Book of abstracts
This book of abstracts gives an overview of the (Ph.D.) research that will be presented during the interuniversity research seminar on construction history.

The seminar welcomes researchers in construction history from all over Belgium and sets out to be a place where research results can be discussed, ideas can be shared and new collaborations can emerge. The full day of presentations is composed of a mid-term Ph.D. presentation, several short pitch presentations on starting projects and more elaborate presentations on advanced research. Abstracts of these presentations, either short or extended abstracts in function of the type of presentation, are compiled in this book.

We would like to thank the participants for their contributions, as well as prof. Silke Langenberg (ETH Zurich), prof. Bernard Espion (ULB) and prof. Johan Lagae (UGent), who have kindly agreed to act as external reviewers during the seminar.
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Mobility as a key to understanding the materiality of the 19th century urban streetscape: the case of the Brussels boulevards

Thomas SCHLESSER, CReA-Patrimoine, ULB

While urban mobility has been widely studied from the point of view of technical, social or economic history, its material dimension has been largely underestimated. The way in which mobility contributes to transforming the city however appears to be a key factor in understanding the evolution of the 19th century urban morphology. The creation of routes and junctions in the city, issues of efficiency and convenience of circulation, as well as the integration of multimodal transport networks have played a key role both in the layout of the streets and in the material development of the street design (the “voirie”).

The study of traffic flows from a multi-scale point of view and an approach based on multimodal mobility issues (connecting train stations, managing the slopes between the upper and the lower city, decongesting the city) leads to overcome the traditional modal view of the history of mobility.

To reconcile urban morphology, mobility and materiality, this research is based on three recently renewed fields of study: history of urban mobility, that has overtaken the technical transportation history; urban history of the “ordinary city”, driven by long-term processes involving its permanent transformation; and the material history of urban design.

Our case study will be the Brussels boulevards in the second half of the 19th century. These spaces of great modernity are at the centre of several public space redevelopment campaigns, aiming to improve traffic flow across the city and to promote their use as promenades.

These objectives will lead to rethinking these spaces on multiple scales: in the first place at the scale of the street design, where it will be a question of experimenting and integrating efficient and comfortable coatings such as macadam, asphalt and wooden pavement. The authorities will also attempt to define the place of each user by adjusting the lateral profile of the boulevards, promulgating traffic regulations, and offering a range of street furniture. These questions will rapidly develop at the scale of networks, aiming in particular to create a spatial and logical connection between the most popular promenades (Allée verte, quartier Royal, Bois de la Cambre). This ambition will be further reinforced in the last third of the 19th century with the development of the tramway on the boulevards, raising specific integration issues testifying to the complexity of the urban fabric.
Reflections on the meanings, the commitments and the references behind learning-by-building pedagogies in architecture schools

Alessandra BRUNO, Faculty of Architecture La Cambre-Horta, ULB

Many architecture schools, in Belgium as in Europe, teach the architectural project through its realization, complete or partial, on a 1:1 scale. The studio becomes a building site, the students become apprentices discovering construction materials, the project becomes a grey zone between the design and the making of the object. The professors engage in a reflection on learning methods and use knowledge and expertise from other professions such as carpenters and other craftsmen, and from other disciplines such as sociology, design and art, in order to rethink the learning environment. This occasionally takes place in architecture schools, in project studios or within more specific courses. Some federate with other teaching institutions outside the faculty, such as the Grands Ateliers in Grenoble, France. Thus, the results differ from the handling of construction materials, to prototyping in the workshop, until the construction of buildings.

Introducing the constructive dimension in architecture studios pursues various objectives and motivations: raising awareness about the emergence of environmental concerns, stimulating dialogue among construction cultures, or even challenge production methods in building environments, etc.

Simultaneously, these activities question and shake up the notion of the architectural project, historically based on the split between the design exercise of the architect and the construction delegated to the other trades in the building industry. Recognising the construction phase within the project allows to grasp and include values and other aspects, often neglected by traditional architectural pedagogy, such as the ethical responsibility towards the project, the thinking behind manual work, the practical knowledge of other trades. Through its critical approach to the project, these activities challenge the architectural pedagogy: what does learning by building do to the teaching of the traditional project? What do these practices reveal about the separation between intellectual and manual learning?

Many of these studios are based on a historical theoretic framework, supported by pedagogical traditions and models, such as the Bauhaus school, the American design-build studios and others. Some of them adhere explicitly to their tradition, others wish to create something new. However, they are often described as recent or returning phenomena.

My research explores and analyses the historicity of such practices, by proposing their re-contextualisation in architectural pedagogy. The aim is to promote the understanding of these practices by investigating their origins and the relationships they maintain with past and present: how is learning-by-building innovative? Which knowledge is remobilised or produced? Is it possible to trace a genealogy of these practices?

Learning-by-building is an opportunity to reflect on the socio-economic and environmental issues of our time. It questions and repositions the architectural project in the face of contemporary situations through reflection on the means of production, materials and their reuse, and even on the role of architects in society. However, the question about their meaning(s) and commitment(s) raises question in the academic world: what types of commitment do they promote? To what social, economic, environmental and technological evolutions do they respond? What is their transformative purpose and their political significance?

PhD project:
Apprendre l’architecture, entre le dire et le faire
supervisors: Ludivine Damay, Wouter Van Acker (ULB)
2019-2023, FNRS
Can we get our materials back, please?

Robby FIVEZ, Department of Architecture and Urban Planning, Ghent University

The first official decree that sowed the seeds of the segregationist spatial politics of the former Belgian Congo - which would later pervade each and every aspect of everyday life in the colony - was a law on building materials. The law stipulated that “in every locality [of the colonial territory] one quarter had to be reserved for wood and iron constructions and another for huttes, pailottes et chimbèques [three different local construction techniques]”. Since the aim clearly was to segregate Europeans from Africans, it is highly remarkable that legislation was shrouded in constructive terminology. Although segregation was included in less shrouded terms in later zoning laws, the racialized categorization of building materials continued to exist throughout Belgian colonialism. Numerous legal texts, books and colonial propaganda refer to durable and non-durable building materials, although a clear definition remained lacking. While these constructed dichotomies were always cloaked as an objective difference of physical properties, in reality they introduced a racialized and cultural hierarchy of building materials that conveniently served the colonial agenda.

