc. The occurrence of vacant (undeveloped) land in built-up areas, providing a spatial reserve for further development without big obstacles (e. g. land in restitution, suitable regulation by masterplan), is also common. Places excluded from construction have usually an obstacle in the form of terrain configuration or a watercourse, including slope deformations, steep terrain, flood areas and other.

Fig. 6. The Hostel Chemik in Strážske, Slovakia - view from Obchodná Street. (Photo: Romana Hajduková, 2021)

Fig. 7. The left-over vacant land on Hospital grounds in Humenné, Slovakia. (Photo: Romana Hajduková, 2022)

Fig. 8. Greenery accompanying the local watercourse called Lieskovec in Humenné, Slovakia. (Photo: Romana Hajduková, 2021)

Fig. 9. The closed Ice Cream shop in Vranov nad Topľou. (Source: R. Hajduková, 2022)

Tab. 5. Summarized emergence mechanisms, subcategories, and the definitions. (Source: Authors, 2023)

Emergence mechanisms	Definition	Subcategory	Definition
Political and socio-economic changes	The results were directive measures or drastic changes (shocks) with a significant impact on the development of the urban structure, the economy of the state and cities, as well as demographic development	Socialist industrialization	The catalyst for economic, demographic, and spatial growth
		Deindustrialization	Economic, demographic, and spatial decline, emergence of unused areas
Unintended product of urban planning	Related to the urban planning and the inconsistent realization of designs	Remnants of the urban-renewal days	Fragmented realization of spatial designs or unfinished designs due to the lack of finance
		Places (deliberately) deprived of a function	Functional use limited by the masterplan
		Place without function	Designing of transit, entry, exit, parking areas, unspecified residual areas
The cycle of urban development	Inherent for all cities, regardless of their context, it is a common, if not inevitable, part of the development of cities as living, constantly evolving organisms	(temporarily) unused objects	Objects and areas stuck between former and new functional use, under the condition that the loss of function did not occur suddenly (in extensive areas) and is not long-term
		Spatial reserves	Vacant land, urban fallows with the potential for development
		Places excluded from construction	Areas unsuitable for development due to terrain configuration or other limitations

DISCUSSION AND CONCLUSION

Creating a typology of terrain vague and identifying its emergence mechanisms (Tab. 5) is crucial in cities that in a relatively short period of time have experienced many key historical events significantly affecting urban structure development. Such examples are our model towns of Humenné, Strážske and Vranov and Topľou located in eastern Slovakia. After 1948, the socialist industrialization and establishment of chemical factories were the catalyst for economic, demographic and spatial growth. Unfortunately, events after 1989 led to an overall decline with negative effects on urban structure. The negative development led to a population decline placing the model towns into the category of "shrinking towns".

In this study, we aimed to create a typology of terrain vague and identify emergence mechanisms specific to our historical context. Based on mapped results, we created the typology of terrain vague consisting of 9 types and identified 3 main emergence mechanisms. After identifying too many specific spaces, we decided to merge them into 9 types that provide enough variety for their description. These types are easily identified in every model town. Predictably, 6 out of 9 are related to some type of green space, 2 types represent buildings and developed areas and 1 type represents paved open spaces. Therefore, we can assume that under-maintenance and lack of activities in green spaces are the main issue in model towns. Moreover, the potential of green spaces has not been realized, which leads to a decrease in the quality of life in model towns (Hajduková, Sopirová, 2022a).

The identified emergence mechanisms are related to the way terrain vague is formed due to a combination of the key socio-economic and political changes, urban planning, and the urban development cycle. By analysing the existing terrain vague, we were able to determine the emergence mechanisms and their subcategories. Subsequently, we defined 3 main emergence mechanisms with 2 to 3 subcategories for each of them. For every type of terrain vague we identified at least one emergence mechanism, and for some types there is a combination of a few of them.

We can compare our results with research of the city of Prague (Haluzík, Pokorný, Storch, Meduna, Ajvaz, Pauknerová, Bušková, Říha, Sádlo, Juřičková, Gibas, Pokorná, Schmelzová, Epos 275, Lacinová, Šturma, Špoula, Veselý, 2020), which is from geographical, cultural and economic perspective closest to our research. Authors tried to explore the different types of terrain vague within the city of Prague, and while they were able to recognize 6 distinct categories, they did not provide a more detailed typology. Other authors researching terrain vague in Slovak cities did not create such a typology (Moravčíková, Szalay, Haberlandová, Krišteková, Bočková, 2020; Grešáková, Tabačková, 2020).

The typology can be a basis for further research related to terrain vague potential in model towns, which we partially examined in our previous research (Hajduková, Sopirová, 2021b; Hajduková, Sopirová, 2022a; Hajduková, Sopirová, 2022b). Then, we can formulate strategies for terrain vague redevelopment (recommendations for municipalities) in the context of all small and middle-sized towns in Slovakia that were greatly affected by socialist industrialization. Municipalities of model towns can use the results as a basic document for spatial planning that recognizes the unused areas suitable for redevelopment that may lead to sustainable spatial development.

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ISSN 2729-7640

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ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0010

Ephemeral occupancies: Non-linear approach to adaptable architecture

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Article information
Sent: April 16, 2023
Accepted: Jun 12, 2023

Abstract: When dealing with the daily demands of a sustainable approach in architecture and the rapid development of society, we must accept change and time as an integral part of a building system. An adaptable approach understands architecture as a non-linear process which enables a dynamic response to changing environmental and contextual conditions with the aim to extend the life of a building. The application of adaptability is as ambivalent as the term itself. Therefore, the paper opens a discussion on different perceptions of adaptability in architecture. Adaptability cannot be only understood as moving partitions or vast open spaces. There is a variety of different principles leading to adaptability that can prove the versatility of use - from the basic understanding of flexibility to comprehensive polyvalence. The paper discusses the relationship between capacity and tendency of an architectural space and its components. The discussed relationship is based on actual and virtual properties of an object and their finiteness of interpretation. The paper focuses on non-linear strategies such as a narrative, feed-back and interpretation that could be applied to design to achieve adaptability as part of the proposed strategy called ephemeral occupancies. The manifold of strategies is discussed, and the result of the conceptual analysis is a framework distinguishing non-linear strategy supporting the divergence of capacity and tendency in the context of adaptability.

Keywords: adaptability, capacity, tendency, narrative, feed-back, interpretation, polyvalence

INTRODUCTION

An important aspect of sustainability in architecture is its long-life, which should be achieved by flexible responses to changes caused by the rapid development of social and economic demands on the programs, spaces, and technological and interior equipment of buildings. Therefore, we believe that adaptability in architecture is an important strategy in architectural design, not just an added value. Examining adaptability in the discourse on architecture from a broader perspective brings an unobstructed view of the issue of longevity and resistance to change. An important aspect is the time scale of the intervention. Longevity should not be about programs, functions, or typological characteristics. It should refer to the building and its construction system, which we perceive as hybridlike. A key factor in longevity is the independence of the shearing layers of the structural system and their time scale characterized by types of adaptability (1. Adjustability, 2. Changeability, 3. Reconfiguration, 4. Scalability within or outside the building volume, 5. Convertibility (Adaptive Reuse), 6. Movability (Austin, Schmidt, 2016).

We can group these scales into two basic scenarios that a building confronted with adaptability must face: 1. the possibility of a change of use; 2. the ability to change the building based on a change of context. In the construction system understood this way, we perceive the function as ephemeral. Ephemerality characterizes a short, fleeting, impermanent, or unstable extension, phenomenon, presence, or creation: of short duration (Gausa, Guallart, 2003). Ephemerality can be one-off (in nature, for example, annuals) or cyclical (in nature, for example, perennials that die for the winter in their above-ground system, but underground, in the root system, hibernate and wait for suitable conditions for growth). The framework of ephemerality defined in such a manner also agrees with Leaman's conceptual framework for change (cyclical and linear changes), which divided changes into two categories, with regard to the impact of changes: 1) Load - demands on spatial qualities, which can be a) sudden - cyclical change of low frequency of changes, linear short-term change; b) or constant (limiting) – cyclical change of high frequency, linear long-term change; 2. Adaptability is divided according to changes into: a) flexibility - cyclical changes of high frequency, linear short-term changes; b) adaptability - cyclical

changes of low frequency, linear long-term changes (Leaman, 1992).

Such a defined framework of ephemerality creates a spatial relationship that we call occupancy: ownership, control, deed, habitation, holding, inhabitancy, possession, and settlement. Ephemeral occupancies are activities and events occurring within a building system that is ambiguous, generic, or specific. They require an open, polyvalent, free, democratic, and adaptable form. They work with hybrid material compositions of different temporal material flows, with dynamic settlement processes and new forms of ownership. Ephemeral occupancies establish a new way of thinking, lifestyle, and approach to climate change. Adaptable architecture encourages a change in the lifestyle, thinking and understanding of the period in which the premises are inhabited. So far, a huge effort has been made in sustainable and energy efficient and passive architecture to ensure the efficient operation of buildings without changing the lifestyle of users. Climate change caused by the speed and disproportionate increase of negative effects on the environment requires changes in our behaviour, daily activities, resources, production and composition of food, the way we work and look at the space we inhabit and use. In the same way, the incorporation of adaptability into practice requires a change in our relationship to space, to its ownership, use and qualities.

The paper is part of an on-going research focused on strategies for adaptable architecture that discuss the reasoning, strategies, and specific examples of adaptability in architecture. This paper explores the phenomenon of non-linear design processes expressing our perception of the adaptability application to carbon-neutral construction. The phenomenon is investigated using the scientific method of conceptual analysis based on examining the relationship between capacity and tendency in the context of adaptability. The study examines the creation of a conceptual system for applying adaptability approaches and strategies in architecture concerning the capacity and tendency of building systems and architecture.

LINEAR AND NON-LINEAR DESIGN THINKING

Designing architecture based on classical traditions is bound to a hard typology of the Neufert type, which works with the strict spatial organization and typological legibility. Also, the tradition of functionalism and modernism carries with it a monofunctional use and a generalized user. The weight of these entrenched patterns of creating and perceiving architecture often leads to limiting spatial qualities that make it difficult to cope with new and unpredictable changes and result in the need to undergo costly reconstructions or even demolitions. Such solutions carry with them a lot of embodied energy, which is based on fossil fuels and contributes to the production of carbon dioxide and environmental pollution. We can consider such a design system a linear one that can be expressed by very simple equations without variables or other complications. The linear system can lead to a clearly defined and legible typology limited to one function, or a set of predefined functions (rigid perception of mix-use). The basic principle is additivity: *"The system is considered linear if the sum of two solutions is a solution; in other words, if the sum is the exact sum of the parts."* (Saunders, 1997)

Based on the above, it is necessary to think about the architecture design strategy that would be based on a non-linear understanding of the process and typology. A state of simple adaptation could be considered a strategic goal. Adaptability can be defined in different ways, but the most common definition in the field of architecture is by Austin and Schmidt (2016): *"Adaptability can be defined as the capacity of a building/object to effectively adapt to the evolving demands of users and the environment/context, to maximize its value throughout its life."* The important terms in the definitions are capacity and value. The value of an architectural work (building) can be defined as a contribution to the field of economy, culture, urbanity, society, and sustainability. The capacity of a building in the context of adaptability indicates the maximum fitness of all building layers for changes. For a building to achieve a certain adaptable capacity, it must have specific characteristics.

Durmisevic (2018) defines properties of adaptability (from her perspective of reversibility) as: a) position, size, and sufficient access to daylight; b) position of circulation and entrances within the building and their mutual distance with respect to the need for dividing or connecting functional units; c) the construction system in relation to the circulation core, dimensions of the "module" and construction methodology (in case of possible deconstruction); d) clear floor height in relation to the exterior wall and daylight access; e) material compositions that have different life cycles; f) material compositions whose functions have different life cycles. A building's capacity to adapt (based on its properties) is supported by principles leading to adaptability such as: 1. Modular coordination; 2. Open plan; 3. Frame and specific space (open building); 4. Loose-fit; 5. Shearing layers; 6. Decomposition, Recycling and Circularity. For adaptable design, it is important to define its parameters, which are usually dealt with during changes. Yona Friedman defined adaptability parameters as the *use weight* of the room, calculated for a specific life cycle and *effort matrix*, availability of spaces, and their connection, for which he used qualities such as distance from the core or daylight and frequency (Friedman, 1975). A key component of a building system is *access*. If the chosen access system supports adaptability, we can call it a polyvalent component. In this context, the position of the staircase, an external gallery, double-helical stairs, or a polyvalent spatial organization supported by a central staircase could be considered polyvalent components.

Manuel DeLanda (2015) distinguishes the philosophical difference between property and capacity. Properties are always actual because an object, at a given time, has or does not have a certain property. But the capacity is not necessarily actual if the object, in the given state, does not require it. This means that capacity can be real without being actual. DeLanda calls this ontological state virtual. He compares this double life of material systems to Deleuze's understanding of the virtual: *"The virtual is not opposed to the real but to the actual. The virtual is fully real in so far as it is virtual …The reality of the virtual consists of the differential elements and relations along with the singular points which correspond to them. The reality of the virtual is structure. We must avoid giving the elements and relations that form a structure an actuality which they do not have, and withdrawing from them a reality which they have."* (Deleuze, 1994) DeLanda explains the concept of structure in Deleuze's definition of the virtual as a structure of possibilities. This structure can be defined by critical thresholds of its stability.

We can compare these critical thresholds to the critical points of failure defined in their observation of changes affecting adaptability by Gosling, Sassi, Naim, and Lark (2013). The critical threshold in this context is a failure understood as the inability of a building to meet specific requirements for functionality (technical performance), lifestyle, user, and market expectations (economic performance), and legal requests. The need for a change arises when one of these requirements comes into disharmony with the other. For example, when there is a difference between the requirements for functionality and the expectations of the users, the two requirements come into conflict and thus a correction is needed. Christopher Alexander (1979) looked at the problem in a similar way: *"The biggest key to the internal structure of any dynamic process lies in its response to change. Of course, culture does not move from one change to the next in discrete steps. New threads are constantly being woven, making change fluid. However, in terms of impact on the struc-*

ture, change becomes significant only at the moment when the failure of misfit becomes critical—the moment when it is recognized, and the users feel that something is wrong with the structure". (Alexander, 1979)

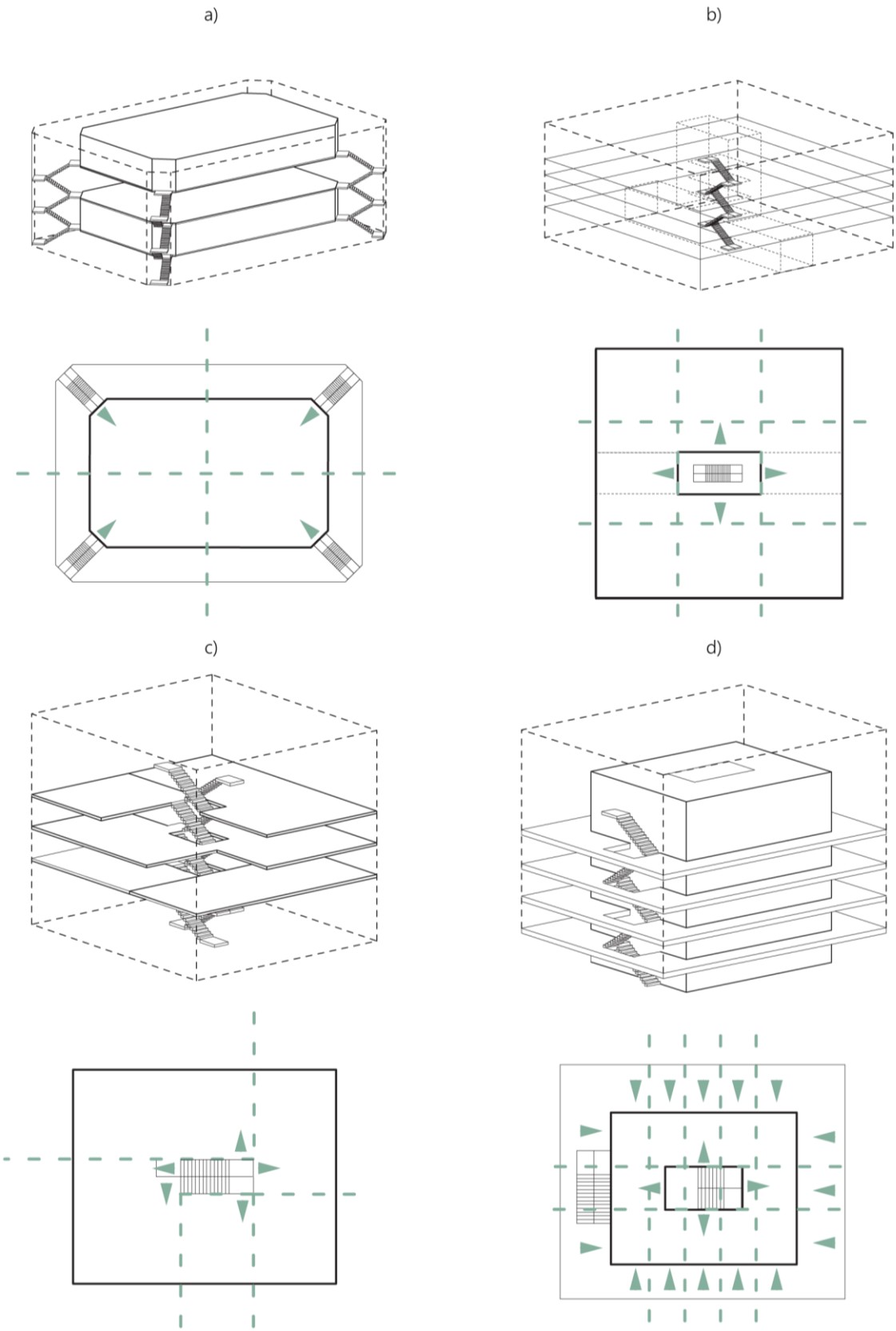

Fig. 1. Different approaches to access as a polyvalent feature in adaptable building. The type and position of the access component could enable adaptable operation such as separation, connection, or clustering of space in the future. a) corner access points – based on Roche office building by Christ & Gantembein, 2021; b) central access point; c) central access point with double-helical stairs; d) access points from external gallery – based on Máj cultural centre by SLLA, 2014. (Source: Lüley, 2023)

If we were to name a virtual state of an object that meets the above parameters, we could call it a tendency. In our case, we can define a tendency as the virtual state of an object that has specific properties with which it fulfils a certain capacity. The building's capacity to adapt (based on its properties) is supported by principles leading to adaptability such as: 7. Polyvalence; 8. Spatial plan (Raumplan); 9. Freespace; 10. Ambiguity; 11. Elastic space; 12. Frame and generic space. DeLanda defines the mutual relationship of capacity and tendency based on the finitude of their possibilities. Tendency has a limited number of possibilities, while capacity has an unlimited number of possibilities. In the context of adaptability, we could compare these two concepts to the relationship between generic flexibility and polyvalence. Pierre von Meiss presented a similar parallel, where he compared the mosque in Cordoba with the cathedral. The mosque in Cordoba is designed as a hypostyle hall, which at first glance appears to be an unusable space compared to the openness of the empty space of the cathedrals. Nevertheless, von Meiss argued that the density of Cordoba's columns offers fulcrums for easier interpretation, while the sparsity of the cathedrals' open space confuses users and forces them to enclose the space unnaturally. It creates a tension between their position in space and the limits of space (von Meiss, 1990).

Herman Herzberger, the author of the principle of polyvalence, reacts to this relationship in the same way. He says that generic space, which should be a suitable solution for constant changes, deprives architecture of its qualities and meanings. He also claims that multi-purpose solutions are proposed to provide specific final solutions for pre-determined purposes (Hertzberger, 2014). On the other hand, polyvalence in architecture provides the competence of spatial compositions that, when faced with unexpected situations, have the capacity to respond effectively. Polyvalence works with reference points that are represented within a building as components, spatial compositions, or situations. These reference points (singularities in DeLanda's interpretation) are points that, after crossing the critical threshold of an unsustainable state, provide a new interpretation and solution for a new situation. Hertzberger argues that an uncertain future and generic space left to future functions and future users means too much specificity. *"The building should listen more than speak."* (Hertzberger, 2014) In his concept, he turns to history and the present, and observes the way of life and the context. His message is: *"Architects should not provide neutral buildings, but buildings with character, explicit, recognizable, authentic, original without enforcing a specific taste and without deriving its characteristics from function and type"* (Hertzberger, 2014).

