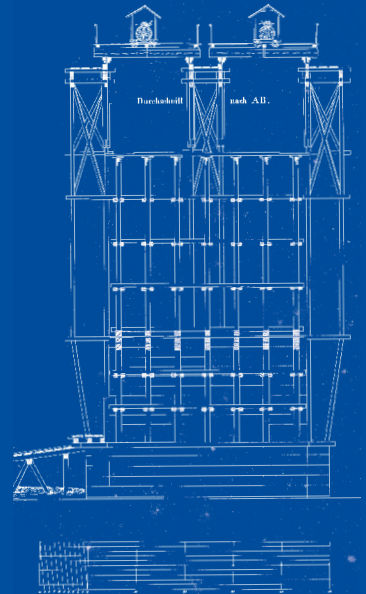


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Book of Abstracts



ZURICH

Book of Abstracts

MONDAY

A1-4	B1-4		D1-4
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A9-11	B9-10	C9-10	D9-11

TUESDAY

A12-15	B12-15	C12-15	D12-15
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THURSDAY

A24-27	B24-26	C24-27	D24-27
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FRIDAY

A35-38	B35-38	C35-37	D35-38
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MONDAY

08:00–09:30 Registration

09:30 Welcome Address by Prof. Dr. Joël Mesot, President of ETH Zurich, HG F 30

10:00–10:30 Coffee Break

A1-4 MATERIALS

10:30 Du

Hong Kong Granite in the Construction of Modern Shanghai, 1900s-1930s

11:00 Sun, Mizuta

Brick industry of Hiroshima Prefecture in modern Japan

11:30 Parein, Wouters, Van de Voorde

Reconsidering PVC window frames (1975–2000). Technological advancements and commercial strategies

12:00 Lee, Hirt, Mueller

Geometry, strength, and efficiency: Tracing the standardization of North American structural steel, 1888-present

B1-4 CONSTRUCTION CONTRACTORS

10:30 Peters

Louis Joseph Vicat's synthesis of analysis and experimentation, the invention of the tremie, and the development of hydraulic engineering expertise in France

11:00 May

Avant-gardists sunken into oblivion

11:30 Buchenau, Kuban

Early reinforced concrete contractors in Germany

12:00 Grom, Putz

Building the face of modern architecture. Facade and window manufacturers as contractors

12:30–14:00 Lunch Break

A5-8 CONCRETE ROOFS & SHELLS

14:00 Spada, Greco

Construction innovation for factory roofs in the second half of the 20th century. Two Italian cases of thin shed vaults

14:30 Galbiati, Graf, Marino

An „audacious technical object“: the Saint Vincent city hall suspended building (1959–1965)

15:00 Azzariti

Economy of Means and Structural Experimentation for a Renewed Liturgy. The Church of the Immaculate Heart by Giuseppe Vaccaro in Borgo Panigale (1951–66)

15:30 Vandenaabeele, Knobling, Holzer

The Swiss modern churches of Ferdinand Pfammatter

B5-8 CONSTRUCTION CONTRACTORS

14:00 Degraeve

Liquid innovators. Company advertisements of sanitary installers in Paris, London, and Brussels (1850–1940)

14:30 Van de Voorde, Depuydt, Sterken

“Dare, persevere, succeed.” De Coene's venture into glulam in the 1950s and 1960s

15:00 Rodrigues, Vita

Large construction companies in the widespread of modern housing. A comparative analysis between Lisbon and Luanda

15:30 Erkan

Contractors Shaping Den Brandt in Antwerp (1910–1925)

16:00–16:30 Coffee Break

A9-11 BUILDING ACTORS

16:30 Pelke, Kurrer

Friedrich Bleich (1878–1950) - life, work, and emigration

17:00 Perugini

Hidden joints: Emil Mörsch's Reinforced Concrete Factory and Le Corbusier's Maison Domino

17:30 Broes

The rise of do-it-yourself in Belgium (1965–1985) and the mutual entanglement between construction history and planning history: an exploration

B9 CONSTRUCTION CONTRACTORS

16:30 Bölük, Rinke, Mateus

Foreign and local construction practices and the formation of Ottoman engineering in the Hejaz railway construction (1900–1908)

B10

17:00 Vilela, Ficher

Sugar and Technology. Manuel Querino and the Role of Drawing in the 19th Century Brazil's Building Culture

18:15 Keynote by Tullia Iori: Learning from Lies in the History of Construction, HG F 30

C 5-7 BUILDING SERVICES & LIVING COMFORT

- 14:00 Gigliozzi**
Latrine towers. Models, uses and diffusion in Mediterranean architecture from the 12th to the 14th century
- 14:30 Lehmann**
Between privy and throne. Building facilities as an expression of sophistication at the court of the Western Umayyad Caliphate (tenth century, Spain)
- 15:00 Dreiling, Pollini**
A late-Hohenstaufen castle and its living comforts: the Palas of Gravina in Puglia

C 9-10 TIMBER

- 16:30 Grimoldi, Landi**
Wood floors versus coffered ceilings: structural improvement and decorative complexity in the palaces of Cremona (1490 - 1540)
- 17:00 Pajovic**
Thin Timber Domes in Restoration England (c. 1670-1680)

D 1-4 THE DISCIPLINE

- 10:30 Dreicer**
Narratives and Silences in the History of the Industrialization of Construction
- 11:00 Heindryck, Dehaene, Ruyscher, Devos, Lagae, Wouters, Van de Voorde**
Construction History, Above and Beyond
- 11:30 E. Richter**
A History of Highs and Lows. The College of Civil Engineering in Cottbus, GDR, in the 1950s and 1960s.
- 12:00 Stracchi, Cardellicchio, Tombesi**
Learning 'through' History: Remaking the Sydney Opera House 50 Years Later

D 5-8 PROSOPOGRAPHY

- 14:00 Buchanan**
Building Parliament: the masons of the Palace of Westminster c.1839-c.1860
- 14:30 Chrimes**
How prosopography serves construction history-working with the lives of civil engineers.
- 15:00 Rochow**
Military engineers as thought collective. Understanding governmental building projects in the Habsburg monarchy around 1850
- 15:30 Genzel**
Mind make the shape. The shell construction in the middle of the 20th century - approach via prosopography

D 9-11 PROSOPOGRAPHY

- 16:30 Engelmann**
Construction history of nailed board trusses in correlation with German engineering biographies in the middle of the 20th century
- 17:00 Guelle**
Defining the Teaching of Construction to Architects.
- 17:30 Putz**
Architects as researchers. The first doctor-engineers (Dr.-Ing.) in architecture

TUESDAY

08:00–09:00 Registration

09:00 Keynote by Ine Wouters: The architectural and structural works of S.A. John Cockerill (1842-1955), HG F 30

10:00–10:30 Coffee Break

A 12–15 PRECAST AND RC

10:30 Giannetti, Russo

Precast thin shells for industrial buildings. The international journey of the Silberkuhl system

11:00 Barelli

Prefab concrete envelopes between the fifties and sixties. The Italian experience of Gregotti, Meneghetti and Stoppin

11:30 Bertolazzi, Giannetti

An Imperfect Industrialization. Prefabrication Cultures in Post-War Italy Between Liberalism and Public Planning (1943–1949)

12:00 Canestrino, C. Galizia, G. Galizia, Lucente

Silvio Galizia's reinforced concrete shell roofs. An experience of cross-pollination between the ETH Zurich and Italian structural engineering after WW II

12:30–14:00 Lunch Break

A 16–19 CONSTRUCTION HISTORY 20./21. C.

14:00 Maranelli

The arrival of the information model, 1969. Italian building industrialization research and the „Electronic challenge“

14:30 Lloret-Fritschi, Jenny, Tucci

Slipforming: From manual to robotic slipforming

15:00 Brenner

Innovative Envelope Design: Theo Hotz's High-Tech Construction for Zurich

15:30 Massafra, Costantino, Predari, Gulli

Modern Construction in Italy: the Institute of Mathematics in Bologna

16:00–16:30 Coffee Break

A 20–23 CONSTRUCTION HISTORY 20./21. C.

16:30 Frommelt

Types and families: A genealogical approach to standardized type structures in the GDR 1960–90

17:00 Kumagai, Kanazawa, Kondo

Construction during the transition from on-site construction to factory production in the former Nippon Telegraph and Telephone Public Corporation Headquarters Building

17:30 Jean, Mosca, Pini

Central Park in Lugano. A massive construction between prefabrication and craftsmanship

18:00 Capurso, Fidelbo

New research results on the history of the construction of an icon of Italian Style engineering

B 12–15 COLLABORATION

10:30 Arroyo Duarte

The National Theater of Panama: a collaborative process

11:00 Haps

Collaboration in building with plastic-coated steel in West Germany in the 1960s: the „Hoesch-bungalow“

11:30 Talenti

Architects and engineers: design authorship between synergies and disagreements

12:00 Curth, Mueller, Ismail

The Concrete Collaborations of Carmen Portinho and Afonso Reidy: Structural innovation in Brazilian Modernism through public service

B 16–19 CONSTRUCTION & DESIGN

14:00 Franz, Rinke, Leprêtre, Dieng

Designing and assessing riveted lattice girders in metallic roof structures : from Navier to Eurocode 3

14:30 Packet, Van de Voorde

From iron to reinforced concrete. Revisiting the post-World War I oeuvre of Victor Horta in light of his US sojourn (1915-1919)

15:00 Abita, Morganti

The research and patents of Dalmine Company. Seamless pipes for the design of building structures.

15:30 Kovaleva

Arched rafters with diagonal ties. On the history of lightweight truss system in the Russian Empire at the turn of the 19th and 20th centuries

B 20–23 CONSTRUCTION SITES & PROCESSES

16:30 Pfeiffer, Weber

Construction techniques at Linz Cathedral or how to build an old-fashioned church in a modern way

17:00 Caston

How Surveying Kept Tunnel Builders on the Straight and Narrow – The Albula Tunnel

17:30 Hays

Robert Mills' Rotunda Annex at the University of Virginia, 1851-1895

18:00 Reinäcker, Monka-Birkner, Krafczyk, Marx

Bridges over the Mittellandkanal in Hanover from 1905 - 1916

C 12-15 VAULTS & BRIDGES

- 10:30 Cione, Schäfer, Voigts**
The Building History of a Medieval Bridge.
Le Pont du Diable in Saint-Jean-de-Fos, France
- 11:00 Carmona López, Knobling, Schäfer**
An Insight into the Building Process of Pont Valentré in Cahors (XIV Century)
- 11:30 Pastor Altaba**
Temporary structures as part of the constructive process. A centering system proposal for the oval dome of San Carlo alle Quattro Fontane
- 12:00 Pfister, Vandenabeele**
Vaulting Techniques in Romanesque Burgundy: Advanced Large-span Groin Vaults at Sainte-Trinité in Anzy-le-Duc (1001-1120)

D 12-15 GLOBALISATION

- 10:30 Coomans, Xu, Zhang**
Reinforced Concrete Catholic Churches in Republican China (1912-1949)
- 11:00 Pan, Moore**
From Timber to Globalization: Exploring the Construction History of Fraser Mills in Coquitlam, British Columbia, Canada
- 11:30 Toson**
Shaping a new building culture in Soviet Union: Soviet engineers in Italy
- 12:00 Sassa, Fujimoto**
Industrial half-timber construction in Japan: French technology transfer and Japanization in the late 19th century

C 16-19 VAULTS & BRIDGES

- 14:00 Wendland, Gielen**
The revolution in vault construction before the Gothic
- 14:30 Häcki, Vandenabeele, Voigts, Holzer**
The cathedral of St. Pierre in Lisieux: A laboratory of vaults from the 12th to the 16th centuries
- 15:00 Safaeipour**
Transformation of a Temporary Mold to a Permanent Structural Member: A Strategy for without-Centering Vaulting in traditional Iranian Architecture
- 15:30 Nazari**
Construction Technique of the Dome of Nizam al-Mulk in the Friday Mosque of Isfahan

D 16-19 ASIA

- 14:00 Li, Wu**
The Development and Decay of Traditional Masonry Craftsmen: A Study on the Last Generation of stone-carving Team in the Northeast of Taiwan
- 14:30 Wang**
Constructing Coldscape in Treaty-Port Shanghai
- 15:00 Bertagna, Harada**
A visual approach to structural design: photoelasticity as a collaborative tool in Gengo Matsui's work
- 15:30 Sakuragawa, Tanishige, Takeuchi, Gondo**
Acceptance of Trocken-Montagebau in Japan

C 20-22 VAULTS & BRIDGES

- 16:30 Rabasa-Díaz, López-Mozo, Alonso-Rodríguez**
Experimental assessment of existing ideas on brick vaults by slices building process
- 17:00 Gil-Crespo, Natividad-Vivó, Calvo-López**
Brick vaults without centering in the church of Calatrava la Nueva: geometry and construction
- 17:30 Schmitt**
The vaults of St. Nicholas in the Lesser Town of Prague (1703-1711, 1737-1760s): the Dientzenhofers' magnum opus

D 20-23 KNOWLEDGE (TRANSFER)