After glossing over the general structure of my work (you can find a synopsis of the research project below), I will focus my presentation on how and why building materials were considered ‘appropriate’ for building in Africa. Highlighting how these considerations about building materials (being ‘appropriate’, ‘durable’, ‘hygienic’, etc.) depended on underlying political, economic or cultural rationales, I will accentuate the ‘misleading innocence’ of building materials. For this argument, cement and burnt lime are particularly useful materials to think with. After all, in colonial times cement was known as “le prototype des matériaux durables” while burnt lime always remained the lesser ‘surrogate’, a position that remarkably started to shift completely in the immediate postcolonial era.

The argument of this presentation is in line with the overarching argument I want to make in the first part of my PhD thesis. This presentation is therefore a presentation of a work in progress and critical remarks about the argument can be particularly helpful.

A Concrete State. Building Ambitions in the (Belgian) Congo, 1908-1964 (research project)

Ever since the first article on colonial architecture in Congo appeared in 1986, a substantial amount of research has been conducted on the topic, scrutinizing late 19th century prefabricated metal structures, the introduction of modernist ideas in design and planning since the 1920s, the emergence of 1950s tropical modernism and more recently, the ‘nation building’-campaigns under Mobutu’s reign. Influenced by post-colonial studies, the perspective of scholarship has shifted from an approach focusing on style and form to more critical analyses of the ‘politics’ of (post)colonial architecture or urban planning. By approaching the built production in the DRC from a construction history-perspective, I aim to add to this growing body of critical scholarship.

In my opinion, a construction history-perspective holds two important advantages over the more traditional architect-driven approach. First, it drastically broadens the historical scope. Instead of only taking architectural masterpieces as objects of our enquiry —anomalies as they remain in the built environment— every building can become of interest. The second, interlocking advantage of a construction history perspective, is the introduction of buildings into the theoretical framework of science and technology studies. Drawing on this body of scholarship and understanding buildings as ‘assemblages’ rather than as ‘static objects’, it is easy to see how numerous acts were involved in the realization of buildings. For colonial architecture history writing, these two advantages are probably even more important, as they allow to address the post-colonial critique on architecture history as being a Eurocentric story of metropolitan architects working overseas, epitomized by the often-heard question “Where are the Africans?”. By understanding buildings as processes, numerous transnational and African acts come to the fore, questioning the image of Congo as ‘built in Belgium’.

Since concrete was of particular importance for the colonial project —its durable and modern image fitted well with the ‘civilizing’ agenda of colonialism— my research project will concentrate on the ‘introduction’ of concrete and cement technology in Congo. By highlighting how certain technological innovations in concrete construction were instrumental in dealing with urgent societal, economic or political problems, the project tries to expand concrete’s colonial agency. Since the selected case-studies often interrogate moments of failure, the research also tries to show how the colonial state often tried and failed to grapple with the complex on-ground realities of colonial Congo. Often, the lack of know-how crippled the enormous ambitions of this concrete state.
Picturing post-war Belgian construction sites.
The photographic collection of the Belgian contractor firm Van Laere (°1938)

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This research project analyses post-war building practices in Antwerp, within the national and international context, by studying the actual building process of small, medium and large construction projects in a comparative perspective and an international context. The project puts the building site in the spotlight as the place where the various actors in the construction sector actually work together, and where labour, materials, techniques and machines merge. By doing so, the project aims to shift away from the traditional architectural historical research and critique, which focuses on the architectural design and the built result, monofunctional studies on materials or experts in the field. It thus focuses on the interactions and collaborations of the different actors on the building site, and adds a new and relevant dimension to existing, often monodisciplinary, contemporary studies.

Within this research project the different building sites and the evolving building practices are questioned from three specific perspectives: an iconographic/symbolic, a regulatory and a socio-cultural perspective. Perspectives that are strongly interwoven in building practice, but at the same time the analysis can be carried out through different sources and as such the critical confrontation of the three analysis perspectives will strengthen the scientific analysis. It analyses a range of building sites in Antwerp, starting with the second half of the 20th century, investigating a variety of materials such as photographs, archives, building schedules and literature. As such, the research fills an existing gap within the research field of construction history, but also connects and reinforces the existing expertise of both 19th- and early 20th-century construction history (Bertels 2015) with contemporary construction practice (Schrijver 2015). Moreover, the construction site as a locus for theoretical reflection focuses the developing discourse on architecture as material culture through the lens of its practices.
Due to demographic developments and stricter energy and comfort requirements among other things, the built urban heritage is under great pressure. Even relatively recent buildings are increasingly begin subjected to major renovations. In most cases, the original materials are undervalued and under-utilised, partly due to a lack of knowledge about the building materials used. As such, a great deal of both embedded energy and embedded culture is lost. This is all the more true for the patrimony from the period 1975-2000, which is at risk before it has gotten a fair chance of being properly assessed. These issues are tackled in a new research project, starting early 2021. In line with the format of an Innoviris Applied PhD scholarship, the project is embedded within the department of Architectural Engineering of the VUB and urban.brussels, i.e. the regional government agency on urban planning and heritage. As such, both the development of scientific, theoretical knowledge and its application in policy and practice are facilitated.

The research will be organized in three main parts. The first part of the research will be devoted to the analysis of a selection of the most common and representative construction materials and building techniques from 1975-2000. The main research questions in this part are related to the cultural, historical, scientific and technical value of these materials, including the way in which they were mounted (and might be demounted).

As the residential typology represents approx. 80% of the total building stock of that period, especially building materials that were applied in housing will be investigated. For this purpose, and as second step in the research, the Brussels housing stock of this period will be identified by means of a geographical, typological and chronological mapping, after which a selection of houses will be studied in depth.

The extent to which building materials characterize the residential architecture from 1975-2000 will indicate the importance of the criterion related to the building materials within the assessment policy on young heritage. In this last step, a critical analysis of the current framework for the assessment of heritage in the Brussels-Capital Region will be performed from an international comparative perspective, in order to re(de)fine its applicability and interpretation for the specific case of young heritage.