Meredith and Sample describe the generic as our new contemporary collectivity: *"History has become a diffuse narrative of contingencies. Our current state is a sort of post-modernism without semiotics, postmodernism without language. What is left is both whole and fragmented, bits and pieces of a flattened ontology where matter, data, and images are made inextricable. Today we value things that are both repeated and singular. We are constructing our worlds through representations of representations,"* (Meredith, Sample, 2016). In this case, it is a critical attitude towards the generic, when blanket solutions are masquerading as flexibility. We should approach the responsible design of adaptability with care and seek the correct application of tendency, capacity, competence, and polyvalence to spatial qualities. According to Salingaros (2004), the optimal method of achieving an adaptable design is to understand the processes of Darwin's theory. He means the evolution of a group of similar competing solutions for a specific project, from which the most adaptable one is always selected in the decision-making process. For such a process, it is necessary to create a set of criteria that are used in the selection of various alternative proposed solutions. For this reason, Salingaros proposes criteria based on adaptability that logically generate adaptable solutions. He suggests a parallel with computer science to achieve an effective strategy for designing an adaptable architecture. He therefore likens the design process to an algorithm: a set of steps that must be followed to produce the desired result.

There are two approaches to achieving a result in the field of design or research: 1. Initiated approach (Top-down) and 2. Evolutionary approach (Bottom-up). Based on his research, he was able to prove that the effectiveness of achieving results is comparable. 1. The initiated approach (Top-down) works with the selection of solutions in two processes: a) searching for a suitable prototype from the past (even from the recent one), which, although adapted to the given situation, may not be correct in the current one, b) virtual presentation of the use of the prototype in the head of the author in the design process. The initiated approach uses proven sources of forms and becomes the result of one person's decisions. Such an approach may not be ineffective, but it can be dangerous if the author relies on prototypes of architectural forms that are ineffective or even counterproductive in the given time and situation. There is still a group of architects that follows the Vitruvian model of architecture, which is based on "classical" rules. And that is the creation of a form that is completely thought out during the design stage and uses models of architectural expression according to one's own taste or belief. Their results are convenient, orderly, human-scaled, but the problem is their static, generalized and default form, which hardly copes with change.

2. The evolutionary approach (Bottom-up) works in the same sequence of processes as the initiated approach, but a) it selects from different sources. Instead of looking for ready-made prototypes, it uses models of behaviour and reactions to inputs and outputs during the generation of the design and during the expected life of the building. At this point, Salingaros relies on Christopher Alexander's models of architectural and urban patterns; b) in the second process of designing as such, i.e. the author's virtual world, several parties are involved in the process and look for a system (algorithm) of solutions applicable at the current time (Salingaros, 2004). Although these two approaches may appear to be very different from each other, this is not always true. In understanding the sequence of steps in design, they are the same, the difference is in the form of the selection of tools with which they work. It is also important to mention the type of architecture for which one of the approaches could be chosen. For unambiguous architectural forms of cultural character or small-scale residential architecture, the initiated approach might be the right choice, under the conditions mentioned above. Another, third possibility, is the synthesis of these two approaches, where one part of a building is designed initially, and the other parts are designed evolutionarily or left to their own evolution.

In the context of designing adaptive and adaptable architecture, Patrik Schumacher (2013) sets himself the task of defining relevant systems or urban formations that are to be networked, correlated, and adapted to each other. To compose and analyse space and urban structures, Schumacher relies on the breakdown into sub-systems of occupancy (use) and movement, which include the distinction and correlation of static and dynamic built environment and infrastructure. To achieve such a model, he suggests analysing the city and decomposing it down into subsystems and components on two levels: 1. form-spatial decomposition (layout, subsystems, or components) and 2. functional-social decomposition of the city. Each of these levels is supposed to create subsystems, which according to the previous division are formed into 1. different character typologies and 2. different functional typologies, understood as typical patterns of communication interaction. Decomposition is followed by synthesis, which can be understood as the composition of these relationships, which in parametricism is understood as correlation. If all subsystems are mutually correlated,

we can talk about a living structure ready to face various obstacles and especially changes.

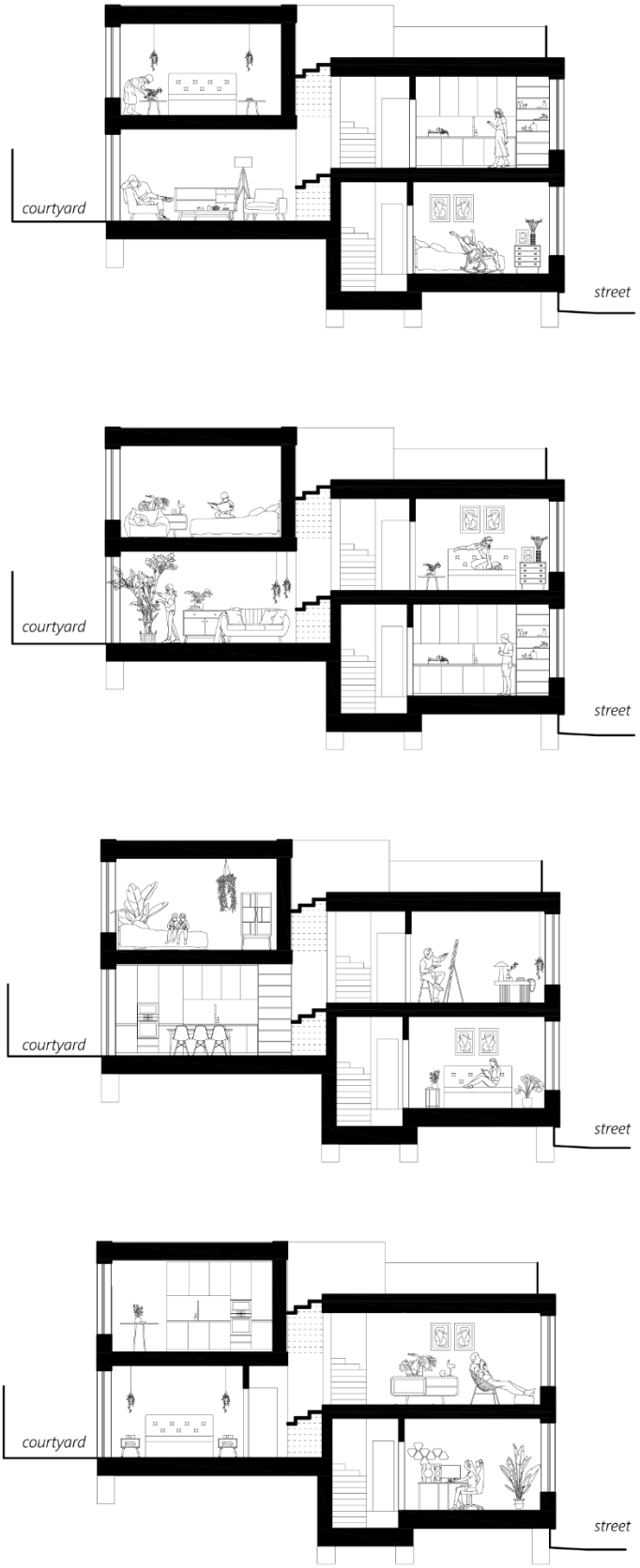

Fig. 2. Adaptable house NO.1 – non-hierarchical spatial organisation enables polyvalence of spaces. Every room of the house is connected to central circulation and services and can be interpreted by the users according to their preferences: orientation to exterior (street or courtyard), connectivity of the spaces and their position within the house. (Source: Lüley in cooperation with Eckhardt studio, 2023)

Schumacher distinguishes three types of correlation: a) Functional correlation, b) Formal-spatial correlation, and c) Form-functional correlation, which he defines as the correlation of patterns of the building environment with patterns of social communication that arise within them. In this case, functions are not a static definition of inhabited spaces but are conceived as parametrically variable, dynamic, and event narrative. Correlations understood in this way explain an architecture that is determined based on an anticipated event or social interaction established within its context. The building environment functions based on visual appearance, legibility, and the related capacity to create the framework and primary communication. In his book The Autopoiesis of Architecture (2011), Schumacher defines architectural order as an organization, phenomenological articulation, and semiological (symbolic) articulation, as three equally vital moments of a fully developed architectural project that could address the challenges of contemporary society. He distinguishes three programs – organizational, phenomenological, and semiological. The organizational program covers the physical constitution and distribution of spatial elements and their patterns and connections, the phenomenological program covers the cognitive readability and perception of space, and the semiological (social communication, sign interpretation) program covers the articulation of architectural organization and by mutual correlation, they create an architectural order or style with its aesthetics, which was also the goal of the parametricism manifesto. Schumacher suggests conceiving a non-linear model of architecture as a complex set of information that multiplies the social interactions that are expected in the proposed space (Schumacher, 2011).

Mitášová and Zervan worked with a similar division of the functions of architecture as well. They call the third function, after the denotative and cognitive ones, the autopoietic function, which: "*in addition to denotations and connotations mediates creative solutions of the so-called open or unsatisfactorily solved architectural problems and tasks in the creative dialogue of an architect with passing generations of creators of architecture. In this mediation and dialogue, no one can use only ready-made meanings and established codes, but emerging meanings are born, represented on the one hand by intra-architectural codes, which have a questioning and critical nature, and on the other hand, represented by emerging forms anticipating new solutions, which retrospectively require verifications and acceptance"* (Mitášová, Zervan, 2020). Such codes "*have the task of initiating the meaning of the self-regeneration of architecture."* Mitášová and Zervan define the autopoietic function through the evaluation of an architectural work, which is based on the relationship of two parameters: *"how creatively it is able to use the sedimented potential of architecture to solve an actual task; and how and with what creative inventions it enriches architecture."* They recommend the codification of the autopoietic function through a) multiplication and doubling of codes; b) polyvalent form; c) architectural programs generating transformable forms and spaces that oscillate around traditional prototypes, and d) hybrid elements, buildings, and spaces (Mitášová, Zervan, 2020).

DESIGN STRATEGIES AND METHODS

In such an established context, we can understand a non-linear system as a system of several variables entering the system, the result of which is significantly disproportionately greater than their input. Another understanding of non-linearity can be the cyclic evaluation of variables. Such a procedure is called iterative and works with tools such as a narrative (a scenario that defines the desired state under certain conditions), feedback, and interpretation. A narrative was specified by Schumacher as scenarios that define function not statically, but dynamically and variably. Henri Achten approaches the problem in a similar manner. He proposes "Interaction Narratives" as the organization of moments of interaction between a user and a system following a story, which is consistent with the style of interaction (Achten, 2018). In his work Narrative Architecture, Nigel Coates distinguishes three narratives: 1. Binary narrative (descriptive appropriation of the narrative form), 2. Sequential narrative (linear conception of events), 2. Biotope narrative (non-linear and variable narrative system). The biotope narrative is interesting in relation to our research. It derives from the biotope – a small, uniform environment occupied by a community of organisms in a mutually beneficial micro-world. In architecture, the biotope replaces the urban context, which contains several functions and events that are mutually supportive, yet independent (Coates, 2012).

In the context of a narrative, a biotope captures an interrelated set of conditions with its internal influences and dynamics. The urban context or building becomes a biotope narrative when the system of narrative components is combined with the system of functional parts, which can destabilize the physical reality of the territory, like dividing systems into sub-systems, thereby allowing it to be open to multiple interpretations. This is how paradigms of urban conditions and situations can be defined, knotted together in a continuous network. *"A biotope narrative without the need for formal organizational devices helps to create homogeneous conditions of equal opportunities. It simultaneously exhibits functional comprehensibility and stimulates inconsistencies, form, and fiction."* Coats tries to identify the two worlds that a user or passer-by perceives. It is the physical world he or she is in and the world of interpretations as he or she reads that world (Coates, 2012). Schumacher's parametric semiology, with which he wants to organize space and its articulation, indicates the same and is legible and interpretative. Likewise, the virtual world described by Deleuze and DeLanda and the principle of polyvalence can be interpreted the same way.

Salingaros defines the feedback mechanism as a tool for incorporating information into an algorithm for the growth of a complex system. Feedback is a two-way action occurring in two different contexts: 1. within a system of components of equal size and importance, and 2. within different levels of the system. An adaptable system uses feedback to influence both small and large scales. An important aspect of adaptability is that each step works with actual adaptation, thus we can arrive at a system that is alive and reactive (Salingaros, 2004). Based on the above, we can categorize the feedback based on the result as follows: 1. Additive result - to fulfil the conditions of the narrative, scenario, or final state, properties are added to the building system; 2. Reactive result - to fulfil the conditions of the narrative, scenario, or final state, the properties of the building system are modified.

The interpretation of an architectural work is described by Mitášová and Zervan (2020) in three steps: 1. Reconstruction of the autopoietic function and intra-architectural code against the background of already existing architectural codes and the challenges and tasks of culture and society – contextual reconstruction and reconstruction of the author's intention; 2. Hypothetical reconstruction of architectural decisions, which helps to connect the architect's intentions with the procedures in the work, must be identified by architectural codes. For this purpose, the authors of the method use hypothetical architectural drawings for examining alternative architectural decisions - architectural interpretation; 3. Reconstruction of the architectural singularity and the internal-architectural code, which should have the ability to connect different contexts and look for the answers it can provide and the extent to which it can connect the previous work of the architect with the current building (Mitášová, Zervan, 2020).

Although the authors use their method of interpretation mainly to investigate existing buildings, we can also use it for non-linear forms of design: 1. Contextual reconstruction of the autopoietic function and the internal-architectural code, where we can perceive the context as a relationship between two states of the architectural space at the point of the critical threshold – the need to change the function; 2. By using the feedback and the scenarios of possible anticipated development, we can infer a hypothetical reconstruction of spatial situations; 3. We can subsequently encode these into building system components and spatial configurations in order to provide answers for future interpretation. A degree of interpretability can also be suggested. Mitášová and Zervan (2020) present a dichotomy of interpretation methodologies, in which the opinion oscillates between an unlimited number of interpretations of a work and a single correct interpretation. We can compare such a relationship to the finiteness of possibilities and properties of capacity and tendency. If space has an infinite number of possible interpretations, it can be called generic and assigned to the properties of capacity. If a space has a specific number of interpretations, it can be called polyvalent and assigned to the properties of a tendency.

DISCUSSION AND CONCLUSION

Identifying the relationship between capacity and tendency clarifies the way we look at the strategies and principles leading to an adaptable architecture. At this point of the investigation, we no longer understand adaptability as stereotypical, or as an added value. We try to integrate it into the architectural composition as its integral part. In the context of the basic quality of adaptability (the same as the quality of sustainable, circular, and carbon-neutral architecture), which is longevity and durability, there is no clear distinction between adaptable and quality building. Many architects design smartly, qualitatively, and sustainably without thinking about adaptability, which can lead to viewing adaptability as an exhausted topic. However, the opposite is true, and its revival, inclusion in the educational process, and its confrontation with current subjects contribute to the improvement of architectural creation. As a result of the conceptual analysis of the relationship between the tendency and the capacity of the architectural space, the strategy of designing an adaptable architecture can be based on non-linear tools of anticipation of variable, dynamic, and event scenarios, their evaluation, and interpretation.

Such a strategy can be applied to the design process generally because it does not dictate the taste, style, or trend of the architectural form, but generates its internal architectural codes and manifold of (unlimited or limited) interpretation. The concept of ephemeral occupancy can work through several models and types of buildings. A potential typology for reinterpretation includes, for example, on-ground parking garages. A huge amount of embodied energy invested in a structure occupying a relatively large place within the city and urban context is transformed into objects with a function for an invention that is currently on the blacklist and heading for longed-for extinction. Automobile transport is one of the most criticized forms of mobility for which such palaces are built. The case study of the 1111 Lincoln Road parking garage by the Swiss duo Herzog and de Meuron is one example of dealing with this situation. The openness and architecture of the building offers versatility of use.

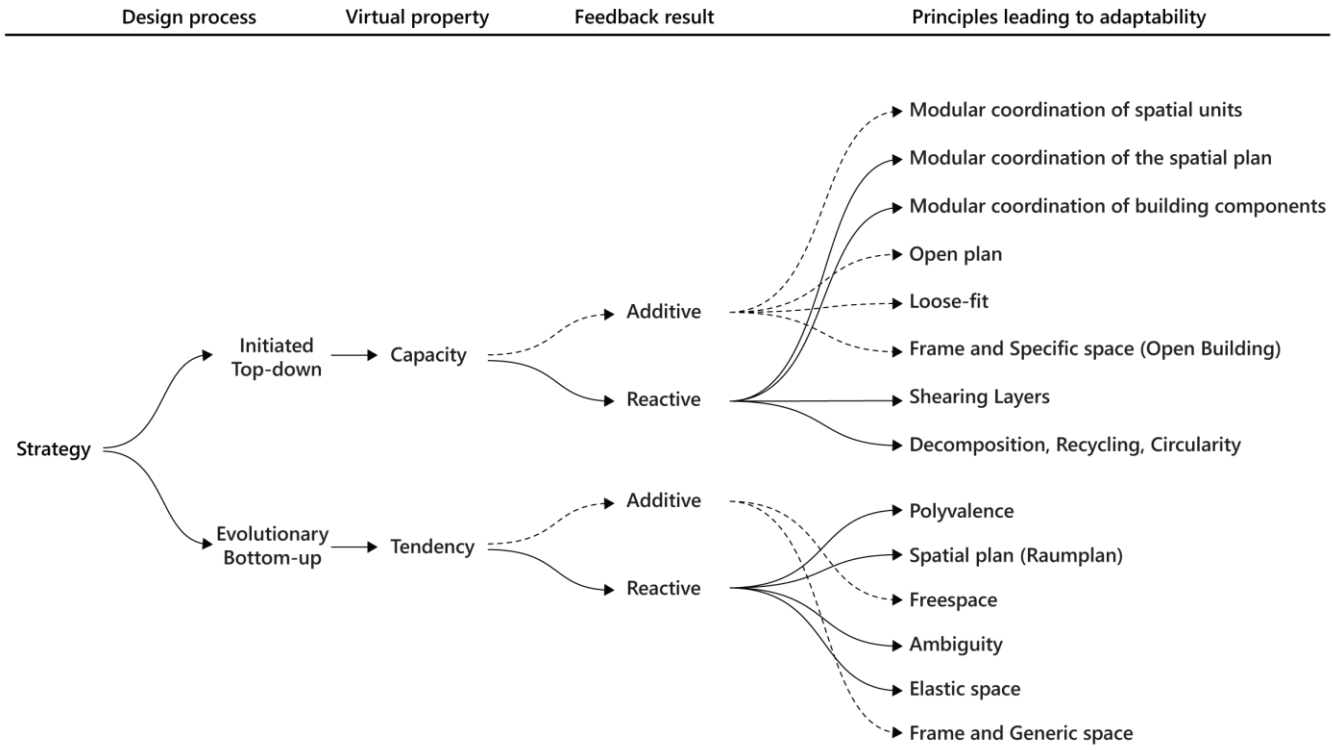

Fig. 3. Decomposition of strategy for adaptable design. The diagram shows the relationship between capacity and tendency in relation to feedback results and different principles leading to adaptability. (Source: Lüley, 2023)

Fig. 4. Adaptable house NO.2 – villa with a studio for a photographer and his family. The evolution of the design shows a) a preliminary solution with operation enabling adaptability. Adding access points and rotating the staircase enables the future division and different use weight of the rooms or units; b) and c) new access points and polyvalent staircase can divide the house up to 4 independent units. (Source: Lüley in cooperation with Eckhardt studio, 2023)

Parking garages conceived in this way (of course with a certain degree of economization and adaptation to other climatic scales such as the case study of 9th Avenue Parkade by Canadian architects Kaspian&5468796 Architecture) are a great example of ephemeral use, structures for the city, users, mobility, and future interpretation. Another use of the concept of ephemeral occupancy could be a solution to the issue of rental apartments, where the construction system itself would be stratified in the

form of shared ownership. We propose the construction of a generous structure that would belong to the state; for example, adaptable infill structures made of light, sustainable and local materials would belong to the municipality or city, and the equipment would be the property of either the tenants or the organization that would take care of the object. Such transformation of Friedman's spatial city into the current context and scale could be able to provide a variety of solutions.

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ISSN 2729-7640

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ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0011

Innovations in sacral architecture: The resettlement churches of Emil Belluš

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Article information
Sent: Apr 16, 2023
Accepted: Jun 5, 2023

Abstract: The 20th century saw a great breakthrough in architectural innovation; however, this was less evident in sacred buildings. The Evangelical Church of A. C. was inherently innovative, which was also reflected in the architecture of its churches. The innovativeness of the evangelical denomination can be seen in completely new spatial concepts, morphology, the use of new constructions, materials and building technologies, including modern technical equipment of sacral spaces. This article focuses on two buildings by one architect—Emil Belluš (1899-1979), a doyen of Slovak architecture, whose work significantly influenced the field of sacral architecture of the Evangelical Church of A. C. Innovative contributions can first be seen in the design and later in the construction of two evangelical churches in Nesvady and Senec, in Slovakia, built in the 1950s. The churches were part of a project originally intending to build ten new churches for people who had been resettled as part of the government's post-war migration policy. For several decades, these two churches have remained the last addition to sacral buildings constructed in Slovakia. The article deals with the reasons for the creation of church plans, the socio-political situation of that time, circumstances of their construction, and spiritual ideas and creative contribution of the architect Emil Belluš. The research is based on a detailed study of these temples, their layout, and the use of new technologies, construction principles, morphological elements, and other architectural means in which we seek and define an innovative approach to creation.