- 16:30 Guidarelli**
The architectural and building culture of the Benedictines congregation ‚de Unitate‘ in the Renaissance
- 17:00 J. Richter**
Planning through Distant Geographies: Uncover a GDR-Cuban Collaboration in the 26 de Julio Cement Plant Construction
- 17:30 De Nys-Ketels, Devos**
Legal expertise in professional construction periodicals: the Belgian building sector shaping and shaped by processes of juridification, 1918-1940
- 18:00 Smyth**
The Tacit Turn: Designing the Silent Laboratory

THURSDAY

08:00–09:00 Registration

09:00 Keynote by Maxime L'Héritier: Notre-Dame de Paris and beyond, HG F30

10:00–10:30 Coffee Break

A 24–27 CONSTRUCTION & DESIGN

- 10:30 Grandjean, Collaud, Jeker, Mosimann, Vanbutsele**
Hall POLYNORM - the reuse of a post-war ultra-light system structure made of folded sheet steel
- 11:00 Sanyal**
Labor or Work? Remembering operations in the construction of the Golconde dormitory, Pondicherry (1935–c.48)
- 11:30 Schmid**
The supporting scaffolding for the foundation restoration of the Strasbourg Cathedral and its remaining model fragments
- 12:00 Leslie**
„Crossroads of the Air:“ The Evolution of Chicago's O'Hare Airport

12:30–14:00 Lunch Break

A 28–31 THE IMPORTANCE OF PATENTS

- 14:00 Isaacs**
Building Paper 1869 to 1919 – a hidden material revealed by patents
- 14:30 Vitale**
New techniques, ancient forms. Deneux's patents for reinforced concrete frameworks
- 15:00 Maspoli, Saponaro**
The innovation of reinforced concrete in the automotive factories in the early 1900s. Patents, technologies and constructive experimentation.
- 15:30 Macedo Xavier De Freitas**
Between Rationalism and “Engenhosidade”, and why not a little Empiricism. The introduction of Portland cement and reinforced concrete in Brazil

16:00–16:30 Coffee Break

A 32–34 20TH C. KNOWLEDGE (TRANSFER)

- 16:30 Bulckaen, Devos**
Knowledge transfer and tacit knowledge in collaborative historic building projects: the case study of the Ghent University building campaign in the 1930s
- 17:00 Schnitzler, Donovan, Ismail, Mueller**
The technics of elegance: Negotiating efficiency and standardization in three prestressed concrete systems by Aldo Favini and Angelo Mangiarotti
- 17:30 Boller, Bertagna**
Constructing lightness. Local and foreign influences in the work of Yuri Plaksiev in post-war Soviet Ukraine

B 24–26 KNOWLEDGE (TRANSFER)

- 10:30 Holzer**
Joseph Cordier (1775–1849) – a liberal engineer between the two Napoléons
- 11:00 Schlachetzki**
Slag, Norms, and Patents. Circulating Knowledge and Experimental Laboratory Construction at the Swiss Federal Polytechnic School 1880–1900
- 11:30 Marulo, van de Werf**
Between practice and rule: codification, testing and use of plain concrete in Dutch military architecture (1870's - 1910's)

B 28–31 IRON BRIDGES

- 14:00 Di Donato, Tosone**
Iron wires. The Seguin brothers and suspension bridges in the Grand Duchy of Tuscany and the Kingdom of Sardinia
- 14:30 Voigts**
The Hackerbrücke in Munich: a well-preserved example of iron and concrete engineering in the late nineteenth century
- 15:00 Porrino**
The Garabit viaduct as the apogee of classical French railway overpass design, 1880–1884
- 15:30 Zhao, Espion**
„Un pont sur arbalétriers“: Building a three-hinged arch over the Faux-Namti Gorge in Yunnan (1908)

18:00–22:00 Gala Dinner in Restaurant Spitz at the Swiss National Museum (only for registered participants)

C 24–27 BRICK & STONE

- 10:30 Bauch, Kastenmeier**
Tegula Cumularia. Life Cycles of Brick and Tile in Pompeii
- 11:00 Lengenfeld**
Building service solutions in the first half of the 13th century CE. - Variations of the same tasks in the two towers of the Margraves of Baden in Besigheim
- 11:30 Sanjurjo Álvarez, Carvajal Alcaide**
The spiral staircase attached to the so-called Gothic Wall of the Cathedral of Jaen (Andalusia, Spain) and its relationship with Mediterranean cases
- 12:00 Piccoli, Tocci, Culla**
Building the international baroque: stone in a brick city, and the pronaos at Superga

C 28–31 ADMINISTRATION

- 14:00 Meyer**
Construction Materials, Building Costs, and the Emergence of Building Estimates in 18th Century Germany – Building and the ‘cameralistic economy of resources’
- 14:30 Jakubowski**
When Patronage Undermines Construction. Negotiating the Uniate Architecture in Eighteenth-Century Poland-Lithuania
- 15:00 Burgassi**
Administration in the mid 17th century court of Savoy
- 15:30 Carvais**
What competence were required of Paris building experts in the early modern era

C 32–34 EARLY MODERN MATERIALS

- 16:30 Landi, Adami**
Building Art: the decorative terracotta of Palazzo Fodri in Cremona (IT)
- 17:00 Charruadas, Goemaere, Sosnowska**
Contribution to the history of roofing slate in Southern Brabant: a methodological approach from the Brussels case study (Belgium)
- 17:30 Song, Campbell**
The Introduction and Manufacture of Cast Iron Water Supply Pipes, 1600-1850

D 24–27 AFRICA

- 10:30 Serrazina**
„Model“ Workers' villages? Company rule and adobe-brick houses in late colonial Africa.
- 11:00 Bloch, De Nys-Ketels**
Système Grévisse. The Lubumbashi post-war housing scheme, between colonial guidelines and reality
- 11:30 Yen**
The Transformation of Traditional Construction under Ethic Migration: Construction Systems of Bunun's Architecture
- 12:00 Vaz Milheiro**
Women, colonialism and construction sites. Gendered experiences in the former African territories ruled by the Portuguese through the colonial archives

D 28–31 HISTORY OF DECONSTRUCTION

- 14:00 Foucher**
Building and second-hand materials in times of crisis. Questioning a constraining context on the supply of building sites in the late Middle Ages and early modern period
- 14:30 Dubois Losserland**
Looking for Construction Process in Early Modern Paris: demolish to build better
- 15:00 Heaton**
Spolia Britannica: Aspects of Architectural Salvage in Britain
- 15:30 Reyniers, Van de Voorde, Wouters**
Small but significant. Tracing the emergence and evolution of the demolition profession in Brussels

D 32–33 HISTORY OF DECONSTRUCTION

- 16:30 Küpfer, Fivet**
Structural component reuse of precast and cast-in-place reinforced concrete in architecture since the late 1960s in Europe
- 17:00 Cook, Sirkar**
Value through the Ages: An evolving landscape of demolition, salvage, and reuse in North America, 1890s-2010s

FRIDAY

08:00–09:00 Registration

09:00 Keynote by Alexander von Kienlin: Wide spanning trusses in Greek and Roman Antiquity, HG F 30

10:00–10:30 Coffee Break

A 35–38 VAULTING INTO THE FUTURE

- 10:30 Rouizem**
The vault, a controversial shape
- 11:00 Suzuki, Segawa**
VECA System: brickwork and social housing in Uruguay and Brazil
- 11:30 Bertini**
Domes, vaults, and mud bricks: form and construction in the work of Hassan Fathy
- 12:00 Madero, Al Asali**
Rebuilding Traditions: Tile Vaults in Spain after the Civil War (1940-1956)

B 35–38 TRANSNATIONAL BRIDGES

- 10:30 Krayenbühl**
Jules Röthlisberger (1851–1911), Swiss expatriate, chief engineer at the Società nazionale delle Officine di Savigliano in Turin (1884–1910)
- 11:00 Simmons, Gasparini**
Albert Fink and the US transition to statically determinate railroad truss bridges
- 11:30 Friedman**
Immigrant Engineers In New York
- 12:00 Kahlow**
The Roebblings: migration, knowledge transfer, and tacit knowledge

12:30–14:00 Lunch Break

A 39–41 BUILDINGS & TECHNOLOGY

- 14:00 Voigt**
The preservation of Heinz Isler's structures made of fiber reinforced plastics
- 14:30 Poma, Graf**
Interactions between the experimental integration of solar thermal systems and building construction technologies: trends identified from a comparative analysis of selected buildings in Europe and the United States (1940s–80s)
- 15:00 Cheibas, Lloret-Fritschi, Rachele, Delbeke, Rust, Gramazio, Kohler**
Emerging building technologies and their impact on facade design

BB BOOK PRESENTATION SESSION

- 14:00–16:00**
Recent books on construction history

16:15 Closing Session, HG E 7

C35-37 ARCHITECTURE & TECHNOLOGY 1600-1900

- 10:30 Mascarenhas-Mateus, Rodrigues de Castro**
The construction of gaiola pombalina in pictures: Historical photographs and the timber seismic reinforcement system in Lisbon, 1870-1910
- 11:00 Treccozi**
Anonymous stucco workers behind great architects: stucco decorations as choral creations in the late-Baroque Naples (17th-18th century)
- 11:30 Marconi, Giannetti**
Design and construction of provisional works for the maintenance of extra-ordinary buildings in the eighteenth century: the wooden scaffolding for the main nave of St. Peter's Basilica in Vatican

D35-38 CONSTRUCTION LABOUR IN TIMES OF CRISIS

- 10:30 Melsens**
(De)constructing gender? Women laborers and building site photography in Western India, 1850-1990
- 11:00 Fizez**
„Unfortunately, the toll is high for some of your blacks“: Moments of Crisis in the Belgian Congo's Construction Industry
- 11:30 Frandsen**
From barrack-hut to Ritz: Housing solutions on the construction site of the Grande Dixence dam, 1950-1965.
- 12:00 Roff**
Crisis or Tradition? Women Construction Laborers in Late Medieval Valencia

D39-42 CONSTRUCTION SITES & PROCESSES

- 14:00 Vale**
Building with limited resources in times of revolution. Construction processes in Social Housing by Álvaro Siza in the early 1970s
- 14:30 André**
Exploring the built heritage of the Gulag: the construction techniques and architecture of a Gulag camp in Siberia
- 15:00 Franco de Mendonça**
Construction works, xibalo and the Maxaquene cove embankment in Lourenço Marques, in Portuguese East Africa
- 15:30 Lagae, Motylińska**
On “Borrowing” and “Othering”. Unpacking the practices, networks, and biases underpinning two manuals on building in the tropics around 1940



Hong Kong Granite in the Construction of Modern Shanghai, 1900s-1930s

Jingliang Du

Department of Architecture, University of Hong Kong, Hong Kong, China

This paper provides an insight into Hong Kong granite as one of the significant building materials used in the construction of modern Shanghai, 1900s-1930s, a flourishing epoch of the city's architectural development. Hong Kong granite was arguably a "modern" material in early 20th century Shanghai with its specialized structural applications and underlying socio-economic role. Ranging from material properties to the resistance of the whole industry, this research unpacks the nuances in the application and further influence of Hong Kong granite. The material is contextualized and understood not only in an architectural or constructional sense but also in broader economic and

social perspectives. Working with a wide range of archival resources, this paper traces the production and circulation of Hong Kong granite as a commodity and the dissemination of building technology between the two cities. From the social perspective, this paper evaluates the dynamic process regarding this building material, involving interactions among critical roles such as colonial institutions, mercantile class, architects and contractors, and labour. Through the lens of one specific building material, this paper seeks to build up a contested narrative of the construction history in cosmopolitan Shanghai.



Brick industry of Hiroshima Prefecture in modern Japan

Chunyao Sun, Susumu Mizuta

Graduate School of Advanced Science and Engineering,
Hiroshima University, Higashihiroshima City, Japan

This paper aims to clarify the status of the brick industry during the late Meiji and Taisho eras (1890s–1920s) in Hiroshima Prefecture from the quantitative side. Specifically, it dealt with statistical data from some national and regional industry-related reports, including the data on brick production and comprehensive surveys of factories. Firstly, it sort out the development of brick industry in Hiroshima with an overview of the establishment process of brickyards. And then it dealt with data of production, as well as the number of brickyards and laborers, to evaluate the production level. In addition, analyzing the records in freights transportation to clarify the main destinations and the quantity in the brick's circulation. In conclusion, the study highlights Hiroshima Prefecture as

a major brick producer in modern Japan, with significant production concentrated in Kamo County, Toyota County, and Saiki County, where the number of brickyards and laborers was also much higher than other areas. Among them, Toyota County maintained consistently high productivity throughout the period studied. There was a transition from small-scale brickyard to large-scale one in those three counties. Meanwhile some small brickyards appeared in the other areas but had little influence on the total production volume. Hiroshima Prefecture became a significant exporter of bricks, substantial brick exporter, supplying the Chūgoku Region and Kyūshū Region through railway and maritime transportation.