The research will offer important and innovative contributions to the current state-of-the-art in various fields. First of all, within the field of Construction History, knowledge on building materials will be expanded in time, in width and in depth. The knowledge will also be geared to possible implementation in the circular economy. Secondly, the specific attention to building materials, including both material-technical aspects as well as their cultural-historical value, will generate a new perspective on heritage. Thirdly, a scientific and validated framework for young heritage will be drafted, enabling urban.brussels to take on a leading international role in this matter.

Giuseppe GALBIATI, LOCI, UCLouvain / TSAM-ENAC, EPFLausanne

Suspended buildings represent without any doubt one of the most important innovations in the history of architecture and construction of the post-WWII period. They consist in a brilliant combination of two pioneering construction techniques: light curtain walls, or modular panels systems, and hanging structures. In this sense, because of their double and indissociable nature, these buildings’ design asked for the first time a close collaboration between architects and engineers. A fundamental role in their diffusion was also played by the building companies, that frequently protected their most advanced building techniques with patents. But in spite of their clear cultural importance, these buildings have become today a category particularly at risk. Very little, or not at all studied, this emblematic corpus is questioned: due to their specific construction and materiality, a priori considered as leaky and poorly insulated, suspended buildings are often subjected to radical alterations, without any recognition of their architectural and heritage value. As the existent building stock represents today about 40% of the European energy consumption, retrofitting and performance optimization of buildings is considered as a real priority.

So, my PhD research, developed in cotutelle between the UCLouvain and the TSAM laboratory at the EPFLausanne under the supervision of professors Giulia Marino and Franz Graf, has, in this field, a double goal. On the one hand it aims to produce new knowledge on the construction of suspended buildings with light facades. On the other hand, it intends to develop a new retrofitting methodology, capable of considering existent buildings as a real resource, that means finding the correct balance between preservation and energy economy issues.

Even the European Union gives clear advices in this direction, stating that: «research into, and the testing of, new solutions for improving the energy performance of historical buildings and sites are encouraged, while also preserving cultural heritage» [1]. Starting from a wider corpus, coming from the systematic research on buildings with suspended structure realized in Europe between 1960 and 1980, three monographic case-studies will be chosen. These two decades are the most representative years for that kind of architecture, when light curtain wall systems, combined with challenging structures, reached their maximal development, before the oil crisis of the 1970s. The subsequent restrictions about energy consumption standards, marked the beginning of their progressive decline. The research will be subsequently developed in different phases, aiming to develop profound knowledge on the materiality of each monographic case-study: architectural, construction and technical analysis, energy diagnosis and structural diagnosis. On this basis, several retrofitting variants will be proposed and compared thanks to a multi-criteria grid specifically made, in order to propose the most appropriate project solution. In terms of procedure, but also in terms of results, this methodology, carried to its extreme through the application to this complex building type, can be considered as a valuable precedent, applicable by analogy to a broader corpus of similar objects, not in the least to more routine examples of the post-war building stock. In other words, the research is conceived as a pilot study, providing a concrete and useful tool for future retrofitting projects of Modern Architecture.

From a historical point of view, the idea to suspend a building was developed for the first time in Berlin, in 1925, by the Rasch brothers, to deal with a precise urban problem of their city, but we have to wait till the 1960s for the first European realization. This is the Marl City Hall, also in Germany, realized between 1960 and 1964, by the
Also the facades conceived by Léon Stynen are very different from their clumsy counterparts in Marl. In the facade of the BP building, any trace of concrete disappears, replaced by completely glazed elements. The curtain walls of the tower consist of a continuous structure of wooden window frames fitted with double glazing, and a fine metal grid that separates the windows from the external sun-shading system, becoming at the same time a narrow walkway, intended for cleaning the facades. This system provides at once an unobstructed view and maximum daylight in the offices.

My lecture, starting from this synoptic analysis of the European situation and Belgian realizations at that time, will mainly deal with the construction history of the Administrative Buildings of the Place Chauderon in Lausanne - one of the three monography case-studies - designed between 1970 and 1974 by the Swiss architects Willomet and Dumartheray, with the expertise of Jean Prouvé. The building represents in many ways the apex in suspended building construction. Here we can find, thanks to a mixed steel and concrete structure, a real optimization in the use of materials, with compressed elements all made of concrete and all tensioned elements made in steel. The facade is cleverly designed by Jean Prouvé with prefabricated modular panels, adopting the CIMT system, directly derived from the railway industry and applied to the construction industry. Thanks to its flexibility and the sliding possibility of the neoprene panels’ joint, the system is capable of supporting vertical deformations up to 50 cm and more, overcoming one of the most challenging constraints, due to the presence of steel hangers. At the same time the sandwich panels, filled with polyurethane foam, assure acoustic and thermal insulation, providing the first link to sustainability themes. According to Roland Willoment, the presence of Jean Prouvé was essential to answer the numerous technological issues of the project, otherwise not manageable in their complexity by any other Swiss architect or engineer. So, the lecture will be focused on the building construction techniques, adopted for the structure and its facade; on the materiality of the complex and its actual condition; on the industrial process conceived for the panels’ fabrication. Particular attention will be also given to construction details, with the analysis of the original technical drawings at the scales 1:10 / 1:5, coming from the EPFL Archives de la Construction Moderne.

The interwar period marks a time of innovation and rationalisation of the kitchen. A desire for a “new start” emerged after the First World War. Architects stepped away from the 18th- and 19th-century architecture, including the (lacking) design of the traditional kitchen. Leading household experts and European designers started to approach this issue in a scientific manner and developed new designs for the “rational kitchen”. American household experts, like engineer’s wife Christine Frederick, inspired many designers through their scientific approach in the kitchen organisation. All this research was performed to create a most efficient and productive work environment for the housewife.