Keywords: innovations, sacral architecture, evangelical church, Emil Belluš

INTRODUCTION

The only sacred buildings constructed by a great architect. This is true for two evangelical churches in small towns in the south of Slovakia. Emil Belluš is primarily known as a prominent architect of a wide range of buildings in both the public and private spheres (Dulla, 2010), but looking at the scope of his work in the field of sacred architecture clearly shows his interest in and relationship with this area, which is reflected in several designs for parishes of different denominations. Considering the appreciated qualities of his work in the field of profane architecture, we can assume that these were similarly transferred to the sacred area of work of Belluš (Krivošová, 1999). In this context, however, we cannot neglect the social situation, which largely influenced and limited the construction of churches in the period under study. The period of the 40th and 50th years of the 20th century was not entirely favourable for the field of sacred architecture. The rapid increase in the construction of evangelical a. c. churches in the 1930s (Fig. 1), caused by the increase in the number of worshippers belonging to the Evangelical Church of A. C. in Slovakia, was gradually slowed down, primarily due to the ongoing Second World War and later due to changes in the political regime.

However, despite its strict principles, the changing political situation led to the origin of two evangelical churches of two evangelical churches in Nesvady and Senec. Both churches were built according to the same plans, with only minor modifications due to the regional characteristics of the selected towns (Fig. 2). It was not uncommon to use the plans of another church and partially adapt or improve them in a new location; this can be seen, for example, with the architect Michal Milan Harminc (1869–1964) in his designs for evangelical churches in Veľký Grob or Žilina, based on the model of the church on Legionárska Street in Bratislava (Pohaničová, Vodrážka, 2018), all in Slovakia.

The aim of this article is to examine and define the manifestations of innovation in the architecture of the two evangelical churches, the creative contribution of the architect Emil Belluš to sacral architecture, but also the influence of the client—the Evangelical Church of A. C. Through a detailed examination of the tectonics of the churches, their layout, the materials used, morphological elements, design principles and technical equipment, we are looking for innovative ideas and principles that bring a change or progress in sacral architecture.

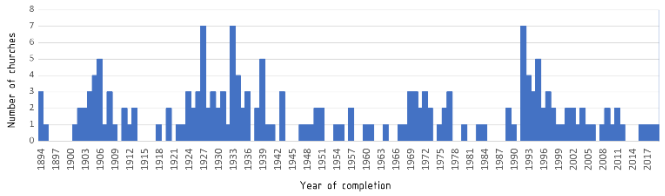

Fig. 1. The frequency of evangelical churches built in the 20th century in Slovakia. (Source: Búliková, 2023)

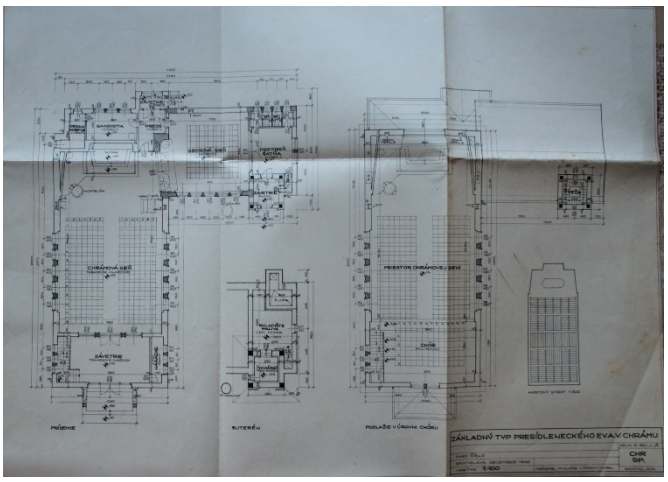

Fig. 2. Original floor plan of resettlement churches. (Source: Archives of Church in Nesvady, Slovakia, 1949)

HISTORICAL CONTEXT

After the Second World War ended, there was a period of great migration between European countries. The territorial and administrative structure of the countries has changed, and new borders have been drawn. With the regaining of its independence, the Czechoslovak Republic also established its own migration policy with several objectives. Among the most important ones were to increase the population of the state, in view of the war casualties, at the same time to prevent the assimilation of the population abroad and to raise national awareness among the citizens. Part of the 'cleansing' of the state was the expulsion of the inhabitants of foreign nationalities to achieve the ideal of a national state of Slovaks and Czechs.

Therefore, resettled Slovaks were mainly placed in the southern regions of Slovakia in order to strengthen the position of the established border with Hungary (Šutaj, 2010). Thus, on 27 June 1946, an agreement between Czechoslovakia and Hungary was made, which spoke of the exchange of an equal number of the population of Hungarian nationality for the population of Slovak (and Czech) nationality. (Ministry of Foreign Affairs, 1946) In April 1947, more than 95,000 citizens of Slovak and Czech nationality expressed an interest in emigrating from Hungary, but due to obstructions by the Hungarian authorities, only just over 70,000 of them left in the end (Šutaj, 2010). They returned to villages, mainly in southern Slovakia, where Evangelical Church of A. C. (hereafter also ECAC) congregations were restored or re-established. The parish in Nesvady was founded in 1948 and in Senec in October 1947.

On 20 December 1948, the Construction Committee of the ECAC in Slovakia commissioned architects Emil Belluš and Eugen Kramár to design the Evangelical resettlement churches. At that time, the ECAC also expressed the request *"whether it would not be possible to build these churches according to a uniform type and a uniform project, enlarged in some places and reduced in others according to the number of churchmen in the congregation."* One of the reasons was to save finances by using one project for several temples, but we can assume that the church or some of its leaders intended to create a completely new type of Evangelical temple, the so-called resettlement temple, referring to the type of tolerance or articular temple (Volková, 1999). The original drawings are also labelled as a "Basic Type of Resettlement Temple" without specifying the location (Fig. 3).

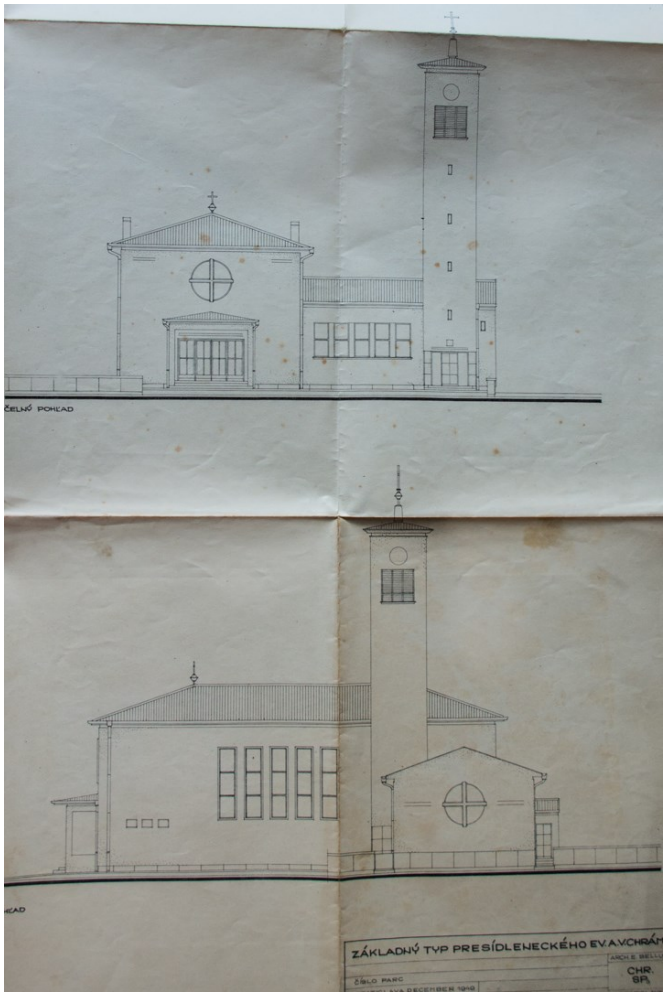

Fig. 3. Original views of resettlement churches. (Source: Archives of Church in Nesvady, Slovakia, 1949)

The task of the architects was to design plans for ten new churches in the villages where Slovaks moved in, and the congregations grew in number. These were churches for the towns and villages of Kalná, Kolárovo, Matuškovo, Nesvady, Nové Zámky, Mostová, Senec, Sládkovičovo, Tešedíkovo, and Želiezovce. It was envisaged that later on, more such churches would be gradually built to increase their number to a total of 20 or 22. (Jančík, Kožuch, 2017). At the turn of 1948 and 1949, the Church announced a collection to finance the building of new churches under the title "Church of the Returned Brethren". As a part of the event, a commemorative postcard picturing names of ten villages, in which the construction of new churches was planned, was sent out (Fig. 4). According to the contemporary witnesses, the goal was to raise more than 10 million korunas and the collection was very well received by the churchmen (Tomka, 2001). However, these ambitions were soon dampened due to significant political changes. Thus, all prospects for the construction of new churches, despite their importance and necessity for the resettled evangelicals, were very quickly terminated.

Fig. 4. A commemorative postcard with the names of the ten villages. (Source: Archives of Church in Nesvady, Slovakia, 1950)

THE FIGURE OF EMIL BELLUŠ

Emil Belluš is one of the founding fathers of Slovak architecture, together with other important architects (not to mention M. M. Harminc, S. Jurkovič, etc.). Over the course of his life, he designed and built several dozen works with a wide variety of themes. He worked on public buildings, housing, technical buildings and, last but not least, sacral architecture. His portfolio includes iconic buildings of his time, such as the National House in Banská Bystrica, the Peasant House in Bratislava, the Municipal Savings Bank in Martin, the National Bank of Czechoslovakia in Bratislava, the Water Reservoir in Trnava, the Pavilion of the Theoretical Institutes of the Slovak Technical University in Bratislava (now Faculty of Architecture and Design, STU), many of which have the status of national cultural monuments.

Emil Belluš was born on 19 September 1899 in Slovenská Ľupča. His relationship with architecture and the Church was formed during his childhood and youth in Banská Bystrica (Dulla, 2010). From an early age he was interested in drawing and art and was encouraged to study painting at the university. After graduating from grammar school, however, he decided to study architecture at the Technical University in Budapest, from which he later moved to Prague (Šlachta, Gašparec, 1992) due to the change in the state system after the end of the Second World War. Then his steps directed to Bratislava, where he established his own studio in 1925, but he also became a co-founder and an active member of the Society of Slovak Artists. He married the daughter of an Evangelical pastor (later a professor at the Faculty of Evangelical Theology in Bratislava), Ján Jamnický (Krivošová, 1999), that was perhaps the result of his interest in and relationship to this denomination and its personalities. However, Matúš Dulla says that we have no knowledge of political or religious beliefs of Belluš, nor does Belluš himself mention them in his personal memoirs, although he was a baptised evangelical (Dulla, 2010).

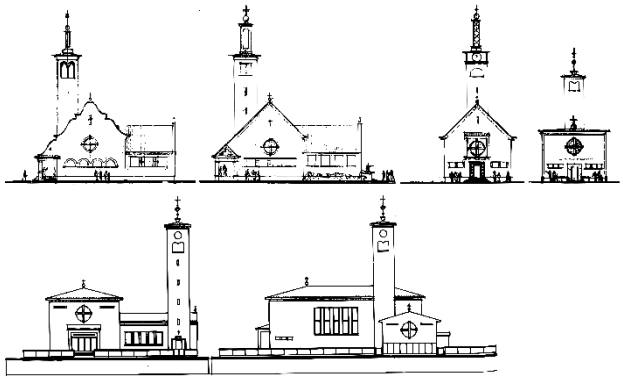

Fig. 5. Original propositions of resettlement churches by Emil Belluš. (Source: Archive of Slovak National Gallery, Slovakia, cat. n. A-772/3, A-772/4, 1950)

Fig. 6. An exterior detail of an evangelical church in Senec. (Photo: Lívia Búliková, 2022)

Thus, his work includes not only profane buildings of a predominantly public character, but also various designs for sacral buildings, mainly for the Evangelical Church of A. C. From an early age he took part in competitions—for the evangelical church in Trnava (built in 1924, architect J. Marek), for Legionárska Street in Bratislava (built in 1927–1931, architect M. M. Harminc) or in Žilina (built in 1934, architect M. M.

Harminc). He is the author of designs for the choir house in Brezno, the Evangelical rectory of the dormitory on Vajnorská Street in Bratislava, as well as for an Orthodox Church on Záhradnícka Street in Bratislava. None of these projects were implemented, but this did not discourage him from continuing his active work. Perhaps it was these earlier experiences and contacts that brought him a commission to design new resettlement churches at the end of his creative period. Several different variants emerged, initially based on more historicist forms and ornaments, mainly in the design of the façades. The material division into three interconnected parts (church, prayer room, tower) was a fundamental element of the design and was reflected in each of the proposed solutions (Fig. 5). However, decorative elements are not found in the final project, perhaps the only reminder being the tympanum in the façade of the church in Senec (Fig. 6). The form of the temples and their façades thus crystallised into a legible functionalism form, which has been preserved in the temples up to the present days. The churches, despite several reconstructions, have maintained their original mass-spatial structure.

Belluš on the construction of an evangelical church

Thanks to the preservation of a transcript of the architect's lecture and its subsequent publication in the magazine Projekt (1999), on the occasion of the centenary of the architect's birth we gain a direct insight into the soul of Belluš and his relationship to architecture of the Evangelical Confession. The lecture was given at the Štúr Evangelical Society in Bratislava on 27 January 1943, years before the idea of resettlement churches was even conceived, but already demonstrating the architect’s years-long experience in previous architectural and theoretical work and writings.

In his lecture, entitled "On the construction of an evangelical church" Belluš comments objectively, if rigorously, on the state of the art in the design and construction of new evangelical churches at the time. He is particularly critical of the immutability and template layouts, the oscillations between historicism and misinterpreted functional modern art. He considers the layout arrangement to be the most fundamental component of the temple building, which is based on the unique and individual rules and dogmas of its denomination or cult. Specifically, the Evangelical Church of A. C. uses the form of primarily interpreting and listening to the Word of God, to which the creation of the gathering space—the temple—should be directed so that the worshippers can concentrate on the Divine Word interpreted from a designated place. It highlights the unique approach of the Evangelical Church of A. C., its worldly outlook and striving for directness of action, realism, and the need to return to purity and simplicity in listening to the Word of God. Evangelical churches should therefore reflect these teachings in mass-spatial and layout form.

He also mentions the Evangelical pastor Fedor Ruppeldt, who published his own text in the magazine Cirkevné listy (Church letters) in 1925, which was supposed to help with the construction of evangelical churches. The treatise is a comprehensive conception of the relationship between spirituality and architecture, emphasising the importance of the connections between the different parts of the whole. Among other things, for example, it presents the amphitheatre layout as the most appropriate arrangement with regard to the concept of the liturgy. It was used by Josef Marek in the construction of the church in Trnava following up on the aforementioned text (Haberlandová, 2015). Belluš, however, disagrees with the idealisation of such a layout and offers a more appropriate solution, especially for congregations with a smaller number of worshippers, in simpler forms, but with a reasonable layout of the interior furnishings.

Although he does not directly use the terms tradition and innovation, the text shows the architect's attitude towards both phenomena. There is a strong push to use new structural systems, new forms of layout that meet the needs of modern congregations. He criticises the lack of use of these achievements, which have long been active in the world of profane architecture, and a kind of reticence to use them also in sacred architecture. He demands quality workmanship and well-executed work even when using new and perhaps more complex design and construction principles. He justifies this on the grounds of factuality and the intention to preserve the character of the temple as a permanent structure. The classification and use of older styles is also interesting. Belluš talks about how the styles of buildings have been continually stabilised, he sees the building of the temple as a changing and unfinished process. He concludes with a strong rejection of the use of historicising Gothic, Baroque or Romanesque styles in contemporary architecture, which he attributes to the ignorance of their detailed principles in the hands of contemporary builders (Belluš, 1999).

The author's enthusiasm and deep immersion in the field of evangelical sacral architecture are clearly evident in the text. Emil Belluš' aim was to make an appeal to use new constructions, principles, and innovative layouts that would also meet the needs of the churchmen of his time. Overruling to all practical ideas stands the idea of creating a high quality and valuable sacred space, which, by itself, would be able to support and positively influence the religiosity and culture of the society.

THE RESEARCH PROCESS

To search for and identify innovative trends in the architecture of the two selected churches in Nesvady and Senec, we used different research methods that were interrelated and intertwined. In particular, we focused on architectural-historical research in situ. In this context, the oral history method was also used, evaluating the unique memories and knowledge of the parish priests, which updated and supplemented the knowledge already acquired. By in-situ research in temples of the Evangelical Church of A. C., conducted in an intimate and directly participatory way, we were able to obtain even seemingly minor but valuable information complementing the overall picture and knowledge about the churches.

We focused on a detailed characterisation of the building, its construction system, layout arrangement, mass-spatial composition, materials used and other aspects that could not be described without a direct visit. We have not overlooked any legible changes or renovations compared to the original plans and documents of the temple at the time of its completion. Information of a factual nature was sought in period archives, as well as in current monographs, collections, or other publications, particularly concerning the construction, financing, personalities involved and other circumstances. Archival research was closely linked to the in-situ research, as priests keep their own archives in their parishes, so we had access to original drawings directly from the pen of the architect Emil Belluš, or their reproductions. These and other materials were the starting point for naming the researched innovative trends in the sacral architecture of the Evangelical Church of A. C.

COMPARISON OF EVANGELICAL A. C. CHURCHES IN NESVADY AND SENEC

Due to the high degree of similarity and identity between the two temples, we will characterise and evaluate them together, highlighting any possible differences directly in the individual areas of examination (Fig. 7).

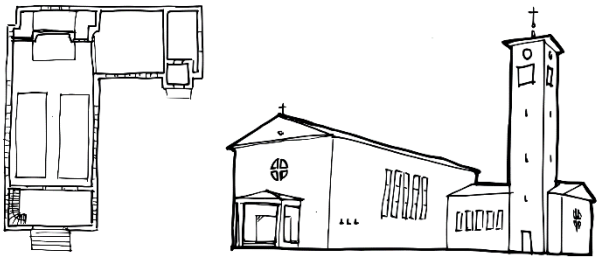

Fig. 7. A sketch of floor plan and perspective of the Senec evangelical church, Slovakia. (Source: Búliková, 2022)

The characteristics of the temples

When comparing the evangelical churches in Senec and Nesvady, it is interesting to note the location of the two buildings, which depended on several factors, especially the choice of available land. The two churches have the same orientation to the street line and are set further away from it, but their effect on the urban development is different. Despite its status as a town, Nesvady is characterised by a predominantly rural form of development. The evangelical church is located outside the town centre, in one of the streets formed by a row of detached family houses. The church looks similar to a house at first sight. Its height does not significantly exceed the surrounding buildings, but it differs from them by the tower, which is situated deeper at the lot. The church is surrounded by a parish garden, which was and is an important part of the building complex of the Evangelical Church of A. C. There are now tall trees that partially block the direct view of the whole mass of the church. The church in Senec is situated on a street corner, next to a larger historic building of the grammar school. The streets have a denser urban character, partly due to their more central location within the town. The position of the church in the corner makes it more open to the passers-by, despite the dense greenery of the parish garden, and the church thus clearly presents its function (Fig. 8).

Functionalism manifestations can be read directly in the material composition of the church, which consists of three parts. The annexed choir room, as an important part of the functioning of the Evangelical congregation, directly to the church was an innovative feature. The church is made up of the nave, the presbytery, which is perpendicular to the position of the altar, and the bell tower, which is accentuated in the corner of the choir room (Fig. 9). The connection of the choir room with the main auditorium of the church has already been used in the Slovak environment by the architect M. M. Harminc in the evangelical church in Žilina (Pohaničová, Vodrážka, 2018). Examining the exterior appearance of the churches in Nesvady and Senec, the first thing that distinguishes them is the form of the roof, where the church in Senec has a gabled roof with a tympanum and an elliptical window in the façade, while the church in Nesvady has a more classical hip roof, perhaps because of its adaptation to the surrounding rural buildings (Fig. 10, 11). The same is true of the bell tower; in Senec the low hipped roof looks almost flat, in Nesvady it is significantly higher and more legible.

The simple, open, single nave of the church is covered by a wooden coffered ceiling, freeing it from other structural elements and leaving the space clear, with a direct view of the altar (Fig. 12). Above the main entrance, there is a matroneum—a choir illuminated by a round window, typical of functionalism (Fig. 13). From the lowered and more enclosed space of the entrance hall, there is a view through the glass wall and passageway to the open space of the main nave, adding to the majesty of the whole temple. The positioning of the organ in the altar area leaves more space for seating in the choir above the entrance, moving it away from its typical position on the sides of the nave.