Reconsidering PVC window frames (1975-2000). Technological advancements and commercial strategies

Marylise Parein^{1,2}, Ine Wouters¹, Stephanie Van de Voorde¹

¹Dept. of Architectural Engineering, Vrije Universiteit Brussel (VUB), Belgium

²Public Service Urban.brussels, Belgium

In the wake of World War II, plastics, particularly polyvinyl chloride (PVC), emerged as key innovations. PVC window frames, a prevalent application of PVC in construction, experienced a surge in Western Europe during the 1970s. This growth was driven by the unique context of oil crises and was further propelled by the desirable thermal properties, cost-effectiveness, and low maintenance requirements associated with PVC windows. Despite their numerous advantages, plastic components, including PVC window frames, have often faced criticism or been overlooked.

This paper challenges the prevailing criticism directed at PVC window frames by delving into the technological advancements that this product underwent between 1975 and 2000. By examining advertisements, we aim to uncover aspects beyond mere technology,

illustrating the relevance and resilience of PVC window frames within construction, as well as the remarkable adaptability of PVC window frame manufacturers in response to the ever-evolving market dynamics. Furthermore, our study transcends the component level to offer a broader perspective on the evolving building culture. This includes an exploration of the notion of specialization within production industries and the transition towards high-tech production processes and materials. The study draws from product catalogues by window frame manufacturers, advertisements and articles in contemporary construction journals, as well as publications by scientific organizations and institutes for vocational training, to enable a variegated perspective on the topic within its wider architectural and construction context.





Geometry, strength, and efficiency: Tracing the standardization of North American structural steel, 1888-present

Keith J. Lee, Natasha Hirt, Caitlin T. Mueller

Department of Architecture, Massachusetts Institute of Technology,
Cambridge, USA

Across North America, the industrialization of steel fabrication in the late 19th century, specifically that of hot-rolled sections, enabled new scales, typologies, and economies of building design and construction. However, steel design during this early period was turbulent, as individual manufacturers provided their own catalogues of available geometries and assumed material strengths, leading to mill-specific schools of design and analysis. During the proceeding century, improvements in manufacturing technology, the merging of dominant fabricators, and advancements in engineering knowledge led to the creation of unified standards of geometry, material strength, and design methodology. In this paper, we follow the progression of steel design, from mill-specific, stress-based analysis to the highly standardized, probabilistic design methodology of

the 21st century, and evaluate the impact on nominal strength and material efficiency. With a focus on doubly symmetric flanged sections (I-beams) used for flexural elements, we show the lineage of available geometry as it progressed from wrought iron rails to contemporary steel W-sections. Alongside this geometric evolution, we follow the developments in engineering methodology and its impact on the nominal strength beams. Through a computational analysis of over 2000 unique sections produced since 1888, as well as seven design methodologies from 1907 to 2022, we show that both the available distribution of section geometries and the development of engineering knowledge have had significant impacts on the assumed capacities and the material efficiency of bending-dominated steel elements since the late 1800s.



Construction innovation for factory roofs in the second half of the 20th century. Two Italian cases of thin shed vaults

Francesco Spada, Laura Greco

Department of Civil Engineering, University of Calabria, Rende, Cosenza, Italy

This paper refers to studies on 20th century construction techniques oriented towards the role of designers and construction companies in the evolution of construction processes and techniques in Italy. From the mid-1950s, the expansion of industrial production encouraged the construction of numerous factories, mainly in central-northern Italy. Important clients entrusted well-known professionals and large construction companies who worked together on useful solutions to combine building architectural features with modern production needs. In this paper, the Siemens factory in via Monte Rosa in Milan (1955-57), designed by Carlo Rusconi-Clerici, and the Perugia factory in Perugia (1961-62), designed by Aldo Favini and Carlo Rusconi-Clerici, are studied for their particular roofs, characterized by thin shed vaults in reinforced

concrete, useful for covering large spans without intermediate pillars and which allow wide natural lighting of the factories. Both factories were built by Sogene construction company. The paper focuses on the construction process of the vaults; indeed, special wooden ribs are used to speed up the casting of the roofing elements. The analysis of the two buildings is framed in the Italian construction history context to evaluate the specificity of that construction in relation to the national context. The two case studies refer to a first phase of construction site mechanization introduced in Italian construction history starting in the 1950s, so techniques used for construction of the Siemens and Perugia factories refer to on-site structural elements prefabrication.



An „audacious technical object“: the Saint Vincent city hall suspended building (1959–1965)

Giuseppe Galbiati^{1,2}, Franz Graf^{1,3}, Giulia Marino^{2,3}

¹Accademia di architettura, Università della Svizzera Italiana, Viale Canavée 5, 6850 Mendrisio, Switzerland

²Université Catholique de Louvain, LOCI Faculty, LAB Institute, Rue Wafelaerts, 47/51 – B, 1060, Bruxelles, Belgium

³Ecole Polytechnique Fédérale de Lausanne, ENAC Faculty, TSAM Laboratory of Techniques and Preservation of Modern Architecture, BP4126, Station 16, CH, Lausanne, Switzerland

The Saint Vincent city hall (Aosta Valley, 1959–1965) represents a key contribution to the European construction history. Designed by architect Enrico Villani in 1959, the building was initially considered too challenging to be constructed. The solution only came years later thanks to an original structural scheme conceived by engineer Antonio Migliasso. Migliasso, brought the architectural design to its technological limits, making of the Saint Vincent city hall the first Italian cable supported building. According to the suspension principle, four slabs hang from the roofing structure by means of prefabricated and prestressed concrete hangers. In this way, continuous open plans were obtained as well as a column-free terrace at the ground floor. At the same time, Migliasso's proposal allowed to reduce by 80% the amount of steel, if compared to the commonly

employed solutions, without increasing the overall cost of the project.

The architectural, engineering, and construction challenges associated with the use of suspended systems resulted in a limited diffusion across Europe. Starting from the 1980s this principle was progressively abandoned, rapidly falling into historical oblivion. Stating the lack of research in the field and assuming the Saint Vincent city hall as case-study building, this contribution aims to delineate the most peculiar features of suspended architecture. The paper investigates the history of an emblematic realization, from the architectural concept to the structural design. Based on the interpretation of unpublished archival sources, enriched by the authors' original documentation, this study aims to redefine the role of a pioneering building for the European construction history.





Economy of Means and Structural Experimentation for a Renewed Liturgy. The Church of the Immaculate Heart by Giuseppe Vaccaro in Borgo Panigale

Giorgio Azzariti

Institute for the History and Theory of Architecture (gta),
Department of Architecture, ETH, Zurich, Switzerland

In the aftermath of the Second World War, the Catholic Church was at the forefront of a radical transformation. In Italy, the thousands of religious buildings that had to be rebuilt following the conflict coincided with a massive migration towards the cities, resulting in a profound wave of urbanization. This unique set of circumstances played a pivotal role in shaping a trajectory that ultimately led to the convening of the Second Vatican Council in 1962. Responding to the need for the Church to engage more openly with contemporary material realities, the Council ushered in an era of architectural adaptation characterized by integrating new materials, techniques, and construction processes.

The church of the Immaculate Heart in Borgo Panigale, in its almost 15 years of development (1951–1966), was an architectural manifesto to such ambitions, which reflected the specificity of the post-war Italian building site. Designed by Giuseppe Vaccaro together with Adalberto Libera, Sergio Musmeci, and Pier Luigi Nervi, it embodies a collaborative effort that gave shape to the radical paradigm shift taking place within the Church. Through material and constructive experimentations, it anticipated future investigations applied in some of the most important Italian architectural and engineering works of the 1950s and 1960s.



The Swiss modern churches of Ferdinand Pfammatter and Walter Rieger

Louis Vandenabeele, Clemens Knobling, Stefan M. Holzer

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

Ferdinand Pfammatter's seminal PhD thesis, *Betonkirchen* (1948), remains a global architectural reference on modern ecclesiastical architecture. In collaboration with Walter Rieger, Pfammatter embarked on the construction of 15 churches and chapels from 1949 to 1972, a response to the settlement of a Catholic diaspora in Switzerland.

Their work was rooted in the emerging field of Swiss modern ecclesiastical architecture and shaped by the influence of Auguste Perret and Karl Moser. While exposed concrete and innovative church layouts characterized the era, Pfammatter and Rieger sought to harmonize tradition with modernism. In the first decade of their collaboration, they created monumental concrete churches in a traditional longitudinal layout with an architectural expression rooted in the models of Perret and Moser, while softening the harshness

of exposed concrete. Their buildings emphasized innovative and efficient construction techniques, notably steel scaffolds, concrete vaults and prefabricated elements. Despite the pioneering nature of their work, it has remained overlooked in recent historiography.

This study examines their evolving church designs and explores their use of modern materials and construction techniques, with a focus on concrete vaults and ceilings. Two iconic projects, *Maria-Frieden* in Dübendorf (1950–1953) and *St. Gallus* in Schwamendingen (1956–1957), serve as case studies. Drawing on archival material, old photographs and on-site investigations, this research revives the contributions of Pfammatter and Rieger while shedding light on their continued relevance in the context of post-war Swiss architecture.



Friedrich Bleich (1878–1950)—life, work, and emigration

Eberhard Pelke¹, Karl-Eugen Kurrer²

¹Independent Researcher, Mainz, Germany

²Lecturer in History of Technology, Civil Engineering Department, University of Applied Sciences, Coburg, Germany

Friedrich Bleich (1878–1950) was an Austrian structural engineer and Jewish. He was one of the few engineers in the consolidation period of steel construction (1900–1950) who managed to amalgamate structural design practice with scientific theory in a distinctive way.

It was always Bleich's intention to communicate with other engineers across national borders. He was one of the founders of the International Association for Bridge and Structural Engineering (IABSE) in 1928 and served as the association's scientific secretary until 1938. Following the annexation of Austria by Nazi Germany and the systematic exclusion of the Jewish population that began immediately afterwards, Bleich, the internationally renowned engineer

with a cosmopolitan outlook, was forced to leave his homeland. After two-and-a-half year's asylum in Switzerland, he was permitted to enter the USA in 1941.

So at the age of 63, Bleich faced a completely new start in his professional life, which he managed to do as a scientific consulting engineer. It was in the USA that his scientific creativity reached its zenith.

This article presents the life and work of Friedrich Bleich in the context of European migration. It will be clearly demonstrated that even leading steel construction scientists of international repute were not immune to enforced flight and exclusion.



Hidden joints: Emil Mörsch's Reinforced Concrete Factory and Le Corbusier's Maison Dom-ino

Federico Perugini

KIT, Karlsruhe, Germany

The article delves into the origins and technical implications of the Maison Dom-ino project, exploring the underlying principles that shaped its design.

The architectural qualities of Maison Dom-ino's minimum unit lie in its proportional relationships and construction system, influenced by Engineer Emil Mörsch's seminal work. Mörsch's book, *Der Eisenbetonbau*, provided insights about the continuous beam and expansion joint, which significantly influenced the Dom-ino project. The article analyzes Mörsch's text and graphic representation.

The article explores the influence of Mörsch's Daimler factory on Maison Dom-ino's structural configuration, particularly the setback columns, highlighting differences such as the flush floor-slab

and the omission of haunches. These differences stem from the patent's objective of separating the functions of load-bearing structure and lightweight partitions.

By shifting the focus from formal similarity to equivalent static arrangement, the article unveils the deeper implications of the patent. It explores the poetic and architectural convictions underlying Jeanneret's dedication to the project, emphasizing the quest for a system that integrates the formal and proportional system with the structural and constructional elements. Ultimately, the Maison Dom-ino represents a synthesis of the visible architectural aspects with the non-visible, technical ones, reflecting the essence of reinforced concrete as a material.



The rise of do-it-yourself in Belgium (1965–1985) and the mutual entanglement between construction history and planning history: an exploration

Tom Broes

Department of Architecture and Urban Planning, Ghent University,
Ghent, Belgium

The well-known 1973 children's story *The House of Barbapapa* aptly summarizes the social struggle for the city that characterized many European cities around the seventies. Rebelling against radical planning policies in which entire neighborhoods were flattened and rebuilt through large-scale, rationalized building practices—obliterating the urban fabric with concrete, aluminum and glass under the guise of modernization—the Barbapapas decided to renovate a charming but dilapidated house in the city all by themselves. The story depicts the dichotomy between economic and social capital, between state and grass-roots urbanism, between technocracy and autogestion, between exchange value and use value, between production and re-production (or maintenance), between professional contracting and amateur DIY, among

many other contradictions that were typically addressed at the time. From a construction history perspective, however, a few critical questions arise that are not usually asked in this narrative: where did the Barbapapas get their tools, building materials, as well as technical knowledge and practical skills to renovate an abandoned slum? These are precisely the questions that this paper addresses in the context of Belgium—with a particular focus on the city of Antwerp. By reconstructing some of the material and constructive aspects of DIY neighborhood renovation in Belgium/Antwerp, this paper aims to formulate a number of preliminary insights at the intersection between urban planning history and construction history with the aim of shedding a different light on some of the contradictions mentioned above.