Though the concepts of some of these kitchen designs are well documented in architectural journals and women’s magazines, profound knowledge on their technical details and materialisation is lacking. By defining these features for a select number of Belgian interwar kitchen designs, for example the CUBEX kitchen by Louis Herman De Koninck, and by mapping existing interwar kitchens in Belgium, it becomes possible to answer the question on how to correctly conserve and approach these kitchens in modern-day Belgian households.

The innovative aspects of this study are its interdisciplinary investigation of three main elements for the Belgian interwar kitchen, namely its concept, construction and conservation with the aim of integrating this Belgian legacy in 21st-century households. The objective of this PhD research is to define the key features and correct conservation/restoration strategies of historical interwar kitchens and to establish knowledge on the synergy of these authentic kitchens with today’s contemporary kitchen appliances and needs.
Assessing the role of construction history in the adaptive reuse of post-war churches

Charlotte ARDUI, Faculty of Architecture, KU Leuven

During the post-war years, Flanders developed into a ‘nebulous city’: the region became almost entirely urbanized and covered with a ubiquitous, low-density built fabric. As part of this rapid suburban expansion, a very important number of parish churches were built across Flanders. In the same period, the Catholic Church underwent fundamental reforms: church architecture broke away from tradition and became a field of creative experimentation.

Today however, modern churches are at the intersection of three pressing societal challenges. Firstly, issues related to ageing of the population, mobility and climate change require an urgent reconfiguration of the low-density peri-urban areas. Secondly, much of the post-war building stock has come to the end of its first life cycle. Little appreciated, these buildings are prone to neglect, unsympathetic alteration or even demolition. Thirdly, in a context of rapidly declining church attendance, more and more churches are closing and are increasingly becoming a (financial) burden to civil society.

In the PhD project 'Faith in the Periphery' post-war parish churches serve as a lens to investigate these pressing concerns which, in turn, provide clues towards ensuring the future relevance of religious heritage in an increasingly secularized society. Beyond merely adapting a given church building to new functional requirements, we seek to develop balanced strategies for the adaptive reuse of churches which capitalize upon their socially and spatially structuring capacity.

In order to identify and operationalize this capacity, we will rely on historical research and research by design: through a variety of design experiments, we will assess the tension between identity and transformation of modern church buildings. The design will occur hypothetical but on realistic basis and will be carried out through drawings, models, spatial interventions, … However, the project’s objective is providing knowledge on different scales and transcending the material artefact. Hence, the underlying motivation is to contribute to the more general imperative of strengthening the future resilience of the Flemish Nebulous City.

Although the construction history of post-war churches is only an ancillary dimension of this research, the materiality and construction techniques are relevant to investigate both from a heritage perspective, and as critical parameters in church buildings’ transformations. To establish this broad relevance, we will look at the church of Sint Jozef Arbeider (Vosselaar, 1967) by Marc Dessauvage, that is currently being transformed into a library. It forms an ideal case to assess this dual perspective for several reasons. On the one hand it is representative for the building culture of the 1960s: the well-documented design and construction process shows a constant ‘mediation’ between Dessauvage’s dogmatic ideals and technical, structural and financial feasibility. On the other hand, in its seemingly low-tech and straightforward transformation unexpected technical and structural issues emerged. Further, the church of Sint Jozef Arbeider is the first listed parish church that is officially being transformed. It serves as a pilot project and therefore, many lessons can be learned.
Controlling the sun: French and Belgian curtain walls since 1945

Jean SOUVIRON, BATir, ULB

The historical study presented in this paper is part of a doctoral research project that focuses on the biography of insulating glass units. The concept of biography is understood here according to two complementary approaches: one that traces the life cycle of glazing from the extraction of raw materials to landfill; the other which explores the history of glazing as a commercial construction product introduced in the aftermath of World War II and intimately linked to changing patterns of consumption and energy policies.

Focusing on Western Europe, in particular Belgium and France, this study raises the following question: how have the requirements for energy efficiency materialised throughout the life cycle of glazing, and how has this process impacted the biosphere? The aim is to contribute to our understanding of the sociotechnical trajectory of the built environment since 1945, to analyse the entanglement of this trajectory with the biosphere and to identify the interlinked key pathways and barriers that influence the nature and degree of ecological transition.

To achieve these objectives, I trace insulating glass units throughout their life cycle and structure this inquiry along three lines of research.

Firstly, this research draws on archives from major French and Belgian glass manufacturers in order to explore the early creation of insulating glass units. Through this historical analysis, it provides an understanding of how and why repairing windows and glass recycling became marginalised practices. This history is rooted in the industrial and economic growth of the post-war period, as well as innovations such as the curtain wall, which enabled the rise of fully glazed buildings dependent on air-conditioning systems and powered by fossil fuels.

Secondly, a case study approach puts this history in the context of the massive urban growth of the second half of the twentieth century. I apply an environmental analysis to the 'North District' in Brussels and 'La Défense' in Paris, focusing on the architectural transformations resulting from the installation of larger and more efficient glazing units.

Finally, this study challenges one of the fundamental longstanding assumptions promoted by the glass industry as well as successive energy policies, namely that the ecological cost of the manufacturing and disposing of insulating glazing is offset by energy savings resulting from the use of more efficient products. I discuss this hypothesis through a life cycle analysis which draws on the sociology of energy to assess the environmental footprint of a series of sociotechnical paths.

This presentation focuses on solar control glass which led to growth in the use of the curtain wall throughout Europe and beyond from the 1960s onwards. I combine construction history with an analysis of the evolution of energy policies to investigate how the technical properties and building processes of curtain walls were impacted by the requirement for efficiency and comfort. I discuss the ecological impact of these policies and questions how the imperative for efficiency has transformed facades and, consequently, the way we interact with the environment.

Controlling the Sun: French and Belgian Curtain Walls since 1945

Following World War II, France, Belgium and the rest of the Western world experienced three decades of exponential growth that permanently changed the material composition of cities. Aluminium became an emblematic product of the industrialisation of the building sector, framing the curtain walls of modern, fully-glazed buildings [1]. This new architecture became a landmark of Western modernity, but was also indicative of an energy-intensive economy.