Krivošová writes about the central part of the church: *"He framed the altar with wooden panelling into which he inserted the organ as a part, as a gradation, as an enhancement of the artistic effect of the altar—just as music and religious song are part of the Divine Service."* (Krivošová, 1999) Instead of the altarpiece there is a stained-glass window made by the academic painter Jarmila Zábranská and professor Vladimír Sychra (Krivošová, 2001). Behind it there is a large window that should provide light (Fig. 14). However, in the church in Senec, due to its poor technical condition (leakage and thermal discomfort), the window has been replaced by a window with a full plastic filling without illumination. The window has been preserved in Nesvady. The illumination of the nave is provided by a series of narrow vertical windows on each side of the nave. The window and door openings have an appropriate proportion and placement in relation to the mass of the church, in keeping with the functionalism tendencies of the time.

Fig. 8. An exterior overview of the Senec evangelical church, Slovakia. (Photo: Lívia Búliková, 2022)

Fig. 9. Historical photography of an evangelical church in Nesvady. (Source: Archives of Church in Nesvady, Slovakia, ca. 1951)

Fig. 10. A frontal view of the Nesvady evangelical church. (Photo: Lívia Búliková, 2022)

Fig. 11. A frontal view of the Senec evangelical church. (Photo: Lívia Búliková, 2022)

Fig. 12. A view of frontal altar space of the Nesvady evangelical church. (Photo: Lívia Búliková, 2022)

Fig. 13. A view of a matroneum of the Nesvady evangelical church. (Photo: Lívia Búliková, 2022)

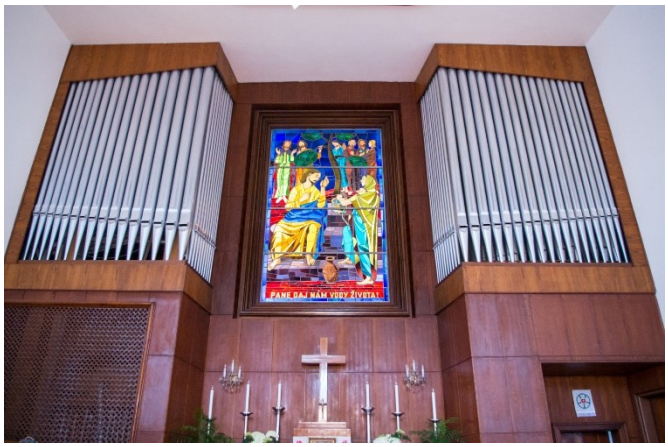

Fig. 14. A view of frontal altar space of the Senec evangelical church. (Photo: Lívia Búliková, 2022)

The structural system consists of reinforced concrete frames supplemented by infill brickwork. The temple was plastered with a rough concrete plaster in a brown-grey colour shade. In Senec the façade has been preserved, in Nesvady the original colour was changed to light blue during a more extensive reconstruction in 2001 (Fig. 15). This colour has significant symbolism in Christianity, representing celestial purity, clarity and hope (Tomka, 2001). The roofs of the churches are made of standing steamed metal, red in Nesvady and grey in Senec. All interior elements are made of the same material, dark stained wood. The space is dominated by a coffered wooden ceiling, which is echoed in the wall behind the altar, panelled by the same wood from floor to ceiling. The pews, choir stalls, pulpit and baptismal font are also made of the same material. A similar finish is applied to the door structures (Fig. 16). Originally, the windows of both temples were made of aluminium, precisely because of the slenderness and lightness of their construction, but this proved unsatisfactory over time, especially from a thermo-technical point of view. The worshippers decided to replace them with new plastic ones. However, despite the similar colour scheme, they have lost the lightness and grace of the original aluminium construction (Fig. 17).

Fig. 15. An exterior view of a choir room with a tower, evangelical church in Nesvady. (Photo: Lívia Búliková, 2022)

Fig. 16. A view of a matroneum of the Senec evangelical church. (Photo: Lívia Búliková, 2022)

Fig. 17. An interior view of windows of an evangelical church in Nesvady. (Photo: Lívia Búliková, 2022)

CONCLUSION

In conclusion, we can evaluate that both evangelical churches, in Nesvady and Senec, were carriers of architectural innovations, ranging from mass-spatial design, construction systems, to materials and layout. The architect Emil Belluš created a functional church, a complex that provides space and facilities in a form that responds to current liturgical and social needs. Today, 70 years later, the timelessness of the functionalism approach is enhanced by its age and the passage of time, which in 2019 translated into the declaration of the church in Nesvady a national cultural monument. It will only bring positive effects if, in time, the same occurs for the church in Senec. The inclusion of the church in the list of National cultural monuments in Slovakia thus recognised the unique qualities of evangelical sacral architecture and the mastery of Belluš' professional thinking. In spite of their location in small villages in the south of Slovakia or their more moderate expression, the valuable contribution of these churches (we can certainly refer to both of them although only one is listed) to the cultural and spiritual society was acknowledged.

We are not referring to innovations in the sense of their first use; we focused on the translation of new approaches in the world of architecture into the field of evangelical sacred work. The architect Belluš used morphological elements of the new style, functionalism, which also reflected the programmatic content in the mass-spatial division. He was not afraid to bring new matters, materials, and systems to the traditional form of the church that were up-to-date and of high quality. The reinforced concrete structural system was not used for the first time by Belluš; M. M. Harminc used a similar design in the church on Legionárska Street in Bratislava (Pohaničová, Dulla, 2014); residential and civic buildings had been based on these principles for years already. However, their use in the construction of sacral buildings was still not quite common and established. The quality and accuracy of the overall design is evidenced, for example, by the location of the choir room within the church and its extensive use today, where the parishes organise various prayer meetings, children's meetings, and meetings of the young, middle, and older generations. The active use thus confirms Belluš' thesis and insistence on a modern and updated approach to the spatial design of temples.

So how did Emil Belluš and the Evangelical Church of A. C. contribute to architectural innovation? The Evangelical Church was open to development, changes in liturgy, new ideas and the needs of the community. Belluš actively used the resulting demands to devise a new form and method of temple construction and was able to translate them into the design of a

functional and spiritually valuable temple, benefitting from current trends in construction and architecture.

Acknowledgements

This paper was published under the project VEGA no. 1/0286/21 "Innovations in architecture of the 20th century in Slovakia" at the Faculty of Architecture and Design STU and at the Institute of History of the Slovak Academy of Sciences (both Bratislava, Slovakia).

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ISSN 2729-7640

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ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2023 (Vol. 28)
DOI: 10.2478/alfa-2023-0012

Contribution of Rudolf Frič to the social architecture of interwar Czechoslovakia

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Article information
Sent: Apr 14, 2023
Accepted: Jun 6, 2023

Abstract: Social policy in the interwar Czechoslovakia focused on the development of social housing. In Bratislava the establishment of new institutions and the related arrival of the Czech middle class of civil servants induced social change in the city population and its housing conditions. This necessitated the construction of modern residential blocks, which stabilised the internal urban structure and urbanised the outer city. A significant contribution to that field would be attributed to construction entrepreneur Rudolf Frič. Although the Slovak historiography exclusively presents him as a builder of civil engineering structures, his portfolio was more complex. The aim of the paper is to identify and critically evaluate Frič's both architectural and construction work in the field of social housing in interwar Bratislava. The study focuses on projects of housing cooperatives, private rental blocks and partly on examples of city social housing. Cooperatives with the highest socio-economic relevance were set by the Bank of Czechoslovak Legions, for which Frič designed or constructed several buildings, such as the residential urban structure "Legiodomy", housing colony in Koliba or the polyfunctional buildings of Legiopojišťovna and LUXOR. Frič's construction portfolio also includes individual projects of rental houses for smaller cooperatives, both in the compact city centre and at the then urbanising outer city peripheries. A specific case was housing for members of the army, like the residential blocks for military veterans in Bratislava. A critical category was social housing for the poorest and unemployed represented by the City rental house with habitable kitchens and the smallest-size flats. Finally, the paper examines private houses, the rental residential block of Irma Hanke and Helena Hudečková and the Trojan & Švarc polyfunctional department. Frič, as a construction entrepreneur, designed rental houses for his own employees, which all reflect the influence of private investors on the social and urban changes of the then modernising Bratislava metropolis.

Keywords: social policy, social housing, housing cooperatives, block of flats, apartment block, rental house, interwar Czechoslovakia, Rudolf Frič

HOUSING AS THE SUBJECT OF SOCIAL POLICY IN INTERWAR CZECHOSLOVAKIA

Social policy during the First Czechoslovak Republic was characterised by a focus on the development of institutional health and social care and social housing. Thus, the state took over the task previously performed by non-state institutions, philanthropists, and the church. (Falisová, 2004) The task reflected the socio-economic, cultural and political changes brought about by the continuing industrialisation and urbanisation of the population. Social housing was a complex issue that expanded beyond the housing conditions of workers with a view to accommodating the needs of the dynamically growing middle class, especially civil servants.

Bratislava is a special case – with the establishment of the republic, it became the capital of the land administration for Slovakia and the associated state authorities. The establishment of new institutions and the related arrival of the Czech middle class and intelligentsia of civil servants, employees, teachers, and army officers induced a significant social change in the composition of the population as well as the necessary improvement in its social and housing conditions. This necessitated the construction of modern residential buildings and urban units, which stabilised the internal urban structure and urbanised the outer city along the urban radials and in Koliba. (Moravčíková, Szalay, Haberlandová, Krišteková, Bočková, 2020, pp. 589–597) Compared to workers' colonies, which were constructed as a result of Bratislava's industrialisation already at the turn of the century, the new development was directly associated with the social policy of the state and the relevant legislation. The single and generally applicable legislation enshrined framework standards for architecture and urbanism, social standards, as well as legally binding conditions. This gave rise to a unified and binding model of high-quality and accessible social housing.

Social policy and housing development was supported by new legislation; in the second half of the Republic, this was mainly the Construction Act – Act No. 45/1930 Coll. (National Council of the Republic of Czechoslovakia, 1930) Under specific conditions, the Act provided the building owner with a state guarantee for mortgages, a house tax exemption for 15 to 25 years or exemption from other charges. The tax exemption was limited to small and the smallest-size flats; for family houses the limitation was a

habitable space of up to 80m^2 or a maximum duration of construction. The Act provided support primarily for local governments and private building owners, especially individual entrepreneurs, businesses, and the then-progressive newly-emerging cooperatives, which represented a relatively new model of accessible housing. (Haberlandová, 2022, p. 178)

A significant contribution to the construction of accessible social housing and the urbanisation of Bratislava was made by entrepreneur in the field of construction, Rudolf Frič (21 March 1887 Nová Ves pod Pleší – 4 October 1975 Bratislava). Although some of Frič's building projects are well known, his work has not been studied or published comprehensively in the historiography of Czechoslovak interwar architecture. In relevant papers he is mentioned only marginally and exclusively as a builder. The present study is grounded in research into Frič's architectural and construction projects of residential architecture. Its focus lies in projects of cooperative and private rental blocks, or residential colonies, and partly in examples of urban social housing. The aim of the paper is to identify and critically evaluate Frič's architectural and construction work in the field of social housing in interwar Czechoslovakia in the social and urban context of Bratislava.

MATERIALS AND METHODS

The issue of the welfare state and forms of social housing was characteristic of 20th century architecture. The issue 3-4/2022 of the Architektúra & urbanizmus scientific journal also deals with these topics (Dudeková Kováčová, Haberlandová, Benko (eds.), 2022). The papers focus on social housing, health care and their reflection in land planning. The case study by Katarína Haberlandová deals with housing cooperatives and the supporting legislation. (Haberlandová, 2022, p. 174-185) Period Slovak architectural journals also reflected the issue of social housing, particularly Slovenský staviteľ, which partly forms a basis of the present research. As founder of the journal and head of the Builders Community Land Department, Frič himself published in it, too. The starting point of the study is a company publication by Ján Slabihoud (Slabihoud, 1947), which contains a list of Frič's works with a selected graphical appendix. The debt of Czech and Slovak historiography towards Czech and Moravian architects of Slovak interwar architecture, which includes Frič, is reflected in the collective publication Zapomenutá generace. (Dulla, Mrňa, Haberlandová, Ščepánová, Pavel, Bartošová, Pohaničová, Šoltésová, 2019)

In their holistic historiographical work, Matúš Dulla and Henrieta Moravčíková (Dulla, Moravčíková, 2002) provide an analytical overview of dozens of Frič's building projects including context explanations. However, his contribution is not directly mentioned or evaluated. The recent monograph Bratislava (un)planned city (Moravčíková, Szalay, Haberlandová, Krišteková, Bočková, 2020, pp. 589-597) examines urban housing in the context of period urbanisation, land planning, urban typology, and legislation. Specifically, the urbanisation of Dunajská štvrť (Danube District), where Frič's residential projects are situated, is the subject of the study by Katarína Haberlandová. (Haberlandová, 2021, pp. 14–20) Similarly, the issue of social housing in that period is described in the thematic chapters of two publications on the architecture of interwar and wartime Bratislava. (Szalay, Haberlandová, Andrášiová, Bartošová, Bogár, Králik, Urban, 2014, pp. 106-213)

The paper uses qualitative architectural and historical research with a continuous validation of the results. The main method of the study was archival research carried out in the State Archives in Bratislava, Slovakia, and the Bratislava City Archives in combination with the study of the above-mentioned publications. Complementary methods included comparison, photography, field research, and oral history, which was limited to Frič's surviving employees and tenants. The initial identification of the buildings was performed by combining archival research and comparison of Slabihoud's list with holistic historiographical publications. This allowed for Frič's architectural and construction projects to be distinguished and his direct contribution to be assessed.

HOUSING COOPERATIVES AND RUDOLF FRIČ

Cooperatives were established in large numbers in the early 1920s and most of them with the aim of building a specific residential block. There were much fewer large cooperatives that would systematically build several residential and commercial structures. These were represented by cooperatives with a high economic and socio-economic relevance, and an equally high political significance. They included especially cooperatives founded by the Bratislava branch of the Bank of the Czechoslovak Legions (Legiobanka), namely the Construction Cooperative of the Czechoslovak Legionaries and the Construction Cooperative of Civil Servants and Railway Workers. (Haberlandová, 2022, p. 178)

Cooperatives had several benefits. They provided their members with more affordable social housing, and unlike in the case of workers' colonies, without a direct dependence on a specific employer. After paying a registration fee and a non-refundable deposit, the members received a share in the cooperative and an ownership right to a flat. In case of losing a job and not being able to pay the cooperative fees and rent, the cooperative members lost their membership along with their housing. Unfortunately, this shortcoming, which manifested itself during the economic crisis, affected the most vulnerable groups of people, which is in conflict with the very concept of social housing. The financial advantage of cooperatives also lied in an advantaged provision of loans by banks and a higher financial stability of the cooperative itself. The cooperative's financial capital consisted of registration and membership fees, term deposits, non-refundable construction deposits, loans, excess profits, donations, and other funds. (Haberlandová, 2022, p. 178) As required by law, a cooperative had an elected board, an oversight committee, and a general assembly. Finally, cooperatives formed communities with deeper relationships and organisation. Community life meant identifying oneself with a place and a shared responsibility for the cooperative and its property.

The Bank of Czechoslovak Legions housing cooperatives

In the beginning, Frič's work in the area of social housing was indeed closely linked to cooperatives, especially legionary and railway ones. After coming to Bratislava, Frič and Pavel Varsík (1891–1939) (Čaplovič, 2003, pp. 639– 642) directly contributed to establishing the local branch of the Bank of the Czechoslovak Legions ("Legiobanka"), which, as the base of Slovak banking, consolidated economic conditions in Slovakia. (Khýn, 1947, pp. 16-18) The bank's key task was establishing businesses and cooperatives, which fell directly under the responsibility of the industrial department led by Frič. Cooperatives established in this mode formed the basis of the social policy of the bank and its affiliated institutions.

The architecture of the bank and its institutions, including the cooperatives, reflected the bank's position of a socio-economic and political pillar of the new state. This was expressed symbolically by adopting the rondocubist architectural style. Projects were created directly in the technical department or were outsourced to private architectural firms. An early project of a cooperative's social housing was the terraced development of two-storey family houses with one and two-bedroom flats in Tehelná and Kukučínova streets (1921) in the then suburbs of Bratislava. The

flats had local heating, separate sanitary facilities, and a maid's room. The architecture, still made of bricks, had a modest expression with a regular rhythm of polygonal bay windows. (Fig. 1)

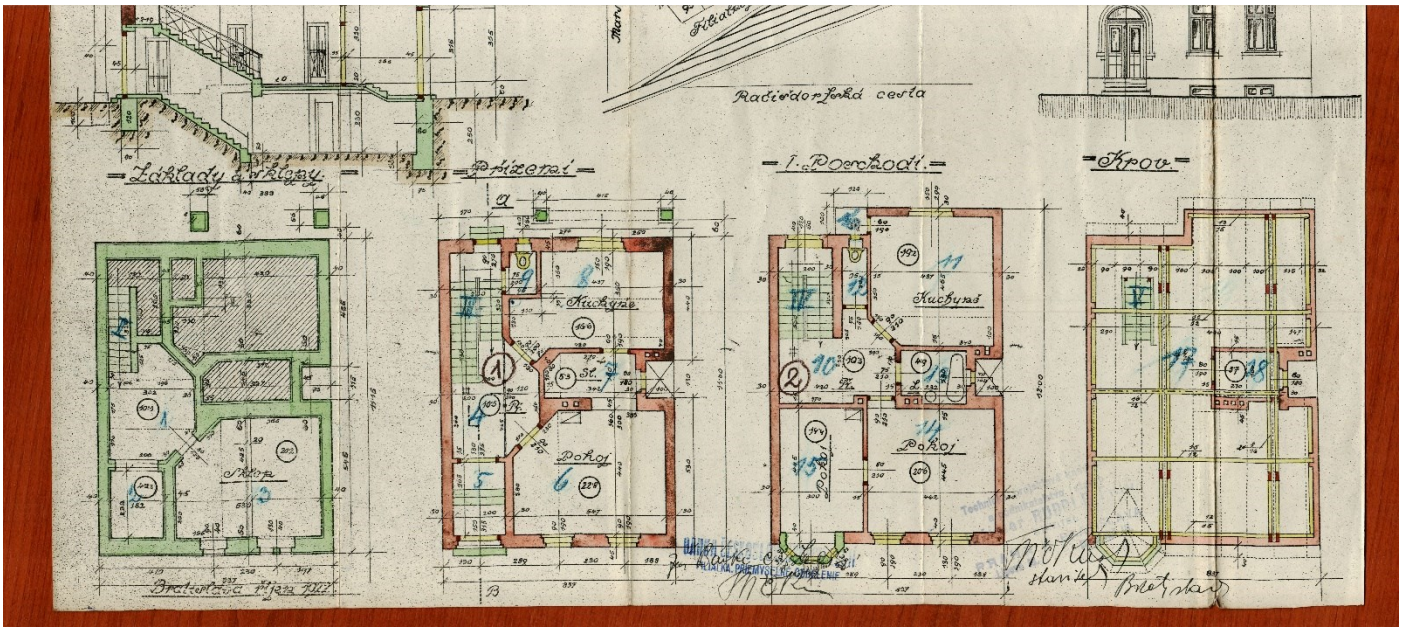


Fig. 1. Terraced houses in Kukučínova Street, Bratislava. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 196, no. 1771, 1921)

After leaving "Legiobanka" and founding his own practice, Frič designed and constructed also buildings other than residential, for the cooperatives and enterprises of the bank. The most extensive block development of residential houses, the so-called "Legiodomy" (1923–1924), was already managed by Frič's private firm following the project of Dušan Jurkovič (1868–1947) and Jan Pacl (1877–1938). (Bořutová, 2009, pp. 266–270) The traditional urban scheme of four blocks of five to seven-storey rental houses urbanised the former Bratislava suburbs and pastures along the Račianska radial road (then the road to Račišdorf). The architecture did not correspond to the bank's characteristic rondocubism, but to Jurkovič's characteristic style with allusions to folk patterns, such as the layout with a large, illuminated square hall and the morphology of the façade. Despite the traditional architectural-urban design, the "Legiodomy" authentically materialised the bank's social policy, offering the then standardized one- and two-bedroom flats with local heating and their own sanitary facilities.