Precast thin shells for industrial buildings. The international journey of the Silberkuhl system (1950–1970)

Ilaria Giannetti¹, Martina Russo²

¹Dipartimento di Ingegneria Civile e Ingegneria Informatica,
Tor Vergata University of Rome, Rome, Italy

²Dipartimento di Ingegneria Civile, Edile, Ambientale, Sapienza University of
Rome, Rome, Italy

Among the numerous construction solutions elaborated during the twentieth century, the development of shape-resistant elements represents a pivotal aspect in describing the evolution of industrial buildings. In particular, thanks to the formulation of the membrane theory, reinforced concrete thin shells were largely applied from the 1920s to the 1970s, reducing the time, cost, and materials needed for the construction process. In this framework, the so-called Silberkuhl system for precast shell roofing elements stood out for its numerous international applications to industrial buildings, in Europe and abroad, up to the late 1970s. The spreading of the system invented by

the German engineer Wilhelm Johannes Silberkuhl (1912–1984) in the 1950s, was supported by a wide set of industrial patents filed throughout European countries, the US, and Japan, and the action of local dealers. In Italy, the system was first registered in 1958 and widely applied to industrial buildings in the 1960s, up to the late 1970s, by the joined action of national designers and construction firms. The present paper describes the evolution of the system following its local transfers, according to the industrial patents paths, and focuses on the national application of the Silberkuhl system in Italy, describing as a case study the Magazzini Mercè Rinascente in Rome (1962).



Prefab concrete envelopes between the fifties and sixties. The Italian experience of Gregotti, Meneghetti and Stoppino

Maria Luisa Barelli

Department of Architecture and Design (DAD), Politecnico di Torino, Italy

The paper intends to investigate a group of works designed by the architects Vittorio Gregotti, Lodovico Meneghetti and Giotto Stoppino at the beginning of their professional career, between the second half of the 1950s and the 1960s, characterized by the use of prefabricated infill panels made of concrete and grit. If artificial stone was used (as a counterpoint to the exposed brick walls) in the small houses in Cameri (Novara, 1954-56) to make sills, architraves, and a few other prefabricated elements, with a view to evoking a tradition strongly rooted in northern Italy, in the houses built in Novara on the site of the old ice factory (1957-60), in the project for the competition for the Municipal Theater in Alessandria (1959) and in the villa designed for the Mira brothers in Romagnano Sesia (1960-64) prefabrication is extended to

all the infill walls of the buildings, looking to the work of Perret and Wright and facing with a still artisanal type of building production. In these works, the relationship between structure and envelope, the modular organization of the project, the rationalization of the building phases and the expressive possibilities linked to the use of a material like concrete, become the themes of a research which the three architects continued to pursue in the 1960s, in a changed context, in the Milanese houses for the “Un Tetto” cooperative. Starting from bibliographic sources and archival investigations (CASVA, Centro di Alti Studi sulle Arti Visive di Milano), and also thanks to some oral testimonies, the contribution aims to reconstruct this history in its technical specificities and declinations, placing it in its cultural and productive framework.



An Imperfect Industrialization. Prefabrication Cultures in Post-War Italy Between Liberalism and Public Planning (1943-1949)

Angelo Bertolazzi¹, Ilaria Giannetti²

¹Department ICEA, University of Padua, Padua, Italy

²Department DICII, University of Rome Tor Vergata, Rome, Italy

Post-World War II building reconstruction in Europe—both Western and Eastern—represented an opportunity to fulfil industrialization process of the building sector that begun since the 1920s. In Italy, despite the Post-War urgencies, such as the broad demand for new housing, building industrialization wasn't adopted as the main tool for the building reconstruction. The industrialization of construction started only in the 1960s because in the Italian socio-economic context the building sector represented a significant employment field strongly linked to traditional construction. However, even before the Second World War's end, Italian architectural culture, starting from the

American and European models, carried out a rich debate on the standardization and optimization of the building process, giving a significant contribution to the international history of building industrialization. The paper analyses the debate through cultural initiatives in support of prefabrication, such as national design competitions, conferences, exhibitions, editorial projects and—finally—an experimental district, which offers a cross-section of the Italian construction, systems and prototypes developed by designers and companies in the early post-war years and who are heavily connected with the debate that started in 1943.



Silvio Galizia's reinforced concrete shell roofs. An experience of cross-pollination between the ETH Zurich and Italian structural engineering after World War II

**Giuseppe Canestrino¹, Chiara Corinna Galizia², C. Giovanni Galizia³,
Roberta Lucente¹**

¹Department of Civil Engineering, Università della Calabria, Cosenza, Italy

²Archivio Silvio Galizia, Roma, Italy

³University of Konstanz, Konstanz, Germany

In the post-Second World War era, Switzerland and Italy emerged as key players in the field of reinforced concrete construction by establishing a unique synergy between artistic craftsmanship and scientific exploration. This dynamic milieu gave rise to the noteworthy architect Silvio Galizia (1925–1989), who built ten thin concrete shell roofs for ecclesiastical commissioners and patrons. Galizia approached his projects with an attitude that synthesizes the multiple experiences of his Swiss academic training and Italian professional practices. He also included trends and practices adopted by his international colleagues in the design and construction of thin shells and concrete structures. Galizia's

approach to the design of thin concrete shells was characterized by a pursuit of combining construction simplicity, cost-effectiveness, exploration of innovative spatial solutions, and the quest for efficient structural performance. This paper focuses on two of Galizia's earlier works in more detail: the Camilluccia and Verbiti churches. The former has a double-curved thin shell made of reinforced concrete, the latter creates an association of four shells around a central plan, close to but not identical to hyperbolic paraboloids. These will be analyzed to demonstrate his mastery of a particular construction technique for building paraboloid-like concrete shells with minimal use of formworks.



The arrival of the information model, 1969. The new international building industrialization frontier and Italy's "Electronic Challenge"

Francesco Maranelli

Scuola di Dottorato, Università Iuav di Venezia, Venice, Italy

The 1960s saw the first proliferation of opportunities to adopt computers in the production of the built environment. In Italy, the arrival of the computer was closely intertwined with research in the field of building industrialization. Through journals, books and the fundamental 1969 exhibition *La sfida elettronica* (The electronic challenge) at the Building Industrialization Fair in Bologna, its protagonists were among the most significant promoters of the computer as a tool for managing the complexity of building projects, as well as the main reporters on relevant international experiences in this sense. Such interest in the computer had to do with its being an "information machine": an instrument capable of collecting, processing, and transmitting unprecedented quantities of information, a significant aspect given the amount of data exchanged between the actors of the construction process. The most advanced applications of computers in design showcased at the

1969 exhibition and in the following years were constituted by early forms of building information modelling developed abroad, especially in England. The fascination they sparked derived from the fact that they condensed many of the recurring themes of the coeval Italian debates on building industrialization: the idea of open, component-based prefabrication, performance design, and meta-design, all of which embodied political as well as technical and economic ambitions in the Italian 1960s. This study identifies key aspects of Italian research on such alliance between information and industrialization, acknowledging how it was developing in a system of international exchanges and how it especially looked at concrete prototypical applications from the Anglo-Saxon world. It analyzes the beginnings and original aspirations of modes of the profession whose historical development is still ongoing and open-ended.



Slipforming: From Manual to Robotic Slipforming

Ena Lloret-Fritschi, Selen Ercan Jenny, Francesco Tucci

Academy of Architecture, Università della Svizzera italiana,
Mendrisio, Switzerland

In the 20th century, a series of groundbreaking developments and innovations in industry, materials, engineering and built environments profoundly influenced architectural design and construction. These innovations revolutionized the construction industry, facilitating rapid and standardized building processes and enabling widespread adoption of new construction techniques among key stakeholders. As exemplified in this paper, one such innovation, slipforming, was adopted as a standardized construction system applicable to storage silos, structural cores, walls, and pillars. Even though slipforming emerged as a manual technique, it has evolved into a fully automated process, initially limited to large-scale on-site construction of standard and non-standard shapes. The initial cost of slipforming limited this

technique to large-scale structures that were no lower than 20 meters in height. However, with the recent emergence of robotics in construction, slipforming has proven to be efficient for prefabrication, demonstrating its potential to enhance the efficiency of building component optimization. This study aims to provide a comprehensive overview of the historical development of slipforming, focusing on four noteworthy projects, namely Peavey-Haglin's slipform structure, the CN Tower in Toronto, the Sakhalin II oil rig platform (demonstrating the power of CAD), and finally robotic slipforming, also known as Smart Dynamic Casting (SDC), which demonstrates how slipforming can be used for the prefabrication of bespoke and optimized structures. Together, these four projects illustrate the evolution from manual to robotic slipforming.



Innovative envelope design: Theo Hotz' High-Tech construction for Zurich

Matthias Brenner

Professorship for Construction Heritage and Preservation,
Department of Architecture, ETH Zurich, Switzerland

The High-Tech Architecture of the 1970s and 1980s is commonly characterized by displaying components of building services as well as structural features outside the building envelope, evoking a technologically advanced appearance. Emerging in the 1960s in England, this architectural movement saw its genesis through the pioneering ideas of groups like Archigram, who significantly influenced a subsequent generation of architects. Notable actors like Richard Rogers, Renzo Piano, and Norman Foster went on to realize iconic structures such as the Centre Pompidou, the Lloyd's Building, and the Sainsbury Centre. In Switzerland, this development started in the early 1970s, culminating in a monumental structure, the Postbetriebszentrum (Postal Operations Center), designed by Theo Hotz (1970–1985). This building is articulated slightly differently than its European counterparts: instead of sophisticated technological features

like colored mechanic pipes or structural parts boldly displayed outside the envelope, the imposing structure is fully clad in profiled aluminum panels. Its design and construction principles draw inspiration from transportation vehicles, including train carriages, automotive and aerospace engineering, as well as from naval architecture. After a short description of the historical development of different streams of High-Tech, this contribution explores the building history of the Postbetriebszentrum with a strong focus on its façade construction. Contemporary theoretical reflections are considered as well as the actors involved in the execution of the design (e.g., architects, engineers, and construction companies). Finally, a comparative analysis is undertaken with a British counterpart, the Sainsbury Centre for Visual Arts designed by Foster Associates (1974–1978), drawing parallels and distinctions between this Swiss High-Tech approach, embodied by Theo Hotz.



Modern Construction in Italy: the Institute of Mathematics in Bologna

Angelo Massafra¹, Carlo Costantino², Giorgia Predari¹, Riccardo Gulli¹

¹Department of Architecture, Alma Mater Studiorum University of Bologna, Bologna, Italy

²Department of Agriculture, Forests, Nature and Energy, University of Tuscia, Viterbo, Italy

During the second half of the twentieth century, the synthesis of the analytical and theoretical components of the design cultures with the practical and experimental aspects of the construction domain became central. In Italy, on the one hand, the use of reinforced concrete construction systems has continued to spread from the previous decades; on the other, spatial composition theory, strongly linked to the emerging social, political, and economic needs, imposed sharp breaks between the pre- and post-World War II design practice. Within this background, a tendency known as „architectural realism“ was defined when mixed masonry-concrete building systems began to exhibit their own figurative and spatial qualities, also expressing the “craft-type” building sites of the time. A representative case study of this period of paradigm shift is the Institute

of Mathematics of Bologna (1955-1965), designed by Giovanni Michelucci, one of the so-called “first generation” of Italian modern architecture masters. This paper aims to evaluate and contextualize the extensive technical repertoire of the building, critically analyzing the time’s technological culture and the productive, economic, and social processes underpinning its ideation and realization. In the text, specific knowledge about the construction characteristics of the building elements is provided and associated with the spatial attributes of the architecture hosting them. In particular, a cross-analysis is carried out between information gathered by archival-historical research methods, digital surveys and information technologies. The result is the systematization of the knowledge about the building to inform its renovation and conservation processes.



Types and families: A genealogical approach to standardized type structures in the GDR 1960-90

Konrad M. Frommelt

Institute for Building History and Art History, BTU Cottbus-Senftenberg,
Cottbus, Germany

This paper investigates the development process of standardized building types in the GDR. The iterative development of prefabricated and mass-produced structures reflected the deep institutional integration of the building industry in the state between 1960 and 1990, creating numerous genealogical connections and relations between the successive variants. Specifically, new standardized structures were formed by recombining existing constructive ideas and iterating them into fresh and original technological solutions that, over time, evolved into newer versions. By employing a genealogical approach to the transfer of ideas in structural design, a broader understanding of the mechanisms behind the evolution of serial structures can be attained. Within

this article, the case study of the RTR segmented space frame roof structure is used to illustrate a typical process of development as a phylogenetic network and linking its structure to the complex interaction of institutions from the spheres of industry and university research that were involved in it. The characteristics of mass-produced structures of the 20th century as industrial products suggest a research focus on the creation of new types and the variation of types over time. A systematic analysis of the development process as a genealogical phenomenon can aid in refining the methodological toolbox of researching such structures and in establishing the design process as an inherent technical value of structures of High Modernity.