Indeed, the lightness of curtain walls led to major energy
loss in the winter, while the large panes of glass caused intense overheating in the summer [2]. Thus, when European companies imported the curtain wall from the USA in the 1960s, they were quickly followed by the first air-conditioners. Sophisticated devices to control the indoor climate became unavoidable extensions of all-glass facades. Modern office buildings and their fossil-fuelled indoor climates have since stretched their fashionable curtain walls across business districts in Europe and beyond, forming the familiar landscape of many metropolises.

But how has the curtain wall managed to traverse half a century of increasingly stringent energy policies? To answer this question, I trace the trajectory of the curtain wall in France and Belgium. I argue that it owes its survival to the glass industry, which has long sustained research into products that filter the sun's rays ever more efficiently. However, this development has widened the gap between architectural design and ecological considerations and led to the normalised use of air-conditioning systems.

In the USA, the energy footprint of office buildings grew dramatically in the 1960s. From 1945, the electricity demand for lighting and air-conditioning had increased by 150%, while fuel for heating had doubled [3]. Although office districts were developed later on in Europe, they were nonetheless very energy-intensive - a problem worsened by the modern trend of enclosing buildings by a glass curtain regardless of solar orientation.

The transparency of such buildings made them particularly vulnerable to climatic variations and it became necessary to find a way of reducing their energy bill. One solution might have been to completely rethink this kind of architectural design, particularly in the light of the bioclimatic principles that were being formulated at the time [4]. Instead, architects and engineers relied on the glass industry, which provided new glazing products promising greater efficiency without reducing transparency. One such example is 'Parsol', a form of tinted glass available in grey, bronze or green, which was produced by Saint-Gobain from 1965 on. This polished filter glass "absorb[ed] excess sunlight and contribute[d] to more efficient, cheaper air-conditioning"[5]. Indeed, a double glazing unit using a layer of Parsol glass had a solar heat gain coefficient of less than 50% [6]. However, transparency was radically reduced, with light transmission only between 30% and 50%, thus resulting in a significant increase in the use of artificial lighting.

A paradoxical goal for the glass industry was then to produce an insulating glass unit that would provide light and transparency while also prevent the sun's heat from entering the building. To meet this challenge, the glass industry relied on material science, a field of research which emerged in the context of the arms race and space race of the Cold War. X-rays and quantum mechanics were opening access to the microstructure of the matter and paving the way to material design [7]. Consequently, the definition of glass evolved throughout the post-war period: from once being seen as a homogeneous material prepared according to a precise recipe, to becoming a composite material with successive layers, each of them designed to satisfy specific functions [8].

Metallic salts began to be used in glazing, acting as a solar filter by reflecting infrared radiation while maximising the transmission of the visible spectrum. In 1963, Glaverbel marketed the first European solar control glass under the brand name of Stopray. Nearly a decade later, Saint-Gobain marketed Parélio, a glass pane with one reflective face, created by a hot deposition of metal oxides. Glazing could now achieve spectral selection to reduce energy use, a major claim on the eve of the oil crises.

The impact of the first oil crisis could be seen in the quasi-systematic use of solar control glass in curtain walls in Belgium and France. One emblematic example is the third tower of the World Trade Centre in Brussels, which was part of a cluster of eight office buildings developed at the end of the 1960s. Two of them were built before 1973 but the third had later been redesigned to include clear coated glass. Completed in 1983, this building offers a striking contrast between its reflective envelope and the other two, darker towers. This contrast is reinforced by their identical architectural morphology, which underlines the role played by technologies in the integration of environmental considerations, at the expense of other architectural means.

This technical approach to energy issues was strengthened by the rapid spread of software applications for building energy modelling. They had emerged at the end of the 1960s and had been enhanced by a renewed concept of
comfort, which objectified the notion of thermal well-being through mathematical equations [9]. The control of the energy system of a building became an issue of physical optimisation where people were reduced to receptors of thermal stimuli to whom a “neutral” level of comfort should be guaranteed [10]. Reduced to the status of passive subjects, users were relieved of the duty to manage even just the blinds and, instead, glazing began to play an active role in the energy system of a building. The curtain wall could no longer be regarded as a static element but rather as a dynamic technology designed to regulate and control daylight and solar heat gain.

In the 1980s, the use of active façades became all the more urgent as solar control glass was no longer enough to limit overheating within increasingly well-insulated offices. Insulating glass units, synthetic rubbers and elastic sealants were so efficient that the heat which used to escape through windows was now stored in airtight rooms [11]. This phenomenon was exacerbated by the use of electronic equipment as well as false floors and ceilings that reduced thermal inertia. Under these conditions, a small amount of solar radiation could worsen a greenhouse effect that the manual use of blinds did not succeed to prevent. Thus, an active façade would control the building transparency according to climate fluctuations, while the employees would focus on their work in a more pleasant environment.

Such technology was the subject of intensive research in the late 1980s, leading to a series of innovations. Saint-Gobain filed three patents between 1987 and 1993 for a double glazed curtain wall with an aluminium frame manufactured in the 1970s ranged from 30 to 40 kg per square metre, whereas contemporary double-skin facades weigh between 70 and 90 kg. As a result, the energy used and greenhouse gases emitted in their production phase are multiplied at least by 2.5. Therefore, while this history highlights an increasing complexity of glazing, a question arises: could the search for energy efficiency have contributed to the invisibility of the network of material flows upon which our built environment depends?

“More and more”, Saint-Gobain was selling “functions, and not just products”[13]. By the end of the 20th century, the glass industry was thus completing a transformation initiated in the 1950s when glass had become a composite material to be designed. An evolution that has radically changed the materiality of curtain walls: the weight of a double glazed curtain wall with an aluminium frame is now used worldwide. See: Elizabeth Shove, Comfort, Cleanliness and Convenience: The Social Organization of Normality, New Technologies/ New Cultures (Oxford: Berg, 2003), chap. 2: “The Science of Comfort: Constructing Normality”, 41–42.

Airtightness also exacerbates sick building syndrome when materials contributing to indoor air pollution began to spread into buildings. See: Michelle Murphy, Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Tecnoscience, and Women Workers, Duke University Press, 2006.