In the early 1930s, Frič's office designed and built a legionary colony of family houses with a functionalist elementary school in the newly-founded Baťov (historically Batu) in Subcarpathian Ukraine (historically Carpathian Ruthenia) for the bank. The town was founded on the railway section Chop – Mukachevo connecting Košice with Lviv. The town had a strategic location on the railway and adjoining the Hungarian border, both from the military and economic point of view. The loose development of isolated standard single-storey family houses with one- and two-bedroom flats formed the urban and social basis of the community settlement. The colony and the town itself are among the few examples of planned Czechoslovak settlements in Subcarpathian Ukraine. It thus provides a potential for further research. (Popelka, 2013)

On the threshold of the Second World War, when Frič's firm concentrated on the construction of transport and security infrastructure, it carried out the last two projects for the Legionary Cooperative in Bratislava. At the corner of Vajanského nábrežie and Kúpeľná Street, a polyfunctional residential house of the Legiopoisťovňa (1939) was built according to the project of the Prague architect Vojtěch Kerhart (1892–1978). (Fig. 2) The building with six stories on average, a colonnade in Kúpeľná Street and an elevated corner, together with the neighbouring building of the Kotva Insurance Company (1930, Bedřich Brettschneider) created an accentuated intersection of the two streets and stabilised the newly-urbanised Danube embankment. The position at the embankment and high groundwater level required caisson foundation, in which Frič's company has specialized since the construction of the Slovak National Museum (Michal M. Harminc, 1926). The second project is the polyfunctional LUXOR department store (1939) designed by Jan Víšek (1890–1966) in Štúrova street. (Víšek, 1945) Similarly to the previous building, this one was built on an important urban axis of a compact city centre that was undergoing modernisation. Despite the multiple functions with a predominance of offices and commercial spaces, the law made it possible to obtain tax relief for social housing even for these buildings. At the same time, both buildings simultaneously present the peak of the social and economic prosperity of the legionary institutions embodied by the already mature functionalist architecture.

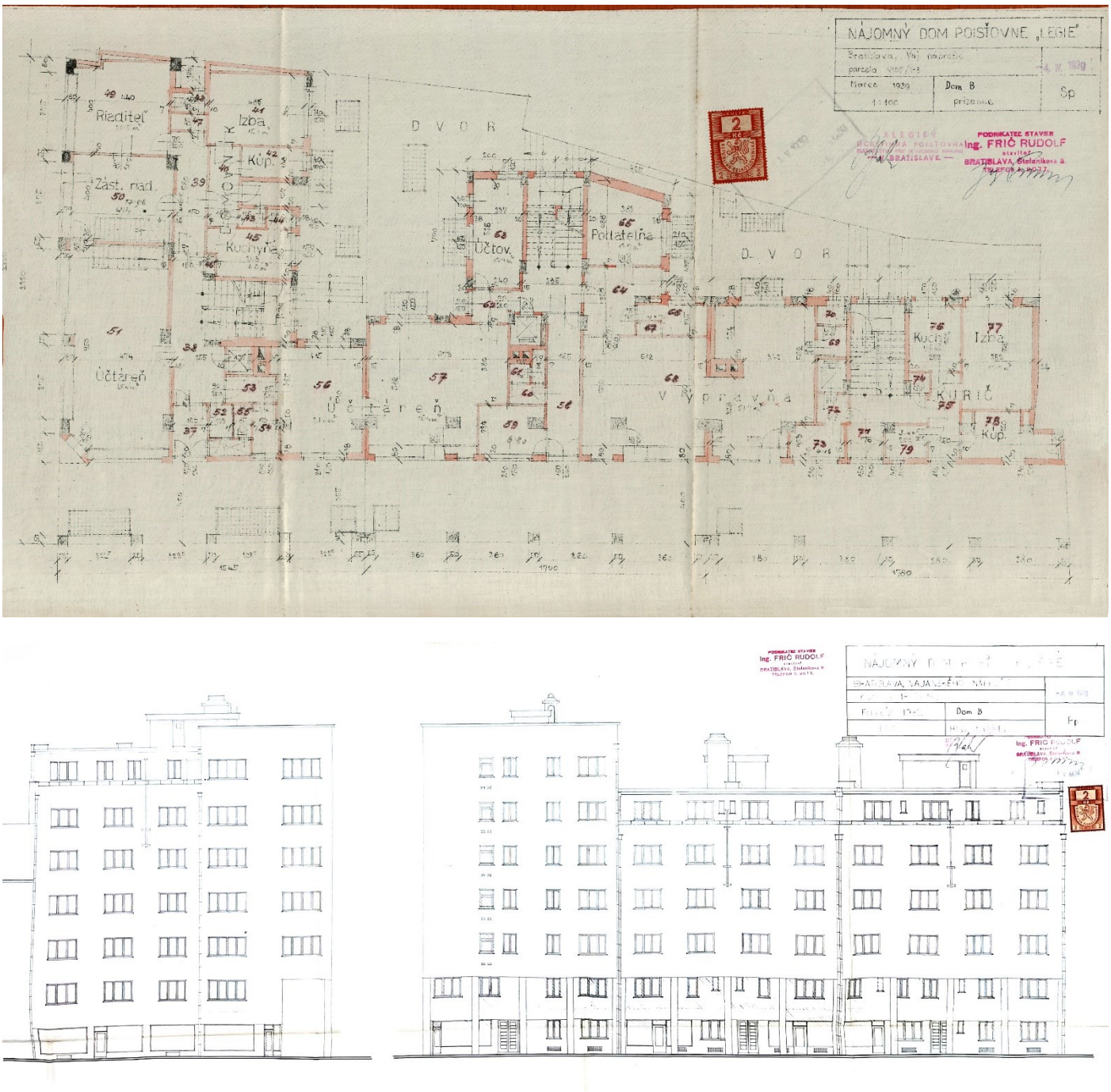


Fig. 2. Polyfunctional residential house of Legiopoisťovňa in Kúpeľná Street, Bratislava. Above: ground-floor plan; below: street elevation. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 209, no. III-89, 1939)

Housing cooperatives of civil servants and railway workers

In the 1920s, Frič was simultaneously designing and building co-operative rental houses for the Construction Cooperative of Civil Servants and Railway Workers. The State Railways were one of the most prosperous businesses in Czechoslovakia and they ensured the highest quality of social care for civil servants. (Haberlandová, 2022, p. 178) The railways are also connected with Frič through the personality of Ján Slávik (1886–1953), the director of the State Railways, who was his close friend and a co-father-in-law. Frič's work for the cooperative of railway workers, which has not been examined in much detail, is the project and construction of a colony of terraced houses in Koliba (1923). (Fig. 3) The colony fills the block between Jeséniova – Hlavná and Tretia – Bellova Streets on the then still non-urbanised suburban slopes. It consists of smaller two-storey family houses and semi-detached houses in combination with three larger villas. The layout of the houses predominantly includes two rooms, a kitchen, sanitary facilities, and a mansard roof. The urbanism is based on the ideas of the garden city and the receding workers' colonies. Frič applied a similar concept to the colony of family houses for the municipal power plant in Machnáč.

In Hausbergl (Palisády), likewise undergoing urbanisation, he built a cooperative residential block (1929) with one- to four-bedroom flats according to a project by Vojtěch Šebor (1890–1968). (Fig. 4 a, b) Similarly to Jurkovič's Legiodomy, the flats had spacious and well-lit entrance halls, local heating, kitchens with maid's rooms and separate toilets and bathrooms. The building was thus ranked among residential buildings with a higher

standard. An added value at that time was provided by the integrated garages in parts of the parterre. The building and its architectural and construction design was published by Slovenský staviteľ. (Frič, 1933) It is characterised by a simple façade with full textured balconies and experimentation with new thermal insulation blocks, then frequently being accomplished by the Frič building company.

Fig. 3. Colony of terraced houses of the Construction Cooperative of Railway Workers in Koliba, Bratislava - view from Tretia Street. (Source: private archive of Elena Frič, The personal estate of Rudolf Frič, 1923)

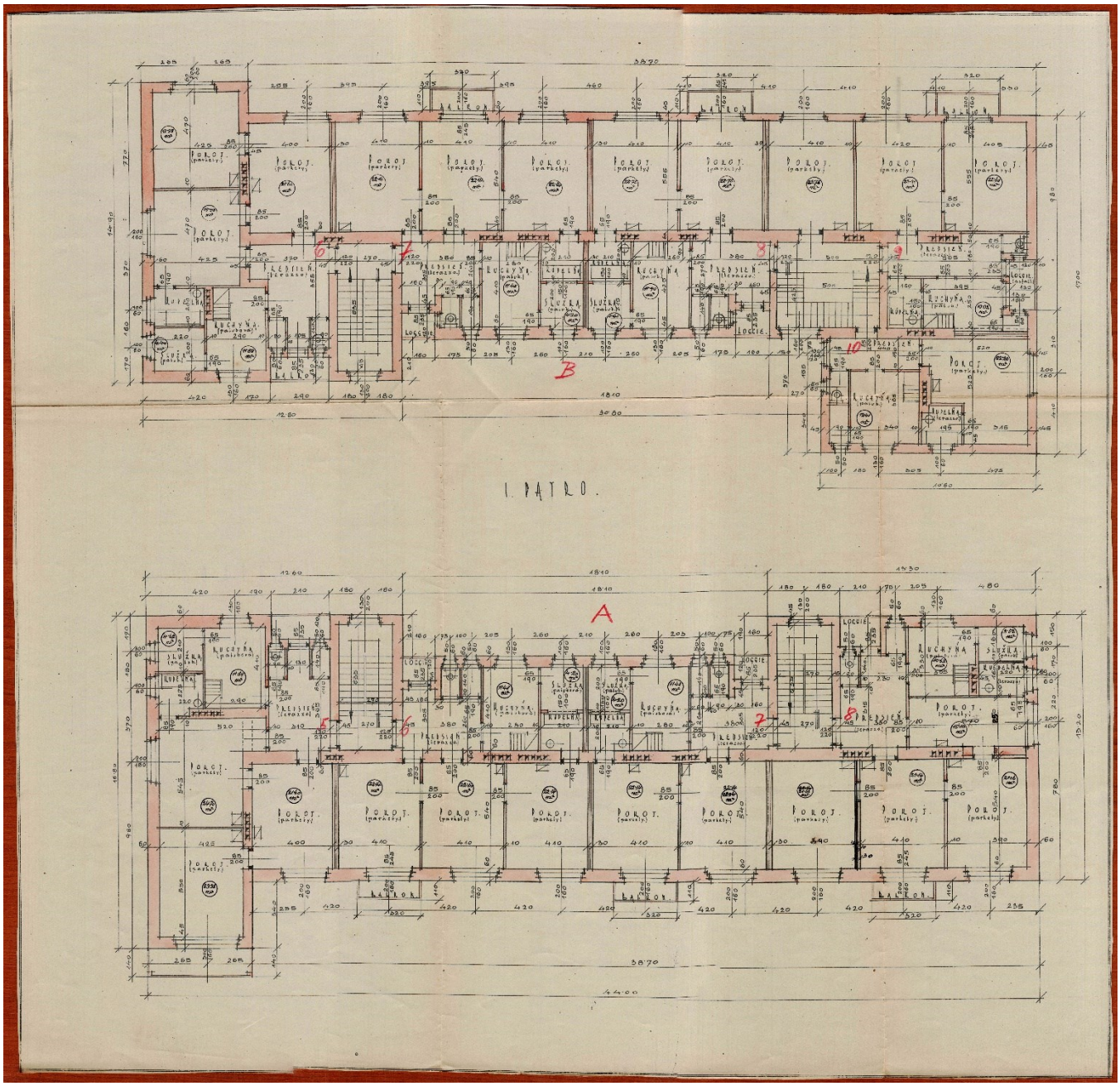


Fig. 4 a. Apartment house of the Construction Cooperative of Civil Servants and Railway Workers in Palisády, Bratislava - 1st-floor plan. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 55, 1929)

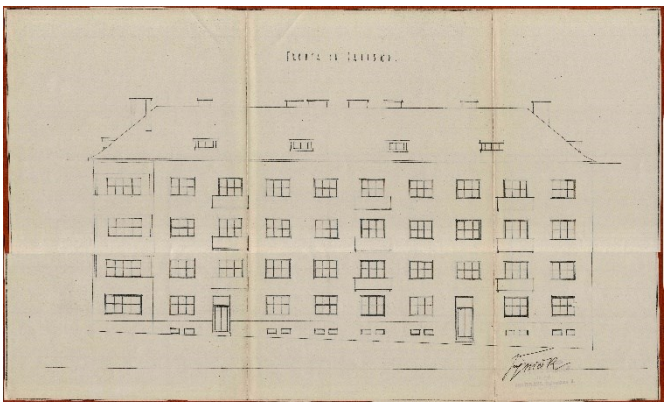


Fig. 4 b. Apartment house of the Construction Cooperative of Civil Servants and Railway Workers in Palisády, Bratislava - elevation from Palisády Street. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 55, 1929)

Individual housing cooperatives

Frič's construction portfolio in the field of social housing also includes individual projects of rental houses for smaller cooperatives. From the urbanistic point of view, they can be divided into two groups: those in the compact city and those urbanising the outer city radials. The first group is represented by the rental house for the Slovak National Theatre members in Klemensova Street (1922, Jindřich Merganc) and the rental house of the "DŽOS" agricultural cooperative in Gajova Street (1934, Josef Nowotný) in the Danube district. (Haberlandová, 2021, pp. 14–20) The second group includes the rental houses of the "Práca" cooperative in Radlinského Street (1934, Dezider Quastler), the rental houses with courtyard balconies of the "Svojdomov" cooperative in Vajnorská Radial (1933, Jan Runt) and the rental houses of the Construction Cooperative in Šancová Street (1930, probably Rudolf Frič). The last one combines standard flats on the floors with substandard social flats with shared bathrooms on the underroof floor. (Fig. 5 a, b)

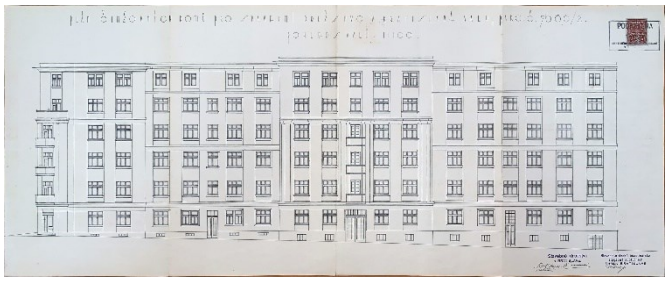


Fig. 5 a. Apartment house of the Construction Cooperative in Šancová Street, Bratislava - elevation from Šancová Street. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 100, 1930)

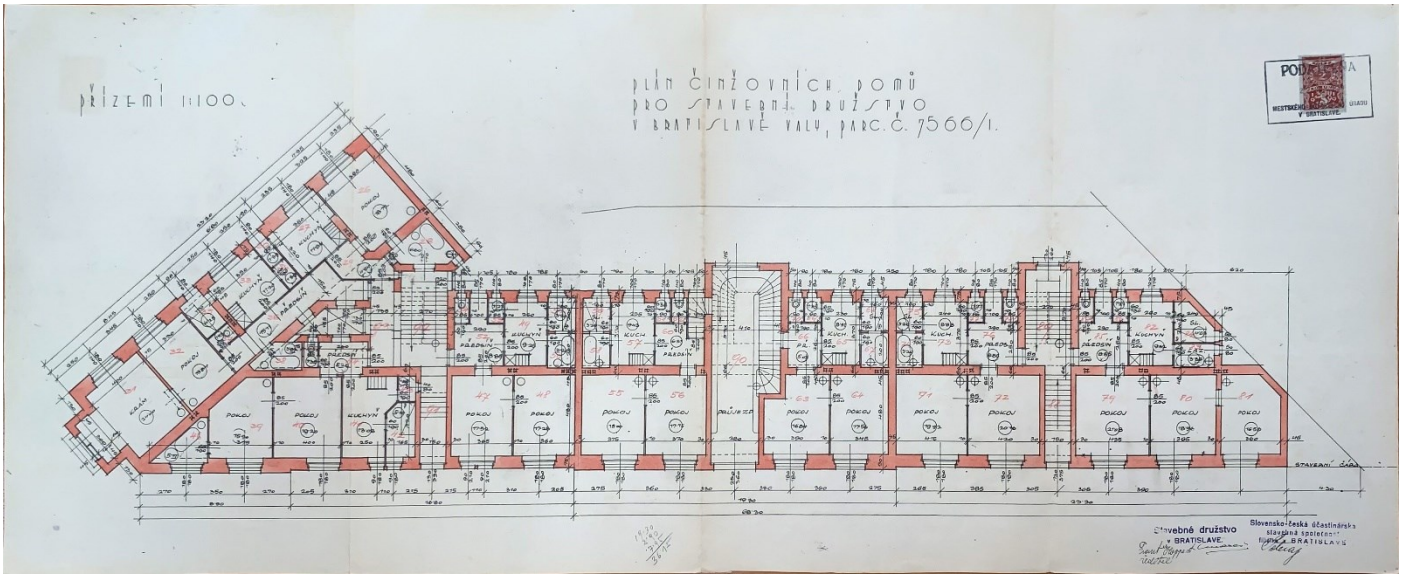


Fig. 5 b. Apartment house of the Construction Cooperative in Šancová Street, Bratislava - ground-floor plan. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 100, 1930)

Fig. 6. Apartment house of the Svojdomov Housing Cooperative in Vajnorská Street, Bratislava - view from Vajnorská Street. (Source: private archive of Elena Frič, The personal estate of Rudolf Frič, 1933)

To ensure fully-fledged urbanisation of the radials, the design of these houses includes amenities in the parterre. With the exception of the house for the "Svojdomov" cooperative, all rental houses have a classic sectional composition with a continuous street façade. They are thus still based on the traditional block urbanism. Only the architectural-urban concept of the house for the "Svojdomov" cooperative partly reflects the principles of modern linear urbanism. (Fig. 6) The main masses are perpendicular to the street, thus letting airflow into the depth of the plot and into the flats. On the other hand, connecting the transverse masses by a continuous parterre along the street supports the traditional street line. (Anon. 2, 1933, pp. 29–32) In spite of the mentioned differences, the distinctive architecture and layout of the flats, all the above-mentioned residential blocks are united by

the progressive idea of accessible social housing, achieved by a cooperative functioning in the community.

URBAN HOUSING FOR PROFESSIONAL ARMY MEMBERS

A specific category of social housing directly financed by the state during the First Czechoslovak Republic was housing for members of the army. Although Frič is responsible for the construction of many barracks in Trebišov, Trenčín, Čemerná, Hájniky, Bratislava, Zvolen, Nemšová and elsewhere, more relevant to the subject of the study are the residential blocks for officers and military veterans in Bratislava. They provided accommodation identical to that in the cooperative residential blocks and had a generally civilian character. They differed only in being subject to different legislation and directly funded by the state. They created a new foundation for block urbanism in the territory of the former northern suburb between Mýtna and Šancová radial streets. Houses for military veterans (1924), designed by Frič, form a part of the Škovránčia – Žilinská urban block. (Fig. 7 a, b) They have a monotonous horizontal façade with a regular rhythm of identical windows and cordon cornices on each floor. The floor plans of the repetitive sections are also simple, with large two- and three-bedroom flats with full facilities and maids' rooms. The Officers' Houses (1927), forming part of the Anenská – Povraznícka – Benediktiho block and designed by Alois Balán and Jiří Grossmann, are similar in layout. (Ščepánová, 2019, pp. 151–153) However, they are architecturally more impressive with their façade with varied volumes, which combines face-work masonry with plaster.