Construction during the transition from on-site construction to factory production in the former Nippon Telegraph and Telephone Public Corporation Headquarters Building

Ryohei Kumagai, Sho Kanazawa, Asa Kondo

Department of Architecture, Tokyo University of Science, Tokyo, Japan

This paper describes the transition from conventional construction to factory production in Japan during a high-growth period through a pre-demolition survey of a representative office building from the early 1960s. Particular attention is paid to the perimeter sashes, integrated ceilings, and partitions. The paper examines the coexistence of pioneering attempts at industrialization and a reliance on on-site craftsmanship. The perimeter sashes were made of a combination of steel plate and partial stainless steel, factory produced and assembled on site. Full-height sashes were placed over the entire surface and can be considered a bridge to the ensuing „curtain wall“ era. The fixed partitions comprised factory-made studs and panels assembled together, but on-site welding was frequently adopted to join them to the

building frame. The variable partitions used fixed inserts, but had the flexibility to be placed with the reinforced ceiling joists. The system of aluminum panel ceilings was introduced much earlier than the introduction of integrated ceilings that became popular in the 1970s. Steel substrates having been standard only since the 1970s suggests that this integrated ceiling dates from when steel substrates were first being introduced. The entire building was integrated via a unique modular system that divided its 7-m span; thus, most of the components were custom made. The building dates from an era when on-site construction was the mainstay and modules were not standardized, which suggests the building was built on the cusp of standardization and used developing industrial components.



Central Park in Lugano. A massive construction between prefabrication and craftsmanship

Giacinta Jean, Cristina Mosca, Lorenzo Roberto Pini

Institute of Materials and Constructions, Department of Environment Constructions and Design, University of Applied Sciences and Arts of Southern Switzerland, Mendrisio, Switzerland

Central Park is a large building complex realized by the well-known architect Peppo Brivio from 1969 to 1978 in Lugano. Three towers of eleven storey occupy an area of 10,300 square meters, for which the yielding hill behind was heavily gutted to allow the construction of this “colossus”. Extensive archive material and oral history sources allow a deep insight in working processes of the construction period, the combination of prefabrication and craftsmanship and the supply of materials from Italy that were not available in Ticino. The architect Peppo Brivio, and the technical team consisting of builders – the Consorzio Central Park and Eugenio Foglia, the project manager – engineers, draftsmen and workers, were able to develop and implement ingenious solutions to give the complex an articulated form, to offer purchasers extremely

flexible and tailor made flats, and to set up a site operating machine with logical, concrete, rapid construction phases that avoided delays and allowed investors a good return. The facades used for the first time in Lugano a system of prefabricated Silipol® slabs then produced by the Fulget company of Bergamo (Italy). The panels imitate natural stone according to a recipe still preserved by the building administration. Every detail, both design and construction, was thought through with great care, required the work of a perfectly tuned team and much testing before being realized. It was an enormous construction site, especially for the Lugano of the time, in which large-scale problems were tackled with a technical knowledge and craftsmanship worthy of being remembered.



New research results on the history of an icon of Italian-style engineering. The Velasca Tower in the BBPR archive

Gianluca Capurso¹, Tullia Fidelbo²

¹Dipartimento di Ingegneria Civile e Ingegneria Informatica, Università di Roma Tor Vergata, Rome, Italy

²Dipartimento di Ingegneria Civile e Ingegneria Informatica, Università di Roma Tor Vergata, Rome, Italy

This paper expands on the study of the relationship between structural solutions and the architectural language of Torre Velasca in Milan. It evaluates records from the BBPR architects, presently kept at Rome's MAXXI Museo Nazionale delle Arti del XXI secolo, loaned by the Belgiojoso family in 2022 and now accessible to researchers for the first time. The research delves into unpublished documents related to the project's execution, with special emphasis placed on the interactions between various participants involved in the building's construction. This study scrutinizes BBPR's drawings, project papers, meeting reports, and

communication with the SGI - Società Generale Immobiliare technical office. By comparing this new data to previous studies, the influential factors driving structural decisions are revealed. The paper also uncovers the rationale behind the design choices made throughout the building's construction and examines how the structure was strategically used to redefine the image of the tower, setting it apart from the North American skyscraper model. Additionally, the study seeks to bring to light the distinct roles played by individuals involved in the construction of this globally acclaimed architecture.





POLYNORM. Dutch modular construction of the 1950s entirely made of steel sheet

Nicolas Grandjean, Agnès Collaud, André Jeker, Reto Mosimann, S  rina Vanbutsele

Institute TRANSFORM, HEIA-FR, HES-SO University of Applied Sciences and Arts Western Switzerland, Freiburg, Switzerland

Material-saving lightweight construction systems for buildings were a recurring theme in the first half of the 20th century and still are today for reasons of sustainability. The construction system developed by NV POLYNORM in Holland after the Second World War fits well into this category of construction systems. With NV Ontwikkelingsmaatschappij POLYNORM, mechanical engineer Alexander Horowitz developed and industrialized a comprehensive construction system for residential buildings and warehouses. The versatile processing and use of steel

sheet is characteristic of the system. Due to the little material thickness of the sheets, a surprisingly high material efficiency and a low total weight are achieved. Another important feature of the construction system is that it can be raised by means of dry construction method, which allows easy and fast assembly and complete disassembly of the buildings. The present work focuses on the hall construction of POLYNORM with a structure entirely made of folded steel sheets and the corresponding fa ade cladding.



Labor or Work? Remembering operations in the construction of the Golconde dormitory, Pondicherry (1935–c.48)

Saptarshi Sanyal

Department of Architecture, School of Planning and Architecture, New Delhi

Few building projects reveal as unusual a trajectory as the Golconde dormitory does. Realized between 1935 and c.1948 at Pondicherry, India, this impeccable-looking modern structure has intrigued architectural experts due to its formal characteristics and environmental performance. Yet, the story of its construction, one not obvious from its appearance or performance, remained untold. By peeling away these (outer) layers however, a rich and textured history of how Golconde was actually built appears. The project's patrons, leaders of a spiritual community (Ashram) in Pondicherry, configured the construction process as an outer realization of a spiritual pursuit. The profound meaning and significance thus ascribed to the act of building provides a critical apparatus to uncover the palpable experiences of Golconde's largely amateur workforce, an unlikely

combination of mostly seekers within the Ashram and few trained professionals. These builders persisted with producing a structure in a material unfamiliar to them, reinforced concrete, and its other components—all with considerable precision. Analyzing records they left behind help to forge a narrative where Golconde's material operations, in effect, become legible through the human relations underpinning them. In such a narrative, the people enacting these operations appear as vividly as physical things they sought to create. The paper therefore proposes that the term "labor" proves inadequate to describe these builders and their efforts, as it presumes built projects to be transactions. Rather, the Golconde project's narrative is better understood as one of "work", a far more inclusive conceptual frame to explain the culture of its construction.



The supporting scaffolding for the foundation restoration of the Strasbourg Cathedral and its remaining model fragments

Benjamin Schmid

Institute of Architectural History, University of Stuttgart, Stuttgart, Germany

The discovery of cracks on the first pillar of the north aisle in Strasbourg Cathedral in 1903 was to be the start of a restoration project on the foundations that was to last for more than 20 years, but which was finally successfully mastered by an innovative solution thanks to the cooperation of expert participants and progressive companies. However, the supporting scaffolds for the stabilization of the cathedral during the renovation work also contributed to this success. The planning and execution of these supporting scaffolds differed from those in other sacral buildings with similar problems that had to be solved then, so some of them will

be used as comparative examples. The model fragments of a section model of the area of the foundation restoration and the supporting scaffolds, which have been preserved along with other documents and records, represent important testimonies to understand the development of general scaffolding construction and the influence of the professional environment, as well as the identity-forming role of the Strasbourg Cathedral in Alsace-Lorraine. This paper documents these models to classify and preserve these witnesses of an important construction project of foundation restoration in civil engineering history.





„Crossroads of the Air:“ The Evolution of Chicago’s O’Hare Airport

Thomas Leslie, FAIA

Illinois School of Architecture, University of Illinois, Urbana-Champaign

In 1955 Chicago already had the world’s busiest airport, but at just 640 acres “amidst the stacks and gas tanks...of southwest Chicago” Midway Airport was clearly incapable of handling the increase in traffic suggested by the arrival of commercial jet traffic. The city’s unique position—near the population center of North America but far enough north to take advantage of great circle routes to Europe—made it an ideal airline hub. Midway Airport’s 6500’ runways were barely adequate for a new generation of aircraft, however. City officials looked farther afield to build longer runways and larger terminals. Plans to build on landfills in Lake Michigan, or to re-purpose

military airfields nearby, ran into formidable political and financial problems.

Orchard Field, in suburban Des Plaines, however, presented unique opportunities. Home to a wartime Douglas aircraft factory—among the largest timber structures ever built—it boasted long runways built for the company’s C-54 aircraft and clear surroundings. In 1945, the city of Chicago announced that it would negotiate with railroads and landowners to expand Orchard into the world’s largest airport, with a dozen tangential runways and an undulating central terminal anchoring an elliptical main tarmac.



Building Paper 1869 to 1919—a hidden material revealed by patents

Nigel Isaacs

Wellington School of Architecture, Victoria University of Wellington,
Wellington, New Zealand

The 1869 invention of “building paper” helped to solve at low cost a widespread problem of timber framed and clad houses – excessive uncontrolled ventilation. It provided a wind-resistant barrier which improved comfort, reduced the cost of heating and had the potential to reduce construction cost. From its earliest days the product was covered by a range of patents, dealing with manufacture, treatment (e.g. making it water-proof) and use. Seventy-four relevant American patents have been identified in the period 1868 to 1919. Based on the coverage of the different patents, three time periods have been identified under three broad headings: 1868 to 1883 Revolution (25 patents); 1884 to 1899 Evolution (23 patents); and 1900 to 1919 Maturity (26 patents). As well as exploring

technical development before the widespread use of trade catalogues, patents provide insight into the role of the various inventors and businesses. The paper examines the geographic spread of inventors and the assignee companies, the different roles played by each business as they developed their specialty products, the roles as they evolved and improved their product; and how patents supported the developing market. As business records are too often discarded, these patents also offer a unique way to explore the history of companies no longer in existence, whether by closure or merger. Early patents can also reveal business tensions which not otherwise be recorded, such as constraining other businesses by limiting access to technology.



New techniques, ancient forms. Deneux's patents for reinforced concrete frameworks

Maria Rosaria Vitale

Department of Civil Engineering and Architecture (DICAR),
University of Catania, Italy

Between 1919 and 1921 Henri Deneux (1874–1979), an architect of historic monuments, registered two different versions of a patent for “assembled and demountable reinforced concrete elements”. It was based on the study of traditional roof frames and particularly on Philibert Delorme’s technique of constructing timber vaults and arches with laminated small elements. Trained under Anatole de Baudot’s teaching, Deneux became architect of the historic monuments in 1905 and after the First World War actively tested the use of reinforced concrete in restoration works, namely in

the re-establishment of the roof frames of the Cathedral and the Churches of Saint-Jacques and Saint-Remi in Reims. As many other reinforced concrete patents, his system was destined to disappear from the field of new constructions, overtaken by Hennebique’s calculation practical methods. Nevertheless, the challenging reconstruction of monuments’ timberworks in Reims proved the possibility to provide tailored solutions for monumental buildings and reach innovative syntheses using ancient forms and new materials.



The innovation of reinforced concrete in the automotive factories in the early 1900s: Patents, technologies and constructive experimentation

Rossella Maspoli, Giulio Saponaro

Department of Architecture and Design, Politecnico di Torino, Torino, Italy

This paper investigates the initial applications of reinforced concrete in both industrial and architectural field during the first two decades of the twentieth-century in Turin, with a focus on its connection to the inception of the automotive sector. The introduction of the main foreign patents into the city, such as the Hennebique System, was facilitated by the activities of Giovanni Porcheddu's construction company. In Italy the diffusion of reinforced concrete was rapidly directed towards the foundation of the new pre-Fordist production sites related to French and American construction models, such as Coignet (Symmonet 1992) and Kahn and Ransome Systems (Mikesell 2019). This paper stems from an ongoing cataloguing activity, conducted under the TAHN (Turin Automotive Heritage Network) Protocol within the Department

of Architecture and Design at Politecnico di Torino, that meticulously identified numerous case studies from the automotive sector in the city of Turin, many of which were previously undocumented. The study delves into the analysis of structural and typological solutions in reinforced concrete, correlating them with the evolution of the industrial system. It draws connections to prior research conducted at both local and sectoral levels. This paper explores exemplary cases, categorized by urban and functional type, technological and structural innovations. An emblematic case is Lingotto (constructed from 1916 onwards), where the remarkable serial nature of the building stands as a noteworthy outcome of the shift from horizontal to vertical factory design.



Between Rationalism and “Engenhosidade”, and why not a little Empiricism: the introduction of Portland cement and reinforced concrete in Brazil

Maria Luiza Macedo Xavier de Freitas

Department of Architecture and Urban Planning,
Federal University of Pernambuco, Recife, Brazil

In Brazil, Portland cement and reinforced concrete were introduced in hydraulic works, such as docks, sewage and water supply networks, and in building subsystems, such as their use in foundations etc. The first news of the use of ‘Portland’s cement’ (as it was called) dates back to 1867 in the construction of the Alfandega and Praia dos Mineiros docks in the city of Rio de Janeiro, then capital of the Empire (1822-1889), a regime policy then in force in Brazil. This work was a milestone in the ingenuity of military engineer André Rebouças. This work seeks to understand the paths, permeated by the rationalism and ingenuity of the nineteenth century that led to the introduction of Portland cement and reinforced concrete in construction in Brazil, as well as a little empiricism.