2. The history of glass architecture is punctuated by these problems of overheating, such as those that appeared behind the increasingly wide windows of department stores or under the grandiose glass roof of the Crystal Palace. See: Henrik Schoenefeldt, ‘The Crystal Palace, Environmentally Considered’, Architectural Research Quarterly 12, no. 3–4 (2008): 283–94. [8]


5. Saint-Gobain publicité, ‘Campagne de presse Parsol, September 1969, DOC SGV 00020.10, Saint-Gobain Archives Centre, Blois, FR. 


10. The term “neutral” comes from the scale of values established by Fanger in the 1970s to define the ideal thermal comfort that people might feel. This concept and scale of values, along with the equation that “predicts” the satisfaction of the occupant of a building—the Predicted Mean Vote (PMV) and the Predicted Percentage of Dissatisfied (PPD)—have been included in the ASHRAE and ISO standards, which are now used worldwide. See: Elizabeth Shove, Comfort, Cleanliness and Convenience: The Social Organization of Normality, New Technologies/ New Cultures (Oxford: Berg, 2003), chap. 2: “The Science of Comfort: Constructing Normality”, 41–42.

11. Airtightness also exacerbates sick building syndrome when materials contributing to indoor air pollution began to spread into buildings. See: Michelle Murphy, Sick Building Syndrome and the Problem of Uncertainty: Environmental Politics, Tecnoscience, and Women Workers, Duke University Press, 2006.

12. Daguerre in: Save and de Beaumont, 43.

In the aftermath of World War I, Belgian architects were facing a daunting set of challenges. The enormous task of post-war reconstruction and the nationwide lack of housing were both aggravated by the catastrophic economic situation. In the quest for solutions, American architecture arose as a potential source of inspiration. Globally known for its commercial drive, technical ambition and cost efficiency, it offered much-needed answers to Belgium’s architectural crisis. From 1918 onwards, several prominent Belgian architects crossed the Atlantic. American architects and foundations became involved in the construction and reconstruction of prestigious Belgian public buildings and the Belgian press became increasingly fascinated with the architecture of the New World. Although these evolutions have not yet been thoroughly addressed by research, they seem to indicate increasing architectural exchange between the two allied nations.

In short, this research sets out to explore how the Belgian architectural field responded to American architecture as a model for post-war reconstruction and innovation. It will examine how transatlantic cooperation arose during and after WWI, and the lasting impact of these partnerships on Belgian inter-war architecture. The focus lies on the decade immediately after the war (1918-1928), with international alliances still very fresh in the public consciousness. The scrutiny of contemporary manuscripts, plans, magazines, exhibitions and lectures will unveil a broad network of actors with diverse goals: from individual architects and architectural associations to pressure groups, philanthropic foundations, politicians, contractors and private investors. One key angle is the constructional aspect of architecture: Belgian architects conducted study trips to the US and American stakeholders were present in Belgian construction sites. To what extent did these exchanges facilitate the transfer and use of more modern, ground-breaking techniques and/or materials?

In answering these questions, this research reveals how the encounter with American architecture forced Belgian architects to question their attitudes and practices in relation to similar evolutions elsewhere in Europe. This will not only further enrich Belgian architectural history, but enhance our understanding of the mechanisms at play in international architectural exchange more broadly.
Local practice and scientific construction: Entanglements of knowledge, technology and institutions in the 19th century Ottoman Empire

H. Tuba BÖLÜK, Architecture Department, Mardin Artuklu University

Worldwide, the dynamics of the industrial revolution significantly changed many areas of society and technology throughout the 19th century. While many European countries saw extensive transformations, in the Ottoman Empire Sultan I. Abdulmecid (1823-1861) paved the way for a comprehensive series of modernization programs: the so-called Tanzimat reforms (1839-1876). These aimed mainly at infrastructure but also included the administrative sectors of the Ottoman Empire, from education to public works, from trade over agriculture to administrative decisions. The “Vilayat Municipality Law” of 1877 for example, defined the law in provinces and in this sense promoted urban reforms such as the construction of new streets, paving and lighting of public spaces, controlling construction processes and expropriation and issues of public health and safety. These interventions, which sought to significantly change the urban tissue, required extensive planning and engineering knowledge out of reach of existing local practices and scientific institutions.

The massive infrastructural programme was thus accompanied by an extensive reorganisation of resources and expertise. Existing local practices and knowledge was reconfigured and combined with the necessary external knowledge from abroad. Together with the new field of expertise a new social context was shaped by various encounters throughout the 18th century, a period of increasing interactions with Western Europe at different levels. These links have been discussed in the broad discourse of “Westernization” [2], developed for Ottoman architecture in the 18th century and thereafter, emphasizing the similarity of built structures with those in Europe, but also suggesting a modernity parallel to the Turkish modernization process, especially with the declaration of the Tanzimat Edict.

Furthermore, the popular concept of Westernization proved to be full of contradictions and often described an identity of imitation, not a true “self” [3].

This research project aims to understand the entanglement of Western institutions and local agents of production during the Tanzimat reforms. Therefore, the involvement of western engineering knowledge in construction projects of the Ottoman Empire will be specifically researched, discussing the production of knowledge on both sides and clarify the influences on organization and use of technology. The study will trace underlying networks, tools and new forms of design practices on a macro and micro scale. In the macro scale approach, the focus will be on engineering education, institutional organizations and regulation in relation to political changes that require new steps in the institutionalization of engineering in the Ottoman Empire at the end of the 18th century. The study will look at the records [4] of institutions, their formation processes, national key figures and key publications. The origins of Ottoman engineering textbooks [5], dating back to 1798 as adaptations and mixed editions, will be considered to research the transfer conditions of the modern technical construction knowledge in the Ottoman Empire, in order to understand the conceptual formation process in the field of education.

The micro scale approach will develop a deep understanding of the technological and constructional knowledge in daily practice. Similar technological steps create their own specific situations instead of producing homogeneous results. Therefore, the study intends to include micro stories tucked between multi-actor macro narratives by tracing various sources, such as manuscripts [6].