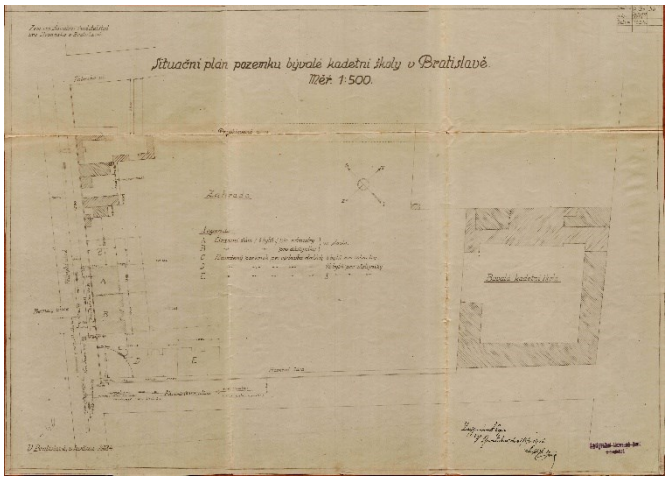


Fig. 7 a. Apartment house for military veterans in Škovránčia Street, Bratislava - site plan of the urban block. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 189, 1924)

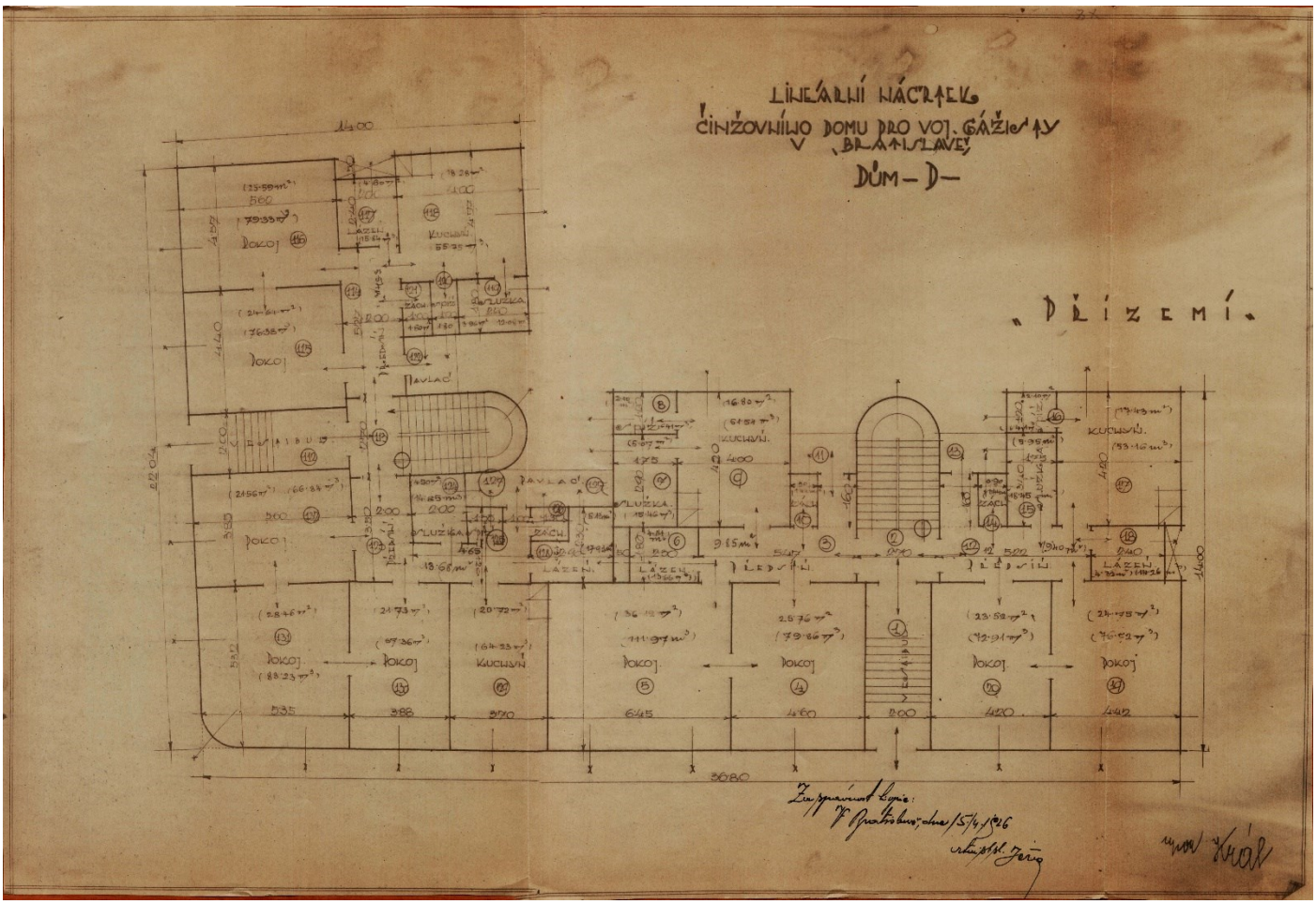


Fig. 7 b. Apartment house for military veterans in Škovránčia Street, Bratislava - ground-floor plan. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 189, 1924)

MINIMAL SOCIAL HOUSING FOR THE POOREST

A critical category of social housing was social housing for the poorest, and especially for the unemployed and homeless. A representative example is the City rental house with habitable kitchens and the smallest-size flats (1936), designed by Josef Marek and built by Rudolf Frič and Ján Petri for the Bratislava City Hall. (Fig. 8) The architecturally austere building is situated at the corner of Bartoškova and Športová Streets near the Vajnorská radial. The substandard flats are accessible from the courtyard balcony and have a minimal layout with one bedroom, a vestibule, and a separate toilet. Corner flats have separate kitchens. The flats have neither private nor shared bathrooms. The building is a rare example of minimal social policy in Bratislava. The state's social policy also intended to improve the living conditions of seasonal workers coming to Bratislava. For this purpose, the city established a lodging house and a dormitory in a new city block at the corner of Jelenia and Železničiarska Streets. (Fig. 9) The project was designed by Vojtěch Šebor and built by Rudolf Frič (1930). Social amenities included centrally heated rooms, modern sanitary facilities, a dining room, and a roof terrace for sunbathing. In order not to depress the place socially, the building's design also included flats for single civil servants and offices. The building is characterised by its functionalist architecture with a progressive reinforced concrete load-bearing frame and high-quality materials, including stone plastering. (Anon. 1, 1933, pp. 26–28)

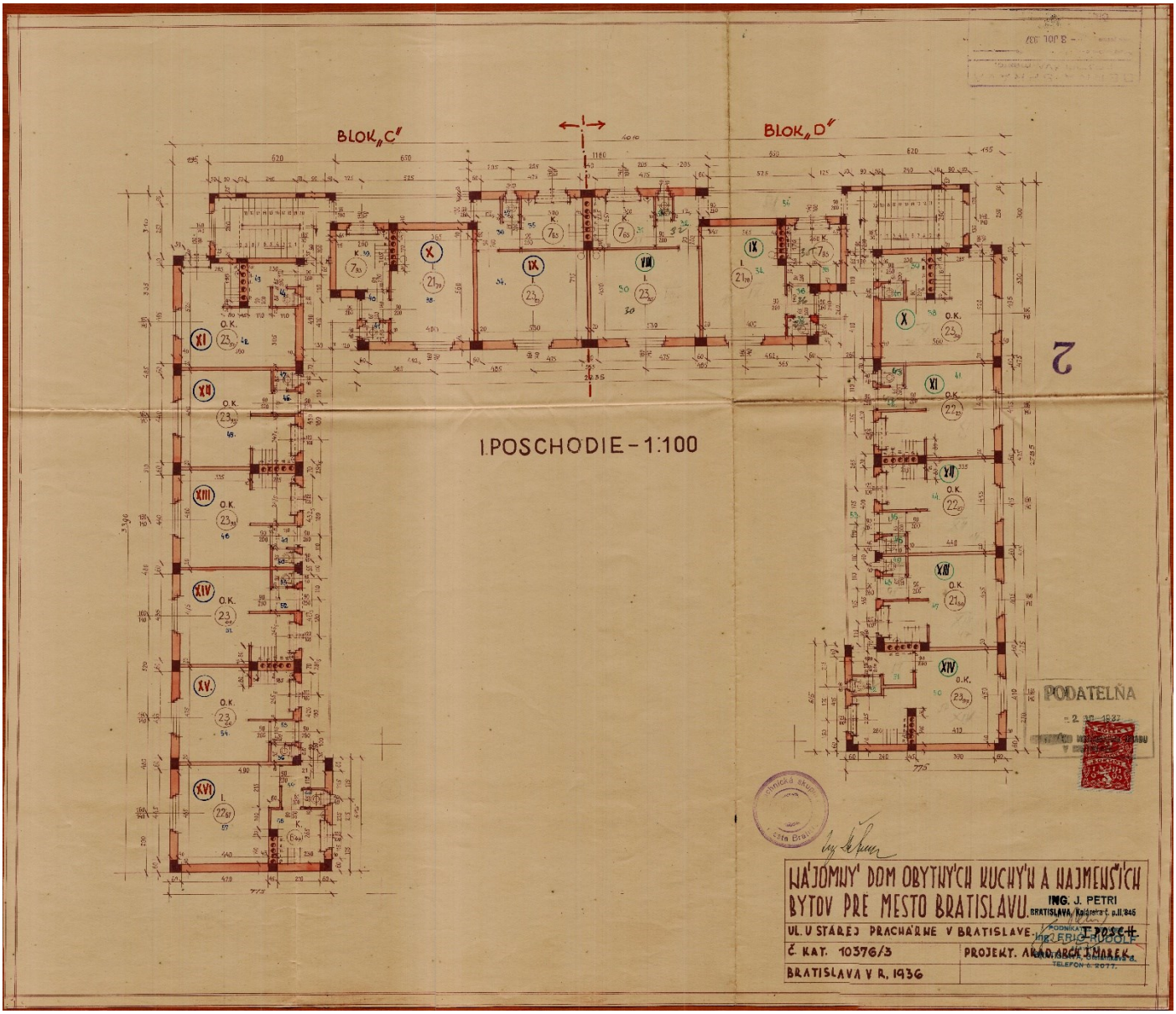


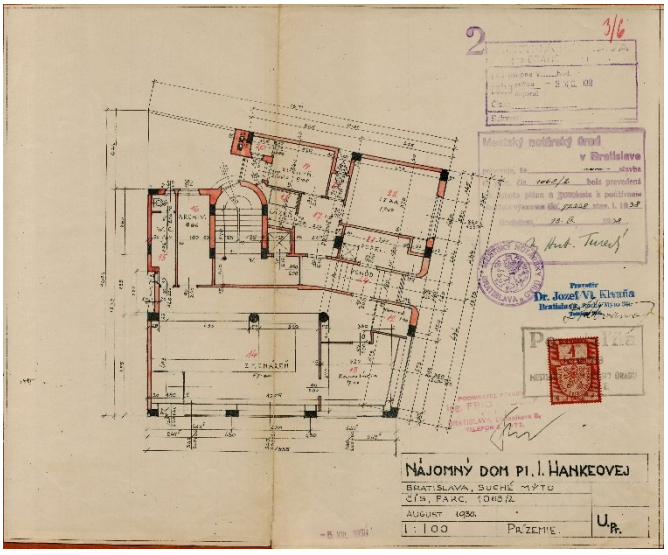
Fig. 8. City rental house with habitable kitchens and the smallest-size flats in Športová Street, Bratislava - 1st-floor plan. (Source: State Archives in Bratislava, fund "Daňová správa Bratislava", box 68, 1936)

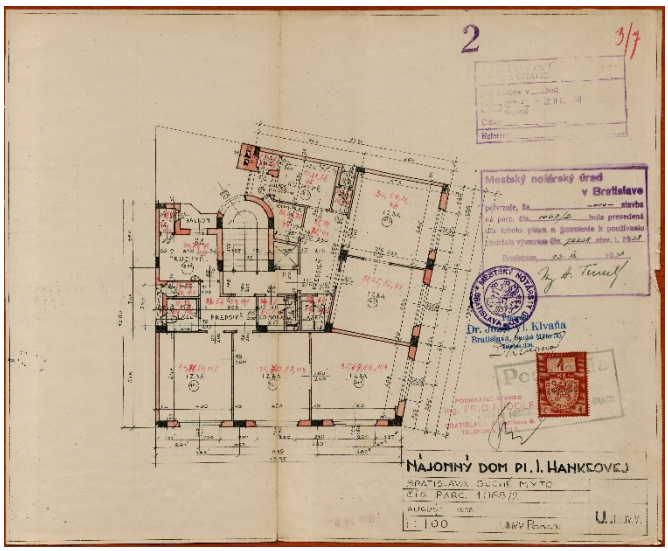
PRIVATE RENTAL RESIDENTIAL BLOCKS

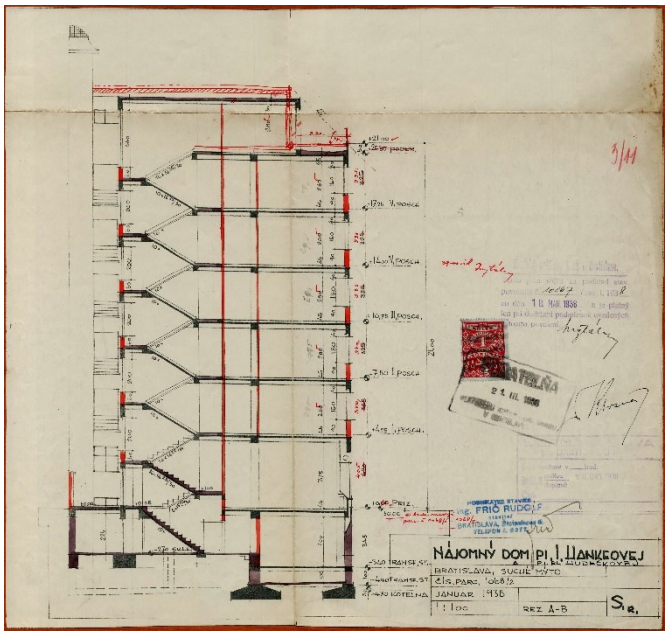
Besides the state, the cities and cooperatives, private investors – entrepreneurs played a significant role in the construction of social housing. Owning a rental house was also a stable investment and security for them, especially after the experience of the economic crisis and the stock crash. The attractiveness of the investment was also increased by the adoption of the Construction

Act – Act No. 45/1930 and related tax exemptions. Thus, the new building owners were no longer just big factory owners building workers' colonies, but also small investors. They did not build rental houses for their employees, but for a diverse and anonymous urban clientele. The new clientele of tenants consisted of a growing middle and educated class, the members of which could afford renting commercially. This was directly reflected in the social and architectural standards of the rental houses themselves, which responded to more diverse residential demands.

Fig. 9. Lodging house and dormitory in Jelenia Street, Bratislava. (Source: private archive of Elena Frič, The personal estate of Rudolf Frič, 1930)







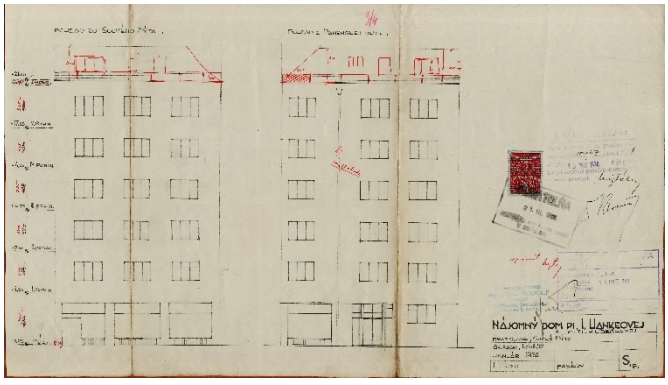


Fig. 10. Rental residential block of Irma Hanke and Helena Hudečková in Panenská Street, Bratislava. Left: ground-floor plan; right: 1st-floor plan, elevations, cross section. (Source: State Archives in Bratislava, Sloavkia, fund "Daňová správa Bratislava", box 185, no. II-34, 1938)

The rental residential block of Irma Hanke and Helena Hudečková (1938) serves as an example. (Fig. 10) Frič designed the seven-storey building on a cramped square plot at the corner of Suché Mýto and Panenská Street on the site of the former vineyard houses. Building on the late 19th-century block development, it brings a new urban scale to the site of the former gardens and vineyards of the northern suburbs. It is not limited either by

the conservation authority or height regulations, as was still the case in the 1920s with Weinwurm's Astoria Café project. (Moravčíková, 2014, pp. 42–47) On the ground floor there is a parterre with an exchange office with large glazing in steel frames; in Panenská Street it is interrupted by the entrance and the caretaker's flat. The individual floors include spacious two- and three-bedroom flats with an enfilade of habitable rooms facing the street. On one of the floors, both flats are merged into one large five-bedroom flat. Sanitary facilities, kitchens, utility loggias and a semi-circular staircase with a lift are turned to the narrow courtyard. The last recessed storey has minimal studio flats with a roof terrace. The building has a reinforced concrete load-bearing framework with hollow ribbed ceilings. The simple floor plan is reflected in the regular rhythm of the purist façade with three-panel windows. Only the shop windows in the parterre have a modest stonework framing.

Polyfunctional department store of the Trojan & Švarc company

Fig. 11. Polyfunctional department store of the Trojan & Švarc company in Mýtna Street, Bratislava. Above: ground-floor plan; below: 1st-, 2nd-, 3rd- and 4th-floor plan. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 118, no. V-148, 1929)

At the urbanistically exposed crossing of Mýtna and Šancová radials on Račianske mýto, the Trojan & Švarc company built a polyfunctional department store with small flats (1929). (Fig. 11) Together with the rondo-cubist cooperative houses of the postal workers (1922, Klement Šilinger), (Dulla, Mrňa, Haberlandová, Ščepánová, Pavel, Bartošová, Pohaničová, Šoltésová, 2019, pp. 86-88) the two buildings form the compositional basis of the modernising urban node. The department store set a new height level for both streets, which, paradoxically, has not been resolved in the immediate vicinity of the house even today. As in the case of the cooperative houses built along the radials of the outer city undergoing urbanisation, it was necessary to provide basic amenities alongside housing. Vojtěch Šebor thus designed a six-storey house with shops, a restaurant, and flats. After the construction, Frič published the building in Slovenský staviteľ (Slovak Builder), where he described the structure of the reinforced concrete framework with infill masonry made of modern "Isolar" thermal insulation bricks. (Frič, 1933) The framework structure freed up the layout of the commercial parterre and spacious two and three-bedroom flats with facilities of a higher standard. The reinforced concrete bearing skeleton with ribbed ceilings (Asimoulin) and lightweight heat-insulating masonry together with high-quality craftsmanship details had characterized Frič's construction practice since the end of the 1920s. The most interesting spatial feature is the fan-shaped staircase with a central cage lift. Šebor's early experience with rondo-cubism can be seen in the purist façade with its distinctive sculptural shadow of the projecting masses of the balconies and massive bay windows.

Rental houses for own employees

Private enterprises and offices were established in Bratislava alongside state institutions, and intellectual and administrative workers were coming to find employment there. The workers' colonies that had been built during the city's peaking industrialisation would no longer be suitable for their needs. Large private enterprises, following the example of state institutions, built urban rental houses with modern social amenities. Alongside the new forms, the older concept of workers' colonies continued to evolve. (Moravčíková, Szalay, Haberlandová, Krišteková, Bočková, 2020, pp. 588–594) Frič, as a construction entrepreneur with dozens of permanent administrative workers, designed and built rental houses for their needs in Lazaretská Street (1937). (Fig. 12 a, b) The project was based on the adopted regulatory plan, which provided that the city block between Špitálska – Dunajská and Lazaretská – Kamenné námestie was to be urbanised and integrated into a compact inner city. (Moravčíková, Szalay, Haberlandová, Krišteková, Bočková, 2020, pp. 215–220)

Height restriction was set at six full storeys. Together with the neighbouring building and the Police Headquarters (1922, František Krupka), Frič's rental houses form the most stable part of the area. The rental houses have seventy mostly one-bedroom and a few two- and three-bedroom flats with good sanitary facilities and fully electrified kitchens without chimneys. An above-standard social amenity was provided in the form of a rooftop community terrace. The partially glazed parterre provides a space for commercial establishments and a restaurant with a summer terrace. The smooth courtyard façades are in contrast with the more traditional street façade with bush-hammered plaster and stonework details. The houses have many well-preserved original features and materials, including cage lifts. Most of the flats have retained the original white brass door fittings, white and yellow terracotta tiles, and rectified bathroom tiles with rounded profile mouldings and inbuilt sanitaryware.

He designed and built rental houses for the junior employees on the outskirts of the town at the intersection of the Račianska Radial and the branch railway line. The periphery was sparsely built up with one-storey warehouses, small factories, and residential barracks. The houses were situated on the eastern edge of the company's technical and warehouse complex. According to archival plans, Frič planned to move the complex and replace it with a linear urbanism of rental houses, of which only two street sections were realized. Together with the neighbouring building and the "Legiodomy" closer to the centre, they formed the basis of the new urbanism of the transforming area. They offered one-bedroom flats with basic social facilities, local heating, and

amenities in the parterre. He designed further social housing for employees in the neighbourhood of the earlier railway colony in Koliba. Three urban villas with smaller flats (1941) were situated on the slope of Hlavná Street, which formed the axis of the newly emerging district of villas on the site of former vineyards and orchards. (Fig. 13) For the employees responsible for the building materials shipment, he designed a smaller tenant house in Novohradská Street (1934). (Fig. 14) Overall, the social housing of Frič's employees reflects the influence of private investors on the social and urban changes of the modernising metropolis in that period.