This research is part of the systematization of surveys already carried out in the doctoral thesis “Modernidade Concreta” (2011), accomplished in different sources, such as specialized engineering journals published from 1890 to 1940, in addition to consulting publications - books and construction manuals - published in the current period of the development of Portland cement and reinforced concrete. The desired results aim to demonstrate the paths of building a technical culture of Portland cement and, above all, reinforced concrete, bringing the main characters of this plot, from the first reports of its use, still experimental, to the formulation of the regulations for works with concrete armed, Brazilian Standard n. 1, from 1940.



Knowledge transfer and tacit knowledge in collaborative historic building projects: the case study of the Ghent University building campaign in the 1930s

Laurens Bulckaen, Rika Devos

BATir, Université Libre de Bruxelles, Brussels, Belgium

During the 1930s, Ghent University undertook a building campaign to meet the needs of the university to accommodate the increasing number of students, as well as the propelling progress in scientific research. For this paper, a selection of three complex buildings was made: the technical laboratories (or Technicum), the Central Library and the Academic Hospital. Each of these buildings was designed by largely the same team, in which engineer-architect Jean-Norbert Cloquet and civil engineer Gustave Magnel played significant roles. This paper scrutinized the types of knowledge and knowledge transfer which made interdisciplinary collaboration between

the professional building actors possible. By looking at a long-term and manifold building campaign, aspects of recurring collaboration and similarities within the building processes of different buildings become noticeable. This research was based on both archival material as well as secondary literature. Using a micro-history approach, significant details in the processes of knowledge transfer for making design decisions were identified. This paper focused both on the actors and their roles within the project, but also on the knowledge transfer within the design process, in which certain actors took on new or ambiguous roles.



The technics of elegance: Negotiating efficiency and standardization in three prestressed concrete systems by Aldo Favini and Angelo Mangiarotti

J. Schnitzler¹, I. Donovan, M.A. Ismail², C.T. Mueller¹

¹Department of Architecture, Massachusetts Institute of Technology, Cambridge, USA

²Department of Architecture, University of Virginia, Charlottesville, USA

This paper traces the technical lineage of three Italian prefabricated concrete building systems designed by the structural engineer Aldo Favini (1916–2013) and architect Angelo Mangiarotti (1921–2012) between 1956 and 1965. These systems were developed in the context of post-war reconstruction to meet the demands of a rapidly expanding Italian building sector faced with severe material constraints. A pattern emerges in their work, in which a commission to design an individual structure is treated as an opportunity to test novel constructive systems with the potential for scaled production and serial deployment. A technical reading of the three case studies—the system developed for the parish church at Baranzate

(Favini, Mangiarotti, and Morassutti 1956), the AL.FA slab (Favini 1965), and the FM system (Mangiarotti 1964)—reveals a period of experimentation with on- and off-site prefabrication through variable discretization and shaping of the structural frame. Further analysis of their structural performance, production, and assembly reveals the effect of the new technical regime of prefabricated, prestressed elements that had emerged only a few decades prior, and situates these systems in a unique design space where negotiations between function and expression, standardization and optimization, and seriality and originality manifested.



Constructing lightness. Local and foreign influences in the work of Yuri Plaksiev in post-war Soviet Ukraine

Giulia Boller¹, Federico Bertagna²

¹Chair of the Theory of Architecture, Department of Architecture, ETH Zurich, Switzerland

²Chair of Structural Design, Department of Architecture, ETH Zurich, Switzerland

Post-war Soviet buildings are often admired as a tangible trace of the recent past by architects, engineers, and historians. The paper discusses the topic from the point of view of construction history. By focusing on the work of the Ukrainian architect Yuri Plaksiev (1932-), the social, political, and economic circumstances were explored to provide a context for his design approach. The aim was to investigate local experiences, expertise, and constraints, as well as foreign influences through the study of two exemplary reinforced concrete buildings in Kharkiv: the “Ukraine” Cinema and Concert Hall (1957-63) and the Sportivnaya Metro Station (1970-73). The former mixed the Soviet interest in technology and prefabrication with innovative structural solutions, showing that it was possible to

achieve non-standard buildings while meeting the stringent requirements for low-tech and inexpensive constructions. The latter materialized research-based discussions at the Laboratory of Architectural Bionics of Professor Yuri Lebedev in Moscow, where Plaksiev completed his PhD in 1969. The collaboration between Lebedev and Frei Otto’s research group in Stuttgart is visible in Plaksiev’s early studies for the Sportivnaya Metro Station. The main hypothesis of the paper is that the coexistence of rather stringent requirements dictated by the Soviet building industry and foreign influences fostered Plaksiev’s design creativity to go beyond well-established architectural typologies and construction solutions that were common all over the Soviet Union.



The vault, a controversial shape

Nadya Rouizem

Laboratoires AHTTEP, EVCAU, Ecole d'Architecture de Paris Val de Seine, Paris, France

In raw earth construction, the most difficult part is the construction of the roof. Thus, in the construction of low-cost earthen housing, the vault represents an interesting possibility to avoid the use of wood and concrete. This is how Hassan Fathy adopted the ancestral technique of the Nubian vault in the construction of the village of New Gourna in the 1940s.

Twenty years later, in Ouarzazate in southern Morocco, a Belgian architect designed 200 low-cost adobe dwellings with a vaulted roof for a social housing project. However, only eight dwellings were built with the vault, as this form was refused by the authorities, and the following 192 dwellings were covered with a

concrete slab, thus causing these dwellings to lose their economic and ecological qualities.

This paper proposes to analyse the circumstances of this failure, also examining other projects in North Africa using this special architectural form. The aim is to understand the representations that the vault can convey in Morocco, in the particular context of the 1960s. It appears that in operations where the vault is made of concrete, the architecture is linked to modernity, while the same shape built in earth refers to tradition. The relationship between form and material is thus of primary importance.



VECA System: brickwork and social housing in Uruguay and Brazil

Juliana H. Suzuki¹, Hugo Segawa²

¹Department of Architecture and Urbanism, Federal University of Paraná (UFPR), Curitiba, Brazil

²Faculdade de Arquitetura e Urbanismo (FAU), University of São Paulo (USP), São Paulo, Brazil

Decent, low-cost dwelling has been an ongoing issue in the Latin American milieu since the mid-twentieth century. The VECA System, Vivienda Económica en Cerámica Armada (Economic Housing in Reinforced Ceramics) was the brainchild of Uruguayan architect Luis García Pardo in 1962, in the circumstances of a country concerned about social housing. It consisted of a proposal to rationalize a building method based on brickwork. The

brick is a material with universal reach and a great tradition in Uruguay. It considered the situation of a country with low industrialization and unskilled labor, but one that was suitable for a construction system with structural and constructive logical procedures and low consumption of materials, compatible with working conditions in the South American context in search of a possible materialization of social places.



Domes, vaults, and mud bricks: form and construction in the work of Hassan Fathy

Viola Bertini

Department of Architecture and Design, Sapienza University, Rome, Italy

The aim of this paper is to explore the use of domes and vaults in the work of the Egyptian master architect Hassan Fathy. Specifically, it discusses how the use of these forms, which originated from a practical need, would end up becoming a key expressive element of Fathy's architectural poetics.

The paper is divided into three parts. The first explores Fathy's choice to work with domes and vaults built from mud bricks. Fathy's understanding of the importance of the vaulting system in Egyptian history is emphasized, with a particular focus on his discovery of traditional Nubian architecture. The second discusses the

evolution over time of Fathy's architectural language where the domes and vaults took on a constituent role. One aspect highlighted is how a construction technique came to be translated into expressive forms, which were both a stylistic feature of the architect and his attempt to declare a cultural belonging with respect to the context he was operating in. Finally, the third part addresses how Fathy's idea of architecture was acknowledged by several of his disciples, with a focus on the Halawa House, designed by Abdel-Wahed El-Wakil and honored by the Aga Khan Award for Architecture in 1980.



Rebuilding Traditions: Tile Vaults in Spain after the Civil War (1940-1956)

Javier Madero¹, Wesam Al-Asali²

¹School of Architecture and Design, IE University, Madrid, Spain

²School of Architecture and Design, IE University, Segovia, Spain

The aftermath of the Civil War in Spain (1936-1939) presented significant obstacles to the country's reconstruction, imposing constraints on resources. During this period, architects and builders resorted to vernacular and traditional techniques for their accessibility and cost-effectiveness in terms of material and labor. In this context, the traditional thin-tile vaults gained renewed significance and were widely employed in rebuilding Spanish towns. Most of these projects were documented in a Francoist regime's quarterly journal called 'Revista Reconstrucción', which aimed to showcase the reconstruction efforts between 1940 and 1956, constituting a crucial historical record and offering valuable insights into that era. Through an analysis of this archival resource, this paper examines the use of thin-tile vaults in Spain after the Civil War, focusing on

housing projects in the reconstruction of villages such as Loz Blázquez and Boadilla del Monte. The paper begins with an overview of vaulting before and after the Civil War, then delves into the findings extracted from the archive of Revista Reconstrucción. Patterns and trends in tile vaulting during this pivotal period are identified through the coding, drawing, and mapping of materials from the journals. This helps form an understanding of how and why tile vault structures were built and leads to a discussion on the dissemination of the technique, showing how it spread from the traditional regions and to new geographies. Moreover, it provides insights into construction in times of scarcity, the role of national identity, and the opportunities for experimentation within the context of tradition.



The preservation of Heinz Isler's structures made of glass-fiber reinforced plastics

Pamela Voigt

Freelance Architect, Leipzig, Germany

The Swiss civil engineer Heinz Isler (1926–2009) is one of the best-known shell builders in the world. As a freelance engineer, he sought to design the most efficient and at the same time most beautiful lightweight constructions from 1955 to around 2003. These shells were made of reinforced concrete, but also of glass-fiber reinforced plastics (GFRP). In the reception of Isler's work, his extraordinary plastic buildings were usually qualified as marginal notes. However, since the cataloguing of his work by the Isler Archive at the GTA Zurich, around ten new projects have been discovered. His oeuvre shows a broad spectrum of supporting structures and constructions made of GFRP as large light shells, sandwich panels as light roofs, folded roof lamellas and façade panels. The documents bear witness to the careful handling of all projects. Isler's composite plastic constructions are

exceptional in their field. Isler began as a plastics pioneer in Europe in 1956, ten years before their heyday. Even after the 1980s, he was far ahead with his knowledge. In the 1990s, he led the first renovation work on his large skylight domes, redefining the control and maintenance of glass-fiber reinforced plastic structures. However, he did not publish this knowledge. The dissemination of this knowledge serves now as a model for the repair and maintenance of other GFRP buildings. Using one project of the large skylight panels, the five roll-up skylight roofs of the Bad Säckinggen hydroelectric power plant over the Rhine (1965), Isler's design approach and working method are explained, taking into account the material properties, the load-bearing behavior and his and current knowledge in conservation and maintenance.



Interactions between the experimental integration of solar thermal systems and building construction technologies: trends identified from a comparative analysis of selected buildings in Europe and the United States (1940s-80s)

Elena Poma, Franz Graf

Academy of Architecture, Università della Svizzera italiana,
Mendrisio, Switzerland

Integrated solar thermal systems for indoor space heating were developed experimentally during the twentieth century for various reasons: to test the results of experimental scientific studies, demonstrate the feasibility of environmental alternatives, and reduce the dependence of buildings on fossil fuels. However, their use in buildings affects design and construction choices to different extents. Eight effective, solar-heated buildings realized between the 1940s and 1980s were analyzed as exemplars of the experimental application of solar thermal energy systems in the US

and Europe. Data on the chosen buildings were collected from literature, construction documents, archival material, and on-site surveys. The adaptation of building construction technologies to ensure the effectiveness of solar thermal systems was observed in their original construction methods, materials, thermal properties, and spatial organization. This study identified three consecutive stages in solar-heated construction; these stages suggest that building technologies evolved toward the greater integration of strategies for energy efficiency.



Emerging building technologies and their impact on facade design

Ina Cheibas¹, Ena Lloret-Fritschi², Cara Rachele³, Maarten Delbeke³, Romana Rust¹, Fabio Gramazio¹, Matthias Kohler¹

¹Institute for Technology in Architecture, Department of Architecture, ETH Zürich, Switzerland

²Academy of Architecture, Università della Svizzera Italiana, Lugano, Switzerland

³Institute for the History and Theory of Architecture, Department of Architecture, ETH Zürich, Switzerland

This study examines historical construction methods in which emerging innovative materials and building techniques have influenced the facade design. It investigated three case studies of iconic facades, through their contextual background, key design theories, and influential models that have contributed to advancements in building design. Across a century, the Prudential Building, envisioned by Louis Sullivan in 1896, the 860–880 Lake Shore Drive Apartments, designed by Mies van der Rohe in 1949, and the Lloyd's Building, crafted by Mike Davies in 1986, emerged as pivotal players in propelling the advancement of facade construction

methods. Analytical-description techniques derived from historiographic and theory-based research served as the methodology for analyzing these case studies. The results pinpointed influential guidelines that pave the way for future trends, including concepts like anatomical transparency, structural clarity, and performative design. These trends have become feasible due to the introduction of novel materials and innovative building techniques. The analysis conducted in this study facilitates a better grasp of the key elements that shape facade construction, particularly in the context of emerging technologies.