Combining the macro and micro scale approaches, the influences of the key organizations, internal and external, their multilayered entanglement and the transformation processes on a practical level in local players of construction sectors will be described and thoroughly discussed. The goal of the research project is to offer a more comprehensive, differentiated and thorough picture of the formation of construction practices of the 19th century Ottoman Empire.

[1] The most important witnesses of these encounters are the Seyyâh-nâme (the book of travels) and Sefâretnâme texts (literally: the book of embassy; a genre in Turkish literature which was closely related to Seyyâh-nâme, but specific to the recounting of journeys and experiences of an Ottoman ambassador in a foreign, usually European, land and capital) written on various European cities.

[2] Westernization, as a general concept used in social sciences in a very broad framework, indicates a change based on a social, cultural and aesthetic analogy with the West.


Iron truss joints of 19th century train stations in France

Hannah FRANZ, Laboratory for metallic structures and cables, Université Gustave Eiffel (France)

Major Parisian railway stations dating from the second half of the 19th century as Gare d’Austerlitz, Gare Saint-Lazare and Gare de Lyon are currently being renovated or about to be. More renovation projects of historic French railway stations of the same period are also scheduled. Within these renovation works, the iron roof structure is a major part and its structural assessment a recurring issue. Since the existing roof structures differ substantially from how we build steel structures today, it is important as a part of this task to understand how and in which extent the structures diverge from their theoretical concept, both as entities and in their connection details.

Many roofs of passenger halls are traditionally double-pitched. They are supported either by underspanned rafters, commonly based on the Polonceau type, or by triangulated trusses. Originally, both versions feature simple statical systems which are statically determined or have only a low degree of indeterminacy and a clear distribution of inner forces, mostly axial. However, instead of using pin joints, many joints are, due to lower manufacturing costs, rigid riveted connections [1]. The actual structural behavior is therefore fundamentally dissimilar from the truss concept. This phenomenon, embedded in structural design practice since the middle of the 19th century, must be considered when examining the existing roof structure. The study, therefore, asks whether truss joints are weak points in the structure and whether their stiffness, neglected in the design process, leads to over- or underestimated load-bearing capacity of the truss.

As the study has just started, its planned course and goals will now be only briefly presented. In a first step, the local stiffness and capacity of some types of riveted joints will be determined according to the real material properties and conditions, geometry, construction method and previous repairs. In a second step, the impact of the joint stiffness on the global bearing capacity will be characterized. This will be done through numerical analysis, extensive laboratory testing and on-site investigations. The results will be discussed with respect to how these questions were tackled in recent renovation projects led by the SNCF company. Furthermore, the results will be linked to their historical context. Here, a key focus is to understand which design assumptions were originally made by architectural engineers when designing those roof structures, which calculation methods were used, and what were the main constraints during the design and building process. Eventually, the most appropriate methods for restoring or adapting existing iron roof structures will be identified.

The European practice in traditional Chinese concrete, 1850-1949

Chang-xue SHU, Department of Architecture, KU Leuven

From the second half of the nineteenth century, European and American engineers were transforming the Chinese landscape on ever-growing scales with their modern knowledge of engineering. My full project builds on such a context. At the core of the research results stand two major debates of mine. First, my studies have demonstrated broad and frequent exchanges of ideas and information among early twenty-century engineers across fields. Specialists exchange in China occurred among civil, hydraulic, geodetic, railroad, municipal and architectural engineers (who all belonged to civil engineering in a broader sense) but also with mechanical, marine, and electrical engineers, chemical engineers, and mining and metallurgical engineers. Inter-field communication constituted an important way of developing engineering practice and knowledge [1]. Second, in engineering China with modern Western science, it was not a one-way transmission of knowledge. Western engineers gained not only their professional experiences in China but also rich information and knowledge about China, and they brought it back home with new insights. There were more complex, subtle layers. Moreover, their extensive fieldwork within China engendered a new type of cultural-historical interest about the country, thereby generating new, modern writing and codification of traditional Chinese science and crafts, distinct from the earlier Chinese writings about arts and crafts as authored by Chinese literati and scholars. In examining the modern phenomena, meanwhile, I take a longue-durée stance in the Chinese engineering tradition [2].

This study, entitled "The European Practice in Traditional Chinese Concrete, 1850-1949," disrupts historians' mainstream idea that cement technology prevailed over China's modern construction. It reveals an unspoken history of rediscovering indigenous Chinese concrete for modern engineering construction, at a time when the supply of industrially-processed quality cement was not viable or economic in the country. Chinese cementitious material was employed as a substitute for Portland cement concrete largely and adaptively in 1850-1949. European engineers in particular recognised the indigenous lime-earth material as "Chinese concrete," and rediscovered their common hydraulic binding character. It was alternatively called "the lime concrete" or "lime-earth concrete" by Western engineers, and "Sanhetu" (tri-mixture earth, literally) by Chinese. In 1901-30, the Chinese concrete became a subject of discussion in all the major engineering societies based in China. In 1901, for instance, as related to building new foundations in Shanghai, some British engineers and architects made one of the earliest written documentation on this subject, yet without knowing much about the complex variety of Sanhetu that the Chinese had been using in varied localities throughout the country [3].

The Chinese utilized lime, earth, and lime-earth mixture in varied compositions and forms as basic construction materials over different geological-geographical conditions for at least 4000 years, as archaeological evidences show [4]. The production of lime and use of lime-based mixture had been recorded in both the classic Chinese literature of arts and crafts, such as Tian Gong Kai Wu 天工開物 (The Exploitation of the Works of Nature, first print 1637) and Wu Li Xiao Shi 物理小識 (Brief Studies of the Principles of Things, accomplished in 1643) [5], and the local histories, namely the genre of the Chinese local gazetteers over time. Lime mortar, either pure or with additives, had often been used as binder and plaster in stone and brick masonry including foundations, locks and sluices in water. Earth-based mixture, meanwhile, had largely been used for basement and wall construction and river-works because of the cheapness and the volumes required in mass structures [6].This kind of thick knowledge and the corpus of written materials became part of the source for the Chinese historians to build the Chinese architectural history from 1930, without referring to the Western engineers' efforts and newly gained knowledge in studying the traditional Chinese concrete [7].