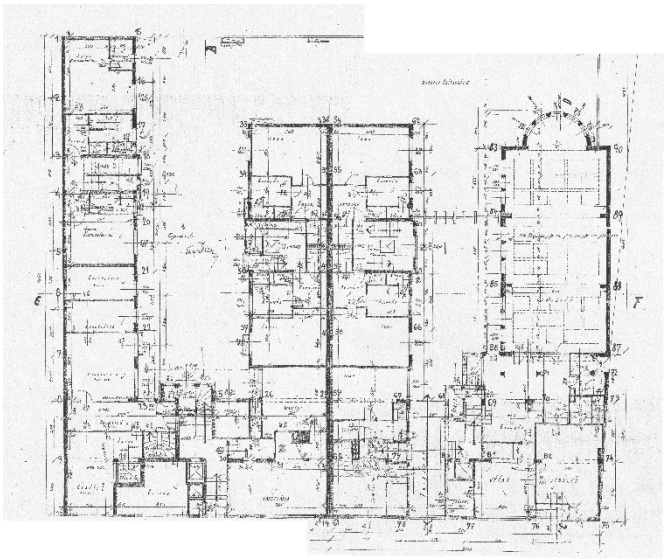


Fig. 12 a. Rental residential block of Rudolf Frič in Lazaretská Street, Bratislava - ground-floor plan. (Source: private archive of Elena Frič, The personal estate of Rudolf Frič, 1937)

Fig. 12 b. Rental residential block of Rudolf Frič in Lazaretská Street, Bratislava - courtyard view. (Source: private archive of Elena Frič, The personal estate of Rudolf Frič, 1937)

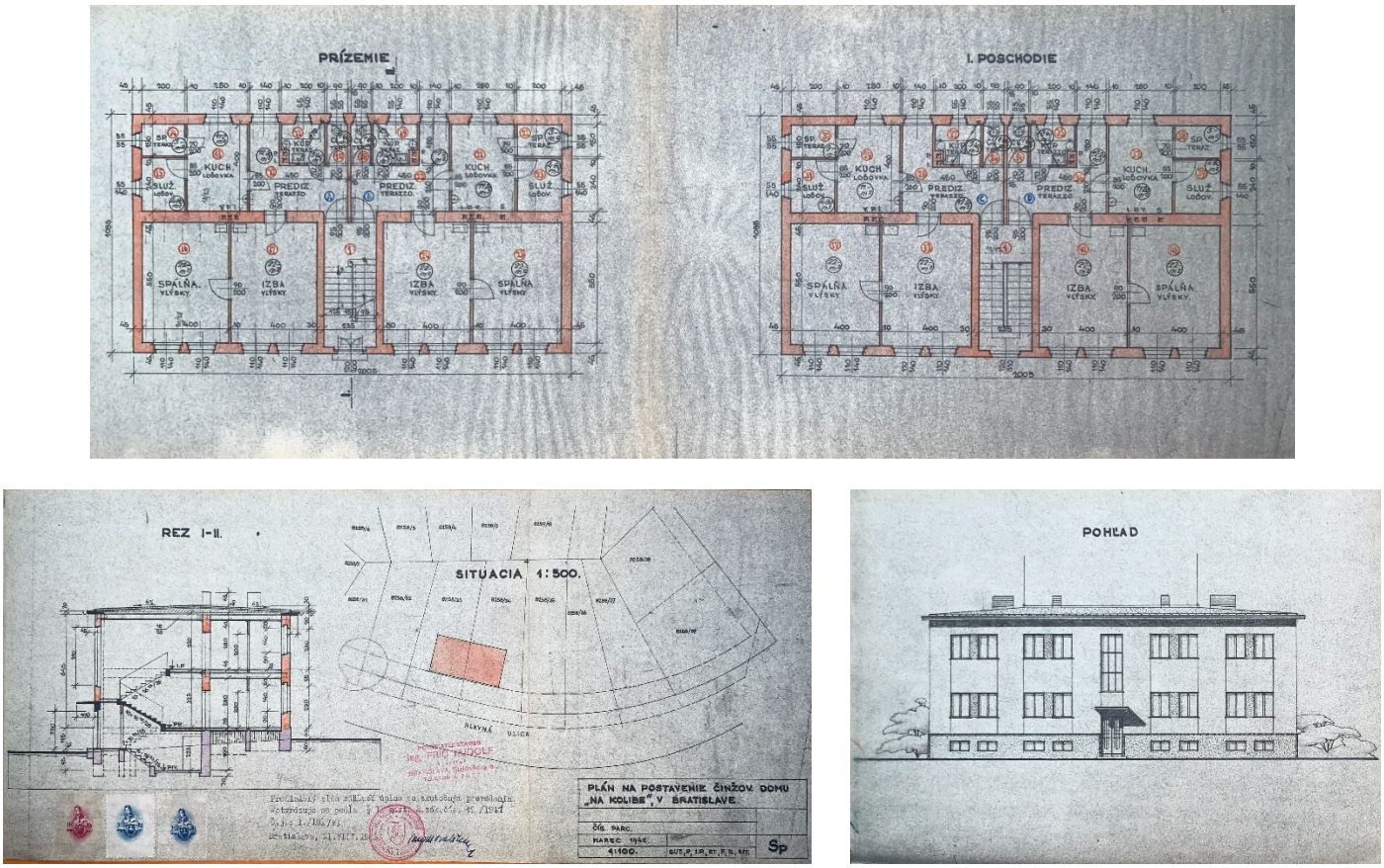


Fig. 13. Rental urban villas of Rudolf Frič in Hlavná Street, Bratislava. Above: Ground-floor plan; below: 1st-floor plan, section, and street elevation. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 52, 1941)

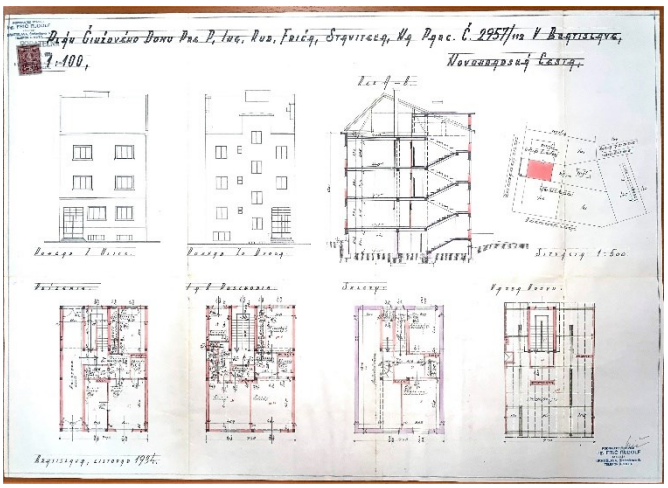


Fig. 14. Tenant house of Rudolf Frič in Novohradská Street, Bratislava - ground-floor plan, complete plans. (Source: State Archives in Bratislava, Slovakia, fund "Daňová správa Bratislava", box 129, 1934)

RESULTS AND CONCLUSION

The social policy of interwar Czechoslovakia was based on the concept of the welfare state. Its main themes included accessible social housing and health care. Social housing was supported by new state legislation and institutions, which was reflected in new forms of housing and their financing. State and municipal social housing, cooperative rental houses, housing colonies and private rental houses were constructed. In Bratislava, their construction was accompanied by the stabilisation of the inner compact city and the urbanisation of the suburbs along the city's radial streets. Research has shown that Rudolf Frič made a significant contribution to this process. Through his work in Legiobanka, he was instrumental in establishing the Legionary Cooperatives, which built the first cooperative houses in the city (Legiodomy, 1923–1924). As a construction entrepreneur, he designed and built cooperative houses for state housing cooperatives, especially for legionaries, railway workers, and civil servants (Hausbergl, 1929). These established a new standard of housing in social terms and in terms of layout. With the project of the railway colony (1923), he contributed to the starting urbanisation of Koliba. The project of the legionary colony with a school in Batu (1930), in turn, is a rare example of Czechoslovak interwar urbanism in Ukraine.

The newer rental houses of the independent housing cooperatives of the 1930s had a progressive framework structure, central heating, a commercial parterre, and specifically the Svojdomov Cooperative House (1933) reflected modern linear urbanism. They demonstrate Frič's quality as a builder, such as the early application of progressive building materials, structures and details. Particularly, the caisson foundation enabled a more efficient urbanization of the Danube embankment (Legiopoisťovňa, 1939). On the other hand, the city rental house with the smallest flats (1936) and the lodging house with the dormitory (1930) are examples of minimal social housing that proved to be socially necessary. The concept of private rental houses, supported by tax exemptions, also became successful. The rental residential block of Irma Hanke and Helena Hudečková (1938) and others confirm Frič's architectural ambitious. Furthermore, his own rental houses for the employees (1937) are a manifestation of a shift away from workers' colonies. The post-war introduction of regulated rents eliminated this model economically.

The paper, based on the research of Frič's selected construction and architectural projects, demonstrates the influence of the interwar social policy on the field of housing and its positive results, especially in Bratislava. It confirms that social policy and housing of the First Czechoslovak Republic reflected the social changes of urban society, slowly transforming from an industrial to a post-industrial society, and the related growth of the middle class and intelligentsia. At the same time, the paper complements the modest references to Frič in the Slovak historiography of interwar architecture, which almost exclusively presents him as a builder of civil engineering structures. Initial research on Frič's buildings shows a more comprehensive contribution of his work. It mainly lied in the transfer or application of innovations; on the other hand, the selection of his own designs and their quality also required Frič's direct architectural contribution. In conclusion, the research assumes Frič's comprehensive contribution to Czechoslovak interwar architectural production, and not only in the field of residential architecture and in the territory of Bratislava. Moreover, the research allowed for Frič's architectural and construction projects to be distinguished and his direct contribution to be assessed.

Acknowledgements

This paper was published within Project VEGA no. 1/0286/21 "Innovations in architecture of the 20th century in Slovakia" at the Faculty of Architecture and Design STU and at the Institute of History of the Slovak Academy of Sciences (Bratislava, Slovakia).

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ISSN 2729-7640

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2/2023 (Vol. 28)

Summaries

RZESZOW CASTLE: HISTORY AND CONTEMPORANEITY - PROPOSAL FOR A NEW INTERIOR ADAPTATION

Kamila Gołąbek, Marek Gosztyła, Agata Mikrut-Kusy

Keywords: castle, architecture, heritage conservation, revalorization, culture

This paper discusses the adaptation of Rzeszow Castle in Rzeszow, Poland (also called the Castle of the House of Lubomirski in Rzeszow), which is a key building on the Subcarpathia's map of monuments. The paper outlines the history of the castle as one of the city's most important monuments. The characteristics of the building are then presented, with focus on its architectural value, and the current state of preservation of the monument is described. The current functional programme regarding the castle is also mentioned, as the aim of the future modification of the monument is to completely change the purpose for which the building is used: from an administrative and office space to a cultural facility with complementary functions.

The history of the construction of the castle located to the south of Rzeszow's main square dates back to the early 17th century and the times of Mikolaj Spytek Ligeza (the owner of Rzeszow, who lived sometime around 1562-1637). After his death, the ownership of the castle was passed to the Lubomirski family and the castle received further extensions and underwent another modernisation based on a design by Dutch architect Tylman of Gameren (late 17th century). In the 18th century, another project to modernise the building was developed and supervised by architect Karol Henryk Wiedemann. The castle enjoyed a period of splendour in the middle of the 18th century. Then, as a result of the partition of Poland by neighbouring countries, the castle was taken over by Austrian authorities. The residence was used for new purposes as a court and a prison.

The current shape of the castle is the result of a reconstruction at the turn of the 19th and 20th century, in accordance with the conservation trends popular at the time. The project was commissioned to conservationist and architect Zygmunt Hendel.

Until the early 1980s, there was a functional prison within the castle walls. Today, the castle houses the District Court and, as a result, access to the castle and its bastions is restricted. The castle is awaiting an adaptation that will give more members of the public the opportunity to use the monument. Based on extensive analyses, a contemporary vision of a plan of use for the castle has been created, one that casts a new light on the opportunities that the Rzeszów palace complex can offer. The concept includes a complete relocation of the District Court to a new building, followed by the adaptive modification of the castle to enable contemporary functions, specifically those associated with culture, art and the promotion of local heritage. Therefore, the objective of the paper also included the elaboration of a contemporary design based on the current conservation concepts. The design focused on presenting possibilities for the future development of the castle space as a historical building.

The priority was to identify the latest trends in conservation art, and, subsequently, to create a proposal for a contemporary interior arrangement for the castle and its site development. The aforementioned design work focused on creating new, innovative concepts for the revalorization of historical buildings, oriented towards development and modernity. The work presents bold, novel – and most importantly – workable solutions for a new functional programme for Rzeszow Castle. The proposals presented in the paper are aligned with new principles of cultural environment preservation, and primarily emphasize ideas that facilitate the development of culture and art, social engagement, and support new initiatives.

Therefore, this new functional programme complements cultural facilities and events offered by the city of Rzeszow - the capital of the Subcarpathia Voivodeship (one of Poland's sixteen provinces). The presented concept aims not only to bring out the architectural qualities of the castle, but also to introduce new solutions in the form of light illumination and elements of the so-called small architecture (e.g. contemporary benches) in the remodelling of the courtyard and the castle surroundings. The article also mentions other, earlier ideas for the adaptation of the castle's premises, which, so far, have not been transformed into an architectural concept.

TRANSDISCIPLINARY COLLABORATION IN ARCHITECTURE: INTEGRATING MICROALGAE BIOTECHNOLOGIES FOR HUMAN AND NON-HUMAN PERSPECTIVES

Veronika Miškovičová, Jiří Masojídek

Keywords: architectural research, environmental challenges, symbiotic ecosystems, microorganisms, microalgae, interdisciplinary collaboration, biotechnologies, public education, integrated problem-solving

In recent years, the architectural community has faced many ecological, geopolitical, and socioeconomic challenges. This paper delves into the potential of algal biotechnologies, with a specific focus on microorganisms, such as microalgae, for architectural and design applications. With the ability to offer a wide range of applications in architecture and design, they encompass small-scale objects, living systems on building exteriors, and urban (rural) scenarios, thus enabling systematic research.

This study investigates the integration of microalgae biotechnologies in architectural designs, considering factors such as maintenance requirements, material and technological adjustments, potential environmental impacts, and the possibility of enhancing public spaces and society across various dimensions from both short-term and long-term perspectives. Considering these factors, potential environmental and social impacts should be analysed within the design process and the further implementation of microalgae-based systems in real-life scenarios. The paper delves into a series of interdisciplinary projects and research revolving around the study of microbiology, architecture, and design. The projects propose various hypothetical scenarios exploring the integration of human and non-human perspectives. Collaborative academic efforts invested in the projects showcase the potential for combining microalgae cultivation with architectural applications.

Microalgae-based architectural systems offer potential benefits, but some concerns must be addressed. Energy consumption is a significant issue, as cultivating microalgae often requires artificial lighting and temperature control, potentially negating environmental advantages. Additionally, the maintenance of and operational requirements for microalgae-based systems can be both resource-intensive and time-consuming. Ensuring optimal conditions for microalgae growth may necessitate regular monitoring, cleaning, and maintenance procedures. Also, the scalability and adaptability of microalgae systems remains a challenge. Translating the accomplishments seen in controlled laboratory settings or small-scale prototypes to a large scale might prove difficult in practical applications. Elements such as regional climate, environmental conditions, and building orientations can considerably impact the effectiveness and efficiency of microalgae systems in architectural contexts. To ensure the long-term viability of microalgae-based architectural strategies, detailed knowledge of these aspects and adaptable design solutions are needed.

Several projects are highlighted within the paper, including the project entitled Photosynthetic Landscape: a modular photobioreactor system that demonstrates the potential for integrating living systems into building exteriors and landscapes, thus contributing to the aesthetics and sustainability of the built environment. Synthesizing/Distancing addresses the challenges of coexistence in global epidemics by examining how these systems, integrating humans, microalgae, and other aquatic microorganisms, could enhance the relationship between the natural and technological, and human and non-human to understand the individual or collective roles in these systems. A permanent interior installation, Biotopia, demonstrates the potential for integrating living systems into interior spaces. This project highlights the role of microalgae in enhancing air quality, providing natural insulation, and potentially contributing to the internal microclimate. The Exchange Instruments project deals with a semi-closed cultivation system that allows for microalgae's growth. Cultivated Environment is a user-friendly microalgae cultivation apparatus that enables individuals and communities to harness the potential of microalgae biotechnologies on a smaller scale. The project aims to encourage the widespread adoption of microalgae-based systems. Further research, interdisciplinary collaboration, and innovative design strategies are needed to overcome the challenges associated with energy consumption, maintenance requirements, and scalability. To achieve this, adopting a non-human perspective in architectural design and practice is imperative, acknowledging the interconnectedness of these entities and ecosystems.

In view of the importance of rethinking our relationships with the environment and non-human species, we must strive to design architectural systems that foster further dialogue with other systems, both natural and technological. This approach encourages us to consider the mutual benefits and co-evolution of human and non-human entities, fostering relationships that promote all living systems' overall well-being. Enhancing the integration of design and architecture research, material science, and technological adaptations with the fields of microbiology and biotechnology necessitates a multidisciplinary approach that promotes innovation and synergy among these diverse areas of expertise. To achieve this, it is vital to create a collaborative environment that encourages sharing knowledge, ideas, and resources, ultimately enabling the design and creation of new mechanisms and apparatuses that harness the potential of microorganisms and biotechnologies. Incorporating this interdisciplinary approach is particularly important for research by design, as it enables a more comprehensive understanding of complex challenges and fosters the development of innovative, context-specific solutions. By integrating insights from diverse fields, research by design can address the multifaceted aspects of the built environment, taking into account the ecological, technological, and sociocultural dimensions. This holistic perspective ultimately results in more effective, sustainable, and adaptable designs that cater to the needs of both human and non-human inhabitants.

TYPOLOGY OF TERRAIN VAGUE AND EMERGENCE MECHANISMS IN POST- COMMUNIST, POST-INDUSTRIAL SMALL AND MEDIUM-SIZED TOWNS IN SLOVAKIA: CASE STUDY OF HUMENNÉ, STRÁŽSKE AND VRANOV AND TOPĽOU

Romana Hajduková, Alžbeta Sopirová

Keywords: terrain vague, typology, post-communist, post-industrial, small and medium-sized towns

These days, the importance of brownfield regeneration and reuse of vacant land is crucial for sustainable development, particularly in post-communist, post-socialist countries, where a series of key historical events caused socio-economic and political changes leading to urban decay. However, if we want to provide a comprehensive picture of the current urban structure and its issues in any city, all unused areas cannot be labelled as brownfields. Instead, we should study urban structure from the perspective of inverse urbanism, which uncovers many unused areas serving their primary function and still appearing as vague areas without any function at all.

The terms commonly used to describe such areas include terrain vague, lost spaces, non-places, white areas, voids, buffer zones and many others. The common denominator of the emergence of unused areas are political and socioeconomic changes after

transitional periods, which all the quoted authors refer to. However, geographic and cultural nuances play a huge role in defining and naming unused areas. We chose the term terrain vague for our research, but there are only few studies focusing on it in Central Europe. The one that is the closest to our research is the case study of Prague.

As we mapped and discovered terrain vague in model towns, we recognized the need for creating a typology of terrain vague and for identifying the emergence mechanisms in model towns of Humenné, Strážske and Vranov nad Topľou. Currently, these towns face several challenges, from declining population to surplus of underutilized areas; therefore, our results will provide us with a better understanding of terrain vague in our model towns and help us to design coping strategies. Our research results could be generalized and used for all small and middle-sized towns in Slovakia that were greatly affected by socialist industrialization.

The aim of our paper is to create a typology of terrain vague and to identify the emergence mechanisms of terrain vague in the context of post-industrial small and middle-sized towns in Slovakia using the case study of towns of Humenné, Strážske and Vranov and Topľou. We combined field survey and desktop analysis methods to map terrain vague based on set criteria. After the evaluation of the data, we used it to create a typology of terrain vague and we identified key emergence mechanisms and their subcategories.

While creating our typology of terrain vague, we decided to use some terms defined in scholarly literature (urban wildscapes, white areas, voids, vacant land), together with 3 types dedicated to green spaces (residential greenery, public green spaces and restricted (campus) green spaces) and a descriptive name – terraced garages.

In our research, we identify 3 main emergence mechanisms, which are further divided into subcategories. We chose this approach based on the key factors influencing the development of urban structures in model towns since the second half of the 20th century until the present. The first emergence mechanism is related to political and socio-economic changes, particularly those occurring in post-communist countries: socialist industrialization, deindustrialization and urban shrinkage. The industrialization and deindustrialization have had opposite effects on urban structures, but in some cases, we cannot completely separate these processes from one another. The second emergence mechanism is an unintended product of urban planning with the following subcategories: remnants of the urban-renewal days, places (deliberately) deprived of a function and places without a function. These processes are solely related to spatial panning, urban design and mostly, a complementary image of an ideal industrial town and a way of reaching such ideal. Remnants of the urban-renewal days are the result of unfinished projects and their realized fragments, while places (deliberately) deprived of a function are the outcome of the consistent effort to organize cities and places without function are transit areas, unstructured landscapes, basically any and every space without a clearly defined function. The third and last emergence mechanism is the cycle of urban development, which is inherent to every town, regardless of the context. It is a common, even inevitable part of the urban development of cities as living, constantly evolving organisms. The emergence of unused objects is a common phenomenon unless they are not neglected for a long period of time and do not emerge suddenly in huge numbers. A similar common occurrence is the vacant (undeveloped) land, providing a spatial reserve for further development and places excluded from construction that cannot be developed for their terrain configuration. Predictably, 6 out of the 9 types are related to some type of green space, 2 types represent buildings and developed areas and 1 type represents paved open spaces. Therefore, we can assume that under-maintenance and the lack of activities in green spaces are the main issue in the model towns.

Our typology and identified emergence mechanisms could be used as a basis for further research related to terrain vague potential in Slovak small and medium-sized towns, and for developing strategies for their management and transformation. It provides a deeper understanding of the potential of terrain vague for urban regeneration and re-development in post-communist, post-industrial towns.