Louis Joseph Vicat's synthesis of analysis and experimentation, the invention of the tremie, and the development of hydraulic engineering expertise in France

Tom F. Peters

Emeritus Professor of Architecture and history, Lehigh University, Bethlehem PA, USA

Louis-Joseph Vicat was among the first generation of engineers to combine an experimental and a theoretical approach to material research. Vicat's artificial cement was reliable because he backed up experimentation with quantifiable knowledge. His work in the development of the first reliable modern hydraulic cement was based on careful study of its chemical composition and its physical characteristics, a novel two-pronged approach based on the unique form of French engineering education. It initiated the modern field of material science.

Vicat followed up the success of his artificial material with two decades of comprehensive research on natural and artificial hydraulic cements and their use. In combination with practitioners and their development of the tremie method of casting concrete underwater, and through Vicat's many publications and his collaboration with Louis-Charles Mary, who spread this knowledge through education, French engineers attained expertise in concrete construction and hydraulic engineering.



Avant-gardists sunken into oblivion – The Berlin steel construction company Breest & Co. and its ingenious engineer Hans Schmuckler

Roland May

SPP 2255 Kulturerbe Konstruktion, BTU Cottbus-Senftenberg, Cottbus

In the first quarter of the 20th century, industrial buildings evolved into central pillars for the desired fusion of arts and technology. This epoch-making shift towards a new culture of modernity has produced countless heroic tales, especially in relation to the group of avant-garde architects. However, other important groups of actors for the shaping of architectural modernism, such as the Berlin-based steel construction company Breest & Co. and its long-serving engineer Hans Schmuckler, have been largely forgotten. Collaborating with a impressive number of leading architectural avant-gardists, the company as well

as its leading engineer cultivated unique profiles as creative leaders in the German steel construction sector.

The paper presents key projects by Breest & Co. and the undeservedly forgotten Schmuckler. Particular attention is paid to the company's role within the architectural avant-garde and the outcomes of this rather unique specialization. Furthermore, the paper demonstrates that the emphasis on "progressive" design may ultimately have been just part of a much broader strategy to ensure the survival of a construction company in exceptionally turbulent times.



Building Parliament: the masons of the Palace of Westminster c.1839–c.1860

Alexandrina Buchanan

School of Histories, Languages and Cultures, University of Liverpool,
Liverpool, United Kingdom

This paper discusses the potential for researching the hitherto anonymous workforce of nineteenth-century British construction associated with specific sites, taking as a case study the Palace of Westminster reconstructed after a fire in 1834. The project aims to build on previous prosopographical studies of nineteenth-century British construction workers, combining biographical and prosopographical methods

to uncover, reconstruct or imagine the lives of the subjects of those records. It discusses the available sources, including their strengths and weaknesses; the workflow for the research, and the challenges associated with the methodology. Analysis of the data offers insights into workforce mobility, health and politics and suggests the value of such methods both for construction history and for interdisciplinary research.



Building the face of modern architecture. Facade and window manufacturers as contractors

Rouven S. Grom, Andreas W. Putz

Professorship of Recent Building Heritage Conservation,
Technical University of Munich, Munich, Germany

Based on post-war economic growth and with technological advancements in prefabrication and construction, many small metal workshops started to develop into specialized industrial manufacturers for the production of windows and facades since the 1950s in Germany. While some of these companies offered comprehensive and customized services, others developed into providers of standardized systems, like Schüco from North Rhein-Westphalia. The former, however, often assumed

the role of contractors for modern glass and metal building envelopes, facilitating the implementation of a distinctive international design feature of modern architecture and construction. Prominent amongst them was the company Josef Gartner from Gundelfingen. The article reflects under which conditions a distinctive range of specialized companies were able to shape the external appearance and internal conditions of modern post-war architecture.



Liquid innovators. Company advertisements of sanitary installers in Paris, London, and Brussels (1850–1940)

Matthijs Degraeve

Postdoctoral researcher, FWO Research Foundation - Flanders; Departments of History and Architectural Engineering, Vrije Universiteit Brussel, Brussels, Belgium

Construction history benefits from a growing attention to artisans and contractors from various building trades. Much remains to be discovered, however, on their development in response to long-term societal change. Building on an emerging research focus on water use and building services, this paper analyzes how the still little-known building trades of plumbers and other sanitary installers developed between 1850 and 1940 in reaction to an expanding market for sanitary comfort. Borrowing sources and methods from business history, the paper uses a database of 183 advertisements from sanitary companies in Paris, London and Brussels, compiled on the basis of directories, trade catalogues and journals, to discern three key aspects of long-term change: the chronology of innovations, marketing instruments, and

the professional background of business actors on the sanitary market. The paper concludes that the early development of sanitary comfort in Britain had a thorough influence in Paris and especially Brussels, where the English origin of sanitary skills and products formed a strong commercial instrument. Actors on the sanitary market deployed a wide spectrum of marketing tools, however, which stressed their expertise, experience and reliability, but also the quality, safety, innovativeness, desirability and affordability of their goods and services. Lastly, whereas sanitary skills initially developed within various trades where on-site work was combined with shop-floor production, a growing distinction emerged between sanitary manufacturing and on-site installations, which became the exclusive domain of contractors.



“Dare, persevere, succeed.” De Coene’s venture into glulam in the 1950s and 1960s

Kaj-Wolf Depuydt¹, Sven Sterken², Stephanie Van de Voorde¹

¹Department of Architectural Engineering, Vrije Universiteit Brussel, Brussels, Belgium

²Department of Architecture, KU Leuven, Leuven, Belgium

In the mid-1950s, a small temporary church was erected in the municipality of Lokeren, Belgium. Typically for the suburban expansion at the time, it was a cheap and quickly built structure that was only meant to last until a ‘decent’ new church could be built. It would indeed have been long forgotten if it hadn’t been awarded the First Prize in a National Architecture Competition in 1956 for reason of its original parabolic shape and its use of three-hinged parabolic arches in glulam. This illustrates how in Belgium at the time, glulam was still something of a novelty, and especially so in the context of a representative building like a church. This paper delves deeper into this seemingly anecdotal fact by focusing on the

emergence of De Coene, the timber company that constructed it, and its role in contemporary church design. To this end, the paper follows the firm’s motto “dare, persevere and succeed” and retraces the firm’s modest beginnings as a family business in the late-19th century until its overpowering dominance on the Belgian glulam market by the end of the 1960s. This evolution is illustrated by discussing a number of church designs whereby the presence of glulam evolved from mere structural support to an integral and acceptable part in the building’s architectural expression—thus highlighting how a technical novelty quickly gained symbolical value as a token of modernity.



Large construction companies in the widespread of modern housing. A comparative analysis between Lisbon and Luanda

Inês Lima Rodrigues, Francesca Vit

Dinâmia' Cet-Iscte, University Institute of Lisbon, Lisbon, Portugal

From the late 1950s, Lisbon and Luanda experienced an exponential population growth that intensified with the outbreak of the colonial war (1961-1975), with the independence of the colonies under Portuguese rule and the end of the dictatorship in 1975. Due to the inefficiency of the public apparatus in responding to the housing crisis and providing different “housing for many people”, the state encouraged the private market (construction companies, cooperatives, developers, investors, etc.) to support the demand for housing in Lisbon and Luanda. The result was a boom in the construction industry, mainly through standardized high-rise buildings, which promoted access to the “home

of one's own” and promised a modern and mechanized lifestyle in central and peripheral locations for the emerging middle class. The role of medium-sized and large construction companies in the spread of modern housing was crucial in both Lisbon and Luanda. The construction companies not only provided the know-how to build quickly and with good quality, but they were also agents in the promotion of a new way of life, in the exchange of expertise and constructive references between Lisbon and Luanda and in the mobilization of different actors (public and private) in the making of the modern city.



Contractors Shaping Den Brandt in Antwerp (1910-1925)

Yonca Erkan

ARCHES Research Group, University of Antwerp, Antwerp, Belgium

Antwerp's expansion, which began in the mid-nineteenth century, extends into the twentieth century. While the public construction sphere transformed itself legally and administratively, clarifying the role boundaries between architect, builder and contractor, the private construction sector developed various new ways of adapting to the new demands of the growing city. Opportunities in the construction sector pushed individuals to form partnerships, family ventures or act as independent entrepreneurs.

The „Den Brandt“ area was opened for residential use in 1910 and developed through three different business models. The first was through the company Société Anonyme Extensions et Entreprises Anversoises (later known as Extensa). The second was through builders such as Eduard van Biesen, who experimented with various forms of professional practice (i.e., the van Biesen Brothers, Berchem's Toekomst company,

co-founded with Edmond Coppens, and independent construction ventures). Finally, independent contractors such as Frans Geerts, who built terraced houses for private clients and in some cases acted as property developers, constitute the last *modus operandi*. In a few ventures, the involvement of an architect is also traceable.

By investigating the different business models favoured by contractors in the transformation of Den Brandt, this study contributes to a better understanding of the role of contractors in urban development/design. Through this research, the article analyses two different construction companies (i.e., Société Anonyme Extensions et Entreprises Anversoises and Berchem's Toekomst), individual contractors (e.g., Frans Geerts, Eduard van Biesen) and their architect collaborators (e.g., Guillaume Peeters, Cornelius Sol) in operation in Antwerp before and after the World War I.



Foreign and local construction practices and the formation of Ottoman engineering in the Hejaz railway construction (1900-1908)

Habibe Tuba Bölük¹, Mario Rinke², João Mascarenhas Mateus³

¹Faculty of Architecture, Mardin Artuklu University, Mardin, Türkiye

²Faculty of Design Sciences, University of Antwerp, Antwerpen, Belgium

³Faculty of Architecture, University of Lisbon, Lisbon, Portugal

Infrastructure projects were one of the most important elements of the reform processes in the Ottoman Empire in the 19th century. One of the central projects was the Hejaz railway line (1900-1908), which ran from Damascus to Medina through the Hejaz region in present-day Saudi Arabia and had a branch line to Haifa on the Mediterranean. For many of these technically demanding projects, foreign companies were engaged who were obliged to collaborate with local experts and labourers. This paper focuses on the Haifa-Dara line characterized by ambitious structures due to the rugged topography. A key person here was German engineer August Heinrich Meissner who facilitated the inclusion of Ottoman engineers (some graduates of the Hendese-i Mülkiye and others educated in European schools). Meissner's apprenticeship model for Muslim and non-Muslim

laborers played a crucial role in shaping the Hejaz railway project. The research investigates the Project's catalyzing role in the development of Ottoman civil engineering in the empire. It aims at a better understanding of how, rather than by whom, new technical knowledge of modern engineering practice was established in the empire. Archival research into diplomatic documents and foreign companies sheds light on the intertwined connections with European enterprises, particularly German ones. The discussion traces construction knowledge and organization, offering a better understanding of the technical, economic, and cultural impact of Ottoman control over foreign enterprises and highlighting the multifaceted implications of infrastructure projects in the complex execution of Ottoman railway projects.



Sugar and Technology. Manuel Querino and the Role of Drawing in the 19th Century Brazil's Building Culture

Adalberto Vilela¹, Sylvia Fischer²

¹School of Architecture, Federal University of Uberlândia (UFU), Uberlândia, Brazil

²School of Architecture, University of Brasília (UnB), Brasília, Brazil

The establishment of large-scale sugar manufacturing in the Americas posed an important challenge to technology and, therefore, to scientific knowledge. Between the 16th and 19th centuries, sugar production in Brazil, in addition to being costly and time-consuming, was possible only due to slave labor, the first trade apprentices in the country.

In 1888, with the abolition of slavery, the country embarked on a mission to establish and encourage ways to improve technical education required for its modernization and industrialization. Manuel Raimundo Querino (1851–1923), Afro-Brazilian artist, professor, politician, and historian who fought for the development of an efficient educational network to generate technicians and scientists who would contribute to the country's technological progress, is remembered as an example of community and

pedagogical action for legitimate transfer of knowledge.

In its pursuit of transitioning from an agrarian society to an industrial nation, this study reveals that Brazil emphasized the cultivation of technical skills, with design education playing a pivotal role. This strategic shift aimed to facilitate industrial expansion by dismantling the historical influence of sugar mills, which had not only shaped the sugar-centric economy but also molded the fabric of Brazilian society. In more straightforward terms, the goal was to eradicate the stigma of servitude that had characterized the early stages of industrial education and the devaluation of manual labor in the country. From a broader perspective, it highlights the importance of drawing as a means of technical, political, and social transformation in architecture and construction.