In the established histories of architecture, industry, and technology, modern cement—Portland cement representatively—and the modern cement based concrete are embraced as symbols of modernity in most of the narratives from the Western worlds to China [8]. Such narratives fall into the historiographical pattern that centres on change and development. In the aforementioned international context of China, the ignored fact that Sanhetu was rediscovered and employed in large scales for modern constructions provokes serious new questions. Where and when was the traditional concrete material recognised? How were they used for modern construction? What kinds of new knowledge did the engineers build upon their China experience? And what were the consequences and legacy? To expose that hidden story, the presentation firstly opens a big picture of the cement and lime industry in China (the material condition, Figure 1) and the group of engineers who had international and intercultural experiences related to China (the actors). Those engineers observed the above-mentioned local Chinese practices, retrieved knowledge from primary building materials, mobilized various scientific sources and made experiments in situ. They generated rich discussions and debates about the Chinese concrete. I examine the new knowledge-making in such a context of engineering, entangled with science, industry, economy, and the political-social-cultural conditions. The traditional Sanhetu and modern cement concrete were used in parallel in China during the period of 1850-1949 and later. This study echoes the aforementioned major arguments of the project. It, moreover, reveals two models of interaction between the local and foreign technologies—a major issue the full project addresses. One is utilizing and developing the local lime-earth materials by assembling local resources...
and making more accurate knowledge of them. The other is the import model, which believed in the superiority of the industrial cement and urged a systematic implantation of foreign technologies. When the new knowledge-building of the Chinese concrete did not grow sufficiently and fast by the right moment, the second model quickly took center stage.

After the 1940s, modern cement concrete gradually prevailed over Sanhetu, establishing its overwhelming power in China’s engineering practice. In retrospect, this was largely because of the values of efficiency and standardization in engineering science and industrial practice, and the novelty of the modern cement that many Chinese architects and engineers did embrace as a symbol of modernization. Today, as a result, China has become the world’s largest Portland cement producer. Traditional lime-earth materials, on the other hand, become subjects for cultural heritage studies.


<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Presenter</th>
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<tbody>
<tr>
<td>9.00</td>
<td>Welcome &amp; Introduction</td>
<td>Rika Devos &amp; Stephanie Van de Voorde</td>
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<tr>
<td>9.15</td>
<td>Materials and agency</td>
<td>Thomas Schlesser [CReA-Patrimoine, ULB]</td>
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<td>Mobility as a key to understanding the materiality of the 19th century urban streetscape: the case of the Brussels boulevards</td>
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<td>9.30</td>
<td>Mid-term Ph.D. presentation</td>
<td>Alessandra Bruno [Faculty of Architecture, ULB]</td>
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<td>Reflections on the meanings, the commitments and the references behind learning-by-building pedagogies in architecture schools</td>
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<td>Break</td>
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<tr>
<td>10.00</td>
<td>Building the post-war period</td>
<td>Robby Fivez [VA&amp;ES, UGent &amp; BATir, ULB]</td>
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<td>Can we get our materials back, please?</td>
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<td>Robby Fivez is a Ph.D. candidate at both UGent and ULB, supervised by prof. J. Lagae and prof. L. Taerwe (both with UGent) and prof. R. Devos (ULB). The working title of his PhD is A concrete state. Building ambitions in the (Belgian) Congo. 1908-1964. ULB thesis regulations require Ph.D. candidates to publically present the progress of their research when they are about halfway through their research or mandate. The Ph.D. advisory committee is presided by prof. B. Espion (ULB).</td>
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<td>10.30</td>
<td>Break</td>
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<td>1.00</td>
<td>Past to present</td>
<td>Jelle Angelis [Faculty of Design Sciences, UAntwerpen]</td>
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<td>Picturing post-war Belgian construction sites. The photographic collection of the Belgian contractor firm Van Laere (1938)</td>
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<td>Marylise Parein [Architectural Engineering, VUB]</td>
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<td>Building materials and heritage value of the Brussels housing stock 1975-2000</td>
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<td>Giuseppe Galbiati [LOCI, UCL / TSAM-ENAC, EPFL]</td>
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<td>2.00</td>
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<td>2.15</td>
<td>Round table discussion</td>
<td>Tom Packet [Art Studies and Archaeology, VUB]</td>
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<td>Allies in architecture: WWI and the Americanisation of Belgian architecture (1914-1928)</td>
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<td>Habibe Tuba Boluk [Architecture Department, Mardin Artuklu University]</td>
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<td>Local practice and scientific construction: Entanglements of knowledge, technology and institutions in the 19th century Ottoman Empire</td>
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<td>Chang-xue Shi [Dept. of Architecture, KU Leuven]</td>
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<td>The European practice in traditional Chinese concrete, 1850-1949</td>
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<td>International exchange</td>
<td>Tom Packet [Art Studies and Archaeology, VUB]</td>
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<td>Thomas Schlesser [CReA-Patrimoine, ULB]</td>
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<td>5.00</td>
<td>Round table discussion</td>
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<td>5.15</td>
<td>Construction History in Belgium. State of the art and new initiatives</td>
<td>Thomas Schlesser [CReA-Patrimoine, ULB]</td>
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<td>Mobility as a key to understanding the materiality of the 19th century urban streetscape: the case of the Brussels boulevards</td>
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<td>5.45</td>
<td>Closing remarks</td>
<td>Thomas Schlesser [CReA-Patrimoine, ULB]</td>
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<td>6.00</td>
<td>(bring your own) Drinks</td>
<td>Thomas Schlesser [CReA-Patrimoine, ULB]</td>
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<td>Mobility as a key to understanding the materiality of the 19th century urban streetscape: the case of the Brussels boulevards</td>
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The seminar will be held online (MSTeams). Click here to participate in the seminar.
Access is free, yet please confirm your presence by email here.
The day closes with a round table discussion: if you have any suggestions, questions or announcements, please send them to us by mail by January 4 2021.
For further information, please contact Rika.Devos@ulb.ac.be or Stephanie.Van.de.Voorde@vub.be.