EPHEMERAL OCCUPANCIES: NON-LINEAR APPROACH TO ADAPTABLE ARCHITECTURE

Marek Lüley

Keywords: adaptability, capacity, tendency, narrative, feed-back, interpretation, polyvalence

An adaptable approach understands architecture as a non-linear process, which enables a dynamic response to changing environmental and contextual conditions with the aim to extend the life of a building. The application of adaptability is as ambivalent as the term itself. Therefore, the paper opens a discussion on different perceptions of adaptability in architecture. Adaptability cannot only be understood as moving partitions or vast open spaces. There is a variety of different principles leading to adaptability that can prove the versatility of use - from the basic understanding of flexibility to comprehensive polyvalence. Longevity should not be about programs, functions, or typological characteristics. It should refer to a building and its construction system, which we perceive as hybridlike. An important factor in longevity is the independence of the shearing layers of a structural system and their time scale. In a construction system understood in this way, we perceive the function as ephemeral. An important aspect is the time scale of the intervention. The study deems the design process to be divided into two streams: a) a linear, initiated, top-down design process. The linear system can lead to a clearly defined and legible typology limited to one function, or a set of predefined functions; b) a non-linear, cyclic, evolutionary, bottom-up process that can lead to ambiguity and indeterminacy with different possible interpretations, thus providing an adaptable solution. This paper explores the phenomenon of non-linear design processes expressing our perception of the adaptability application to carbon-neutral construction using the concept of ephemeral occupancies. Ephemeral occupancies are activities and events occurring within a building system that is ambiguous, generic, or specific. They require an open, polyvalent, free, democratic, and adaptable form. They work with hybrid material compositions of different temporal material flows, with dynamic settlement processes and new forms of ownership. Ephemeral occupancies establish a new way of thinking, lifestyle, and approach to climate change. The phenomenon is examined using the scientific method of conceptual analysis based on examining the relationship between capacity and tendency in the context of adaptability. The study explores the creation of a conceptual system of applying adaptability approaches and strategies in architecture in relation to the capacity and tendency of building systems and architecture. The terminology based on the most cited definition of adaptable architecture puts capacity in the prominent position as the main property of an adaptable system. On the other hand, Manuel DeLanda distinguishes the philosophical difference between property and capacity. Properties are always actual because an object, at a given time, has or does not have a certain property. But the capacity is not necessarily actual if the object, in the given state, does not require it. This means that capacity can be real without being actual. Subsequently, DeLanda explains the structure of the virtual and introduces tendency as a supporting phenomenon. The result of the conceptual analyses is a framework distinguishing the non-linear strategy supporting the divergence of capacity and tendency in the context of adaptability. In such an established context, we can understand a non-linear system as a system of several variables entering the system, the result of which is significantly disproportionately greater than their input. Another concept of non-linearity can be the cyclic evaluation of variables. Such a procedure is called iterative and uses tools such as a narrative (a scenario that defines the desired state under certain conditions), feedback, and interpretation. Narrative strategies are supported by Schumacher's understanding of scenarios that define function not statically, but dynamically and variably. Henri Achten approaches the problem in a similar manner. He proposes “Interaction Narratives” as the organization of moments of interaction between a user and a system following a story, which is consistent with the style of interaction. Another type of narrative is provided by Nigel Coates, which we understand as a narrative connecting the urban context, which contains several functions and events that are mutually supportive, and yet independent, to dynamic systems of building’s functional parts. Feedback as a system of constant evaluation of variables is an intermediate step to interpretation that was in our case inspired by the finding of an autopoietic function and intra-architectural codes described by Mitášová and Zervan. Although the authors

mainly focus on the investigation of existing buildings using their method of interpretation, it can also be uses for non-linear forms of design, such as: 1. Contextual reconstruction of the autopoietic function and the internal-architectural code, where we can perceive the context as a relationship between two states of the architectural space at the point of the critical threshold – the need to change the function; 2. With the help of the feedback and the scenarios of possible anticipated development, we can infer a hypothetical reconstruction of spatial situations; 3. We can subsequently encode these into building system components and spatial configurations in order to provide answers for future interpretation. The final observation is based on the principle of polyvalence as one of the key features in adaptability. It can be expressed using a single component, spatial organisation, position of access points, etc., as presented in the author's own practice.

INNOVATIONS IN SACRAL ARCHITECTURE: THE RESETTLEMENT CHURCHES OF EMIL BELLUŠ

Lívia Búliková

Keywords: innovations, sacral architecture, evangelical church, Emil Belluš

This article focuses on two buildings by one architect – Emil Belluš (1899–1979), a doyen of Slovak architecture, whose work significantly influenced the sacral architecture of the Evangelical Church of A. C. His innovative contributions can be seen in the design and later in the construction of two evangelical churches in Nesvady and Senec, built in the 1950s. The aim of this article is to examine and define the manifestations of innovation in the architecture of the two evangelical churches, the creative contribution of the architect Emil Belluš to the field of sacral architecture, and also the influence of the client—the Evangelical Church of A. C. Through a detailed examination of the tectonics of the churches, their layout, the materials used, morphological elements, design principles and technical equipment, we are looking for innovative ideas and principles that bring a change or progress in sacral architecture.

The churches were part of a project originally intending to build ten new churches for people who had been resettled as part of the government's post-war migration policy. After the Second World War ended, there was a period of great migration between European countries. The territorial and administrative structure of the countries has changed, and new borders have been drawn. With the regaining of its independence, the Czechoslovak Republic also established its own migration policy with several objectives, part of that being the expulsion of the inhabitants of foreign nationalities. Thus, on 27 June 1946, an agreement between Czechoslovakia and Hungary was made, which spoke of the exchange of an equal number of the population of Hungarian nationality for the population of Slovak (and Czech) nationality. In the end, more than 70,000 Slovaks returned, mainly to towns and villages in southern Slovakia, where Evangelical Church of A. C. congregations were also restored or re-established.

Taking a closer look on the figure of Emil Belluš himself, we can see that he was quite interested in the field of sacral architecture. Among his work as a prominent architect of a wide range of buildings in both the public and private spheres, we also find a few designs for sacral buildings for different denominations. None of them, except for the two studied in this paper were ever built.

Thanks to a unique preserved lecture "On the construction of an evangelical church" by Belluš from 1947, we gain a clear look of his view on this subject. His enthusiasm and deep immersion in the field of evangelical sacral architecture are clearly evident in the text. Emil Belluš' aim was to make an appeal to use new constructions, principles, and innovative layouts that would also meet the needs of the churchmen of his time. Overruling to all practical ideas stands the idea of creating a high quality and valuable sacred space, which would be able to support and positively influence the religiosity and culture of the society.

To search for and identify innovative trends in the architecture of the two selected churches, we used different research methods that were interrelated and intertwined. The main focus and most used method was the architectural-historical research in

situ. Helped by the oral history technique, we gathered unique and necessary information needed for next steps in the research process. We focused on a detailed characterisation of the building, its construction system, layout arrangement, mass-spatial composition, materials used and other aspects, including newer renovation changes of the churches. We were able to obtain original plans by the architect Emil Belluš himself, along with historical documents, comprising pictures and writings from the years around the completion of churches. These and other materials were the starting point for naming the researched innovative trends in the sacral architecture of the Evangelical Church of A. C.

As a result, we compared the two churches between themselves. We looked closely on their mass-spatial design, construction systems, inspected materials and layout, looking for innovative approaches either by the architect or the investor—Evangelical Church of A. C. Even now, 70 years later, we can evaluate the timelessness of the functionalism and its use in the forms of sacral architecture. The architect Belluš used morphological elements of the new style, which also reflected the programmatic content in the mass-spatial division. He was not afraid to bring new matters, materials, and systems to the traditional form of the church that were up-to-date and of high quality. The quality and accuracy of the overall design is evidenced, for example, by the location of the choir room within the church and its extensive use today, where the parishes organise various prayer meetings, children's meetings, and meetings of the young, middle, and older generations. The active use thus confirms Belluš' thesis and insistence on a modern and updated approach to the spatial design of temples.

So how did Emil Belluš and the Evangelical Church of A. C. contribute to architectural innovation? The Evangelical Church was open to development, changes in liturgy, new ideas and the needs of the community. Belluš actively used the resulting demands to devise a new form and method of temple construction and was able to translate them into the design of a functional and spiritually valuable temple, benefitting from current trends in construction and architecture.

CONTRIBUTION OF RUDOLF FRIČ TO THE SOCIAL ARCHITECTURE OF INTERWAR CZECHOSLOVAKIA

Matúš Kiaček

Keywords: social policy, social housing, housing cooperatives, block of flats, apartment block, rental house, interwar Czechoslovakia, Rudolf Frič

Social policy during the First Czechoslovak Republic was characterised by a focus on the development of institutional health and social care and social housing. The task reflected the socio-economic, cultural and political changes brought about by the continuing industrialisation and urbanisation of the population. Social housing was a complex issue that expanded beyond the housing conditions of workers with a view to accommodating the needs of the dynamically growing middle-class, especially civil servants.

In Bratislava the establishment of new institutions and the related arrival of the Czech middle class and intelligentsia of civil servants and employees induced a significant social change in the composition of the population and the necessary improvement in its social and housing conditions. This necessitated the construction of modern residential buildings and urban units, which stabilised the internal urban structure and urbanised the outer city along the urban radials. Moreover, the new legislation enshrined framework standards for architecture and urbanism, social standards and legally binding conditions and provided financial support for all potential developers.

A significant contribution to that field would be attributed to construction entrepreneur Rudolf Frič (1887–1975). Even though the Slovak historiography of interwar architecture almost exclusively presents him as a builder of civil engineering structures, his portfolio and contribution would be more complex. The aim of the paper is to identify and critically evaluate Frič's both architectural and construction work in the field of social housing in interwar Czechoslovakia in the social and urban context of Bratislava. The study focuses on projects of housing cooperatives and private rental blocks, or residential colonies, and partly on examples of city social housing. Their social and

architectural qualities are being confronted with the urbanistic impact on the modernizing city.

Housing cooperatives provided their members with more affordable social housing. Cooperatives with the highest socio-economic relevance were founded by the Bank of the Czechoslovak Legions (Legiobanka). Those were the Construction Cooperative of the Czechoslovak Legionaries and the Construction Cooperative of Civil Servants and Railway Workers, for which Frič designed and constructed several buildings. In early 1920s he built residential urban structure "Legiodomy", designed by Dušan Jurkovič and Jan Pacl, which urbanised the then former city suburbs along the Račianska radial. Later, Frič's firm also designed a legionary colony of detached houses and functionalist elementary school in the newly founded Bat'ov (Batu) in Subcarpathian Ukraine. The colony and the town itself are among the few examples of planned Czechoslovak settlements in the region. Frič designed a similar project based on the ideas of the garden city for the cooperative of railway workers in Koliba. In late 1930s Frič's practice carried out the last two projects for the Legionary Cooperative in Bratislava – the polyfunctional residential house of the Legiopojišťovna designed by Vojtěch Kerhart and the polyfunctional LUXOR department store designed by Jan Víšek.

Frič's construction portfolio also includes individual projects of rental houses for smaller cooperatives. From the urbanistic point of view, they could be divided into two groups: those in the compact city centre, e. g. the "DŽOS" cooperative block of flats in Gajova Street designed by Josef Nowotný, and those urbanising the outer city radials like the Construction Cooperative block of flats in Šancová Street designed by Frič.

A specific category of social housing directly financed by the state was housing for members of the army. The residential blocks for military veterans in Bratislava, designed by Frič, also created a new foundation for block urbanism in the territory of the former northern suburb between Mýtna and Šancová radial streets.

A critical category of social housing was social housing for the poorest and unemployed which is represented by the City rental house with habitable kitchens and the smallest flats, designed by Josef Marek and built by Rudolf Frič and Ján Petri. The lodging house and dormitory in Jelenia Street, designed by Vojtěch Šebor and built by Rudolf Frič, demonstrates that the state's social policy also intended to improve the living conditions of seasonal workers.

Besides the state, the city and housing cooperatives, private investors played a significant role in the accessibility of social housing. Their clientele of tenants consisted of those who could afford the commercial rent. Such an example is the rental residential block of Irma Hanke and Helena Hudečková, designed by Frič at the corner of Suché Mýto and Panenská Street, where it brought a new urban scale. At urbanistically exposed crossing of Mýtna and Šancová urbanising radials, he built the Trojan & Švarc company polyfunctional department designed by Vojtěch Šebor. Frič, as a construction entrepreneur, designed and built rental houses for his own employees in Lazaretská Street, Račianska radial and at the axis of the emerging Koliba district. They all reflect the influence of private investors on the social and urban changes of then modernising Bratislava metropolis.

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ISSN 2729-7640

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2/2023 (Vol. 28)

Summary of approved PhD theses

Anna Gondová
Ivana Bradová
Lucia Oberfrancová
Michal Jelínek

HISTORY OF THE BRATISLAVA CASTLE RESTORATION

Ing. arch. Anna Gondová, PhD.

The Bratislava Castle is tangible evidence of the city's history and the biggest architectural icon in its structural image. It stands for a landmark in terms of the typology of fortification structures and palace buildings in the cultural history of Slovakia. Approximately since the mid-1950s, it has undergone a systematic restoration implemented in several stages. The first major comprehensive stage, practically completed in 1968, resulted in the restoration of the castle palace in its Baroque form. The emphasis was on the tectonics of the medieval fortress character the building used to have before its reconstruction in the second half of the 18th century. This form was known to the public until 2008, when another major restoration stage of the Bratislava Castle began. It uses the restoration method of stylistic period reconstruction of the last historical development stage (Theresian redevelopment) while presenting all the values preserved from older phases. The thesis focuses on the so far unmapped history of the restoration of Bratislava Castle and the Castle Hill during the 20th century up to the present. In order to better understand the context including the issues of all restoration phases, the thesis also includes a brief summarization of the Castle's construction history. The emphasis is put on the loss of its original function and subsequent fire destruction of the monument in 1811. The history of the Castle's complex restoration in the 20th century focuses on the events that initiated its rescue in the 1950s, the implementation of the first general restoration and ongoing second general restoration of the Castle complex. However, given the numerous resources, the emphasis is on the interventions from the 2nd half of the 20th century (architecture and urbanism, interiors, art works, methodological approaches, etc.). The research deals with the subject of the Bratislava Castle restoration not only from the architectural point of view, but also in terms of the cultural-societal and historical setting. The aim of the dissertation thesis is to help enhance the subject of the Bratislava Castle restoration by providing a systematic evaluation, which is almost absent within the current professional and societal discourse. The two-stage evaluation of the conservationist intervention builds on a comparative analysis of the monument's comprehensive restorations. These are characterized by the individual architectural and urban interventions, methodological approaches and methods of monument restoration identified within every restoration stage.

PhD thesis approved at the Faculty of Architecture and Design STU in Bratislava, Slovakia, in the study programme Architecture

RURAL PUBLIC SPACES IN SUBURBAN HINTERLAND OF BRATISLAVA

Ing. arch. Ivana Bradová, PhD.

In this dissertation thesis, we focus on the analysis of contemporary knowledge and on deepening the current state of knowledge of original public spaces and new public spaces in rural and suburban settlements strongly affected by suburbanization. The aim is to evaluate the current state of public spaces and articulate the principles and recommendations for their sustainable development. The paper contributes to

the theory of architecture, urbanism, pedagogy, and the praxis in terms of formulating the functional classification and specific approach and method used by the author to evaluate the general situation of public spaces. Authors' purpose is to provide a proper instrument usable in urban planning for interpretation of public spaces' variables of rural settlements in the urban and ecology spheres. Rural settlements influenced by suburbanization are typically situated in the so called "transitive area" that involves both rural and urban features. These kinds of areas are typical for their extensive development with its clear negative influence on the state, renovation, revitalization, and creation of public spaces. Insufficient quality of public spaces, lack or often even their complete absence negatively impacts social relationships in the relevant areas and encourages frequent migration of inhabitants (even on weekends or holidays), usually to the closest town or city. Inappropriate pressure on the transportation capacity or infrastructure and inadequate congestion in the centre of agglomeration are consequences of this situation. In the Slovak Republic, this particular problem is typical for the Bratislava's agglomeration as the country's quickest developing area, and hence the authors conducted a detailed analysis and evaluation of public spaces in the selected settlements in this region using their own method. We focus our interest on the Žitný ostrov – Danube development axis as the most dynamically growing area from among all development axes in the Bratislava self-governing region both related to its multiple growth of population and residential development. The results of evaluation of this model region are then compared to the other evaluated urban areas: Bratislava – Záhorská Bystrica City District and the nearby Austrian borderline rural settlement Kittsee. Our findings resulting from this comparison have become the groundwork to create recommendations for selected suburban public spaces. These recommendations contain a collection of visions and rules for the creation, renovation, and revitalization of public spaces in the hinterland of Bratislava on the residential and the zonal levels, also with their theoretical impact on rural and suburban public spaces across Slovakia in general. Finally, the document also summarizes the percentage share of active and inactive public spaces from among all the public spaces in the area of our interest.

PhD thesis approved at the Faculty of Architecture and Design STU in Bratislava, Slovakia, in the study programme Architecture

FRIENDLY ARCHITECTURE

Ing. arch. Lucia Oberfrancová, PhD.

The dissertation explores the relationship between architecture and the quality of life of its users, and the possibilities of evaluating the socio-cultural sustainability of buildings. Sustainability and quality of life are currently among the main goals of global development. Today, energy-efficient architecture alone is no longer enough. In addition to the energy efficiency strategy, other sustainability strategies are increasingly coming to the fore: strategies of sufficiency and consistency. Digitalisation, too, is a prominent subject of talks regarding current and future global developments as a possible tool to achieve the above objectives. Friendly architecture, as understood in the dissertation, emphasizes user satisfaction and the quality of architectural expression while maintaining environmental friendliness. On the one hand, solutions need to be sought to improve people's quality of life and maintain their culture and traditions, and on the other hand, people need to be motivated to a healthy and sustainable lifestyle. Both approaches are taken into account in answering the question of how to evaluate friendly architecture, how to measure qualities that are often associated with subjective perceptions of individuals, and what aspects and elements of architecture lead to comfort, satisfaction, and a healthy and sustainable lifestyle. The dissertation consists of an introductory, theoretical, analytical, evaluation, and concluding part. The introductory part provides information about the background and relevance of the topic, and the motivation to choose the topic based on the author's previous research experience. The theoretical part (state of the art in science and technology) is followed by the analytical part which elaborates on the investigation of social sustainability and architectural design quality in existing standards, guidelines, tools, and certification systems as the basis to design a resulting scheme or system to plan and evaluate socio-cultural quality of buildings during their entire lifecycle. The investigation and comparison of selected case stud-

ies, according to the proposed method called 'Friendly Architecture Life Cycle Analysis' (FA-LCA), are introduced in the evaluation part, followed by a summary of results, which comprises testing or verification of research questions. The conclusion and discussion are presented in the concluding part. As a final point, a Slovak résumé and a list of references, tables, figures, abbreviations, and appendices are presented, the latter also including a detailed analysis of sustainable building assessments regarding the sociocultural sustainability and a detailed evaluation of considered case studies.

PhD thesis approved at the Faculty of Architecture and Design STU in Bratislava, Slovakia, in the study programme Architecture

SKETCHING AS A TOOL OF VISUAL IDEATION FROM THE DESIGN PERSPECTIVE

Michal Jelínek, MA, ArtD.

This manuscript examines and explains the role of sketching as part of the creative design process, especially during its concept phase, when a new idea or solution is formed. The main focus of the study is on the visual form of ideation, known as "sketching." The thesis also presents examples of practical ideation sketching techniques, analyses them, proposes the scientific explanation of mental mechanics behind these techniques, and provides the perspective of cognitive psychology. Initial research includes an overview of the current understanding and positioning of ideation sketching, of the literature that covers the given subject, and validates these findings by an online survey, followed by interviews with twenty experienced professionals in the field of car and entertainment design. Research is intended primarily for students and creative practitioners of disciplines such as design or architecture; however, the content can likely be beneficial in a broader context, despite the resources and examples typical for these disciplines. Last but not least, the work concludes with a critical evaluation of research results, addressing the lack of shared understanding and terminology, and proposes a systematic approach to ideation sketching at the level of practical exercises and formal education.

PhD thesis approved at the Faculty of Architecture and Design STU in Bratislava, Slovakia, in the study programme Design

ISSN 2729-7640

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ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2023 (Vol. 28)

ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU

volume 28
year 2023
number 2

PUBLISHED BY
Faculty of Architecture and Design STU
Námestie slobody 19, 812 45 Bratislava, Slovakia
www.fad.stuba.sk
tel.: +421 257 276 178
+421 949 015 316
e-mail: alfa@fa.stuba.sk
IČO: 00397687

and

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Ul. Bogumila Zuga 32A, 01-811 Warsaw, Poland
https://www.sciendo.com/
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KRS: 0000055478
NIP: PL 9521878738

June 2023

PUBLISHED ONLINE QUARTERLY
ISSN 2729-7640

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