The National Theater of Panama: a collaborative process

Silvia Arroyo Duarte

Facultad de Arquitectura y Diseño, Universidad de Panamá, Panamá, Panamá; Sistema Nacional de Investigación, Secretaría Nacional de Ciencia, Tecnología e Innovación (SENACYT), Panamá, Panamá

This paper is a case-study based approach that will focus on the collaborative process of the construction of the National Theater of Panama by studying legislation, contracts, networks, technical aspects, contacts, and personal references related to the building. The National Theater was one of the first monumental buildings in Panama, and it was designed by the Italian engineer Gennaro Ruggieri. The contact with engineer Florencio Harmodio Arosemena (Panamanian president from 1928 to 1931) brought him to the country and their work started in 1905, at the dawn of the Republic of Panama. At the time, the nation lacked the technical expertise needed to build such an important theater, even

if it was on a modest scale. Ruggieri and Arosemena conducted collaboration that developed on the arrival of numerous skilled craftsmen (from Italy and Spain) and the training of Panamanians in the new construction techniques. They collaborated with various engineers, artists, and constructors, and brought innovative technology to the country at the time. The documentation reveals that the construction was not a sole authorship, but a collaborative process developed through knowledge exchange. Furthermore, it reflects on the fine line between architects and engineers and the importance of the professional roles of these two engineers at the beginning of the twentieth century.



Collaboration in building with plastic-coated steel in West Germany in the 1960s: the „Hoesch-bungalow“

Silke Haps

Montanhistorisches Dokumentationszentrum (montan.dok), Deutsches Bergbau-Museum Bochum – Leibniz Research Museum for Geo-resources, Bochum, Germany

In the mid-1950s the Hoesch steel company invested in the diversification of its products and began to develop plastic-coated steel under the trademark of Platal. The production ranged from everyday items to construction elements for prefabricated houses. The development of prefabricated houses by Hoesch in West Germany in the early 1960s was a phenomenon typical of the time. The so-called Hoesch-bungalows, some of which are still preserved today, were flat-roofed detached houses, mostly single-story in a style explicitly declared „modern“, made of the newly developed composite material Platal. Initially, they were prototypes, often inhabited by Hoesch executives, who were not infrequently involved in their development.

Eventually, nonetheless, the houses were aimed at a broader end consumer market. Even though this development failed in economic terms after a few years, for the steel company, this meant a foray into new territories. This venture was characterized by efforts to build up collaborations with companies, engineers and architects experienced in system construction and to expand existing production facilities. The collaborations led to the generation of knowledge about material and construction – developments that are still used today. The paper focuses on deciphering tangible and intangible elements of the planning, decision-making and production processes of these collaborative developments evolving around the “Hoesch-bungalows”.



Architects and engineers: design authorship between synergies and disagreements

Simona Talenti

Department of Civil Engineering, University of Salerno, Salerno, Italy

In Italy, the construction of complex structures such as skyscrapers has made collaboration between architects and engineers vital, as evidenced since the 1930s by the first tall buildings, such as the Genoese tower designed by the architect Marcello Piacentini in collaboration with engineer Angelo Invernizzi. A deep fellowship was born between them, attested by an ongoing exchange of correspondence full of reflections, sketches, and suggestions. This teamwork had unquestionable and clear impacts on the entire design process. Even more famous was the synergy between Gio Ponti and Pier Luigi Nervi culminating in 1960 in the famous Pirelli skyscraper in Milan: an experiment where teamwork replaced the traditional rivalry between the two professions. Indeed, Nervi pointed out how “collaboration gives a far greater return than the simple sum

of individual skills would imply”. After this brief period when experts from the great Italian engineering school put themselves at the service of designers seeking constructive advice for their towers, engineers seem to have once again become a category of ‘invisibles’. Today, architects often figure as the only true creators of these audacious structures whose forms are instead the result of a complex collaboration of professionals from an increasingly number of disciplines. Through the study of the relationships between the leading figures of Italian modernity in the twentieth century – sourcing information from the epistolary exchange housed in some archives – the paper aims to reflect on the issues of authorships, mutable boundaries, close partnerships and overlaps of these two professions, particularly in relation to construction of Italian skyscrapers.



The Concrete Collaborations of Carmen Portinho and Affonso Reidy: Structural innovation in Brazilian Modernism through public service

Alexander Curth, Caitlin Mueller, Mohamed Ismail

Over the course of a 20-year collaboration from 1942-1962, architect Affonso Reidy and engineer Carmen Portinho left a lasting impact on the urban fabric of Rio de Janeiro and helped create the Brazilian Modernist movement, all from their shared offices in the city planning department. As lifelong civil servants, their achievements have often remained unrecognized beyond Brazil. However, in Brazil, their impact as both designers and urbanists is visible from nearly any street corner of Rio de Janeiro, with housing and municipal building projects across the city still occupied today. Perhaps most notable is Portinho's role as the driving force for this work, both as a politically savvy administrator and a highly skilled civil and structural engineer. It was her study of post-WWII reconstruction in reinforced concrete that facilitated the pair's first large-scale concrete

projects and the creation of the Department of Popular Housing in Rio, which would shape policy to this day. In this study, we survey the works of Reidy and Portinho and the innovations in reinforced concrete design that these works represented at the time of their construction. We present a novel analysis of the Museum of Modern Art Rio de Janeiro's structural design, comparing historical construction images and drawings to a detailed finite element analysis model of the building's exceptional suspended concrete frame structure. In addition, we compare the structural design approaches used in the Museum of Modern Art project to earlier social housing projects, considering the notable balance Portinho and Reidy struck between structural efficiency and economical fabrication through repeating concrete modules.



Designing and assessing riveted lattice girders in metallic roof structures: from Navier to Eurocode 3

Hannah Franz¹, Mario Rinke², Emilie Leprêtre¹, Lamine Dieng¹

¹MAST-SMC, Université Gustave Eiffel, Bouguenais, France

²Faculty of Design Sciences, University of Antwerp, Antwerp, Belgium

Between 1850 and 1930, wrought-iron and mild-steel riveted lattice girders were widely used by designers of roof structures in France. In recent restorations, these structural elements have often undergone reinforcements, primarily due to conservative assessment methods. This paper presents a case study of a lattice purlin from the train shed of Montauban, built in 1903 and retrofitted in 2012. Using the case study, the paper delves into historical and contemporary

design practices to identify the sources of discrepancy responsible for strengthening measures. The research particularly focuses on structural analysis techniques and buckling design criteria, highlighting the divergence between nineteenth-century construction practices heavily reliant on experience, and modern assessment practices, constrained by standards intended for the design of new structures.



From iron to reinforced concrete: revisiting the interwar oeuvre of Victor Horta in light of his wartime sojourn in the US

Tom Packet¹, Stephanie Van de Voorde²

¹Department of History, Archeology, Arts, Philosophy and Ethics, Vrije Universiteit Brussel, Brussels, Belgium

²Department of Architectural Engineering, Vrije Universiteit Brussel, Brussels, Belgium

Belgian architect Victor Horta arrived in New York in December 1915. Where Horta had initially gone to the US to raise funds for the Belgian war effort, he would also conduct an in-depth study of American architecture and construction. A good example of this is given by a letter, dated November 30 1918, from the American construction entrepreneur Hugh James Fleming to Horta. Fleming was advising the architect on the “Sawyer system”, giving suggestions on how this system of precast concrete could be implemented in Belgium to help with the “great work of reconstruction”. While Horta’s archives do not include other references to the Sawyer system, Horta’s stay in the US during WWI did not go without consequences. Throughout his sojourn, the architect became particularly impressed by the efficient and rational building practices in the US, praised the American custom of collaboration between architects and engineers, and became

acquainted with the potential of reinforced concrete. Horta’s pre- and interwar oeuvre is indeed remarkably different. Internationally recognized as the main pioneer of Art Nouveau and the visible use of cast iron, wrought iron and steel in the domestic sphere at the end of the nineteenth century, Horta changed gear after WWI. He advocated, among other things, the “return of the beautiful simple line” and the use of concrete. In this paper, we investigate the impact of Horta’s stay in the US by critically questioning a threefold shift between his pre- and interwar oeuvre: the shift from iron to reinforced concrete, from Art Nouveau to Art Deco, and from the genius artist holding absolute control over the design process to a collaborative professional. To evaluate this, we briefly examine and revisit two of his interwar projects that offer interesting perspectives: the Palace of Fine Arts (1919-28, Brussels) and the Municipal Development project (ca. 1927-31, unrealized).



The research and patents of Dalmine Company: Seamless pipes for the design of building structures

Matteo Abita, Renato Morganti

Department of Civil, Construction-Architectural and Environmental Engineering, University of L'Aquila, L'Aquila, Italy

Dalmine was one of the leading companies of the Italian steel industry since the first half of the twentieth century and its seamless pipes were used in several engineering fields. The expeditious restructuring of the production and the redevelopment of the sales network subsequent to the ravages of World War II facilitated a phase of expansion, enabling the company to invest in research and development, particularly in market sectors that were previously deemed less profitable. Following the lead of some international rivals, who conducted studies on the use of steel pipes for the structures of their new headquarters, Dalmine started new studies on the possible use of their products for the

construction of large buildings, during a period of steady growth in the national building activity. The research conducted by the Metal Carpentry Center aimed at optimizing the use of steel pipes for building structures and attempted to overcome the difficulties of their connection in order to gain the same flexibility of traditional open section profiles. With bibliographical and archival sources of the Dalmine Foundation Archive, this essay aims to retrace the development of studies, experimentations and patents linked to the use of seamless pipes in the building structure before the introduction of technologies that eased their structural use.



Arched rafters with diagonal ties: On the history of lightweight truss system in the Russian Empire at the turn of the nineteenth and twentieth centuries

Daria Kovaleva

Institute for Lightweight Structures and Conceptual Design (ILEK),
University of Stuttgart, Germany

This article (re)discovers the context of the emergence and spread of an innovative and remarkably efficient structural system—diagonally braced arches, which appeared in the Russian Empire in the last decade of the nineteenth century and remained exclusive to its construction practice. Due to its lightness and expressiveness, the new structural system, for the first time applied for covering the passages of Upper Trading Rows (now known as GUM) in Moscow (1890–93), immediately gained popularity and was widely used in many public and industrial buildings at the turn of the centuries.

In modern Russian and foreign literature, the invention of this new truss typology is usually attributed to the outstanding Russian engineer Vladimir Shukhov, who published its analytical solution in his book „Rafters“ in 1897. However, careful analysis of historical documents

indicates that Shukhov was not involved in either the design or implementation of the earliest designs where diagonally braced arched rafters were used. This article proposes to revisit the context of the emergence and dissemination of this system by analyzing archival sources, Russian and foreign press of that period, and other documents devoted to the description of the design and construction of well-known and newly identified built examples. The most significant constructions using this system are presented in chronological order. Information is provided on structural details, technical data of the projects, names of engineers involved in the development of structural solutions and calculation methods. Finally, data on the identified projects are systematized and discussed in the context of nineteenth- and twentieth-century Russia.





Construction techniques at Linz Cathedral (1862-1924/36) or how to build an old-fashioned church in a modern way

Iris Pfeiffer, Christiane Weber

Institute of Architectural History, University of Stuttgart, Stuttgart, Germany

From 1862 until its consecration in 1924, the Mariä-Empfängnis-Dom in Linz was Austria's largest neo-Gothic cathedral, and was also the last major cathedral construction site in the country. With the appointment of the Cologne diocesan master builder Vincenz Statz as the first master builder at Linz Cathedral, a Dombauhütte (stonemasons lodge) was set up that was rooted in medieval tradition and modeled on the Dombauhütte at the completion of Cologne Cathedral. The construction of the neo-gothic Linz Cathedral was prolonged until 1936. Over the course of these 74 years, construction operations changed from the

purely manual practices of a medieval-style Bauhütte to a technical large-scale construction site. The fundamental basis for this was provided by the infrastructural facilities implemented at the state and municipal levels in the process of industrialization. The introduction of gas and electricity made it possible to launch mechanized equipment such as stone saws, hoists and a compressed air system. Innovations eased and accelerated construction progress, enabled lower construction costs and serial production of the vaults and transformed construction operations in the long term.



How Surveying Kept Tunnel Builders on the Straight and Narrow - The Albula Tunnel

Philip S. C. Caston

Neubrandenburg University of Applied Sciences, Neubrandenburg, Germany

This year (2024) sees the completion of the new Albula Tunnel under Piz Dschimels (called Giumels in the sources) in the Grisons, Switzerland and is therefore a good opportunity to look back some 120 years at the first Albula tunnel. Construction information and the time line of the original, almost 6 km long, tunnel were published in the Schweizerische Bauzeitung by surveyor-in-charge W. Graf in 1902. One of the many interesting aspects of the tunnel works is how the surveying kept the tunnel builders on the straight and narrow. Graf's article treats us to a glimpse of this in compact form which includes one plate showing the alignments and two photos of some of the surveying equipment used. The surveyors faced similar problems with

several longer Swiss tunnels, the Mont Cenis, the Gotthard and the Simplon. A look at the surveying of these and other earlier tunnels also throws light on how the surveyors worked. This paper will attempt to explain how the tunnel portals were located by using triangulation, how the main tunnel axis was set out on site and how the surveyors guided the miners forward. Two teams of miners move along a theoretical common axis towards each other. At the Albula Tunnel one team started from the north-west portal at Preda, the other from the south-east portal at Spinas. The breakthrough took place at 3:30 am on the May 29, 1902. The horizontal displacement of the two halves of the axis was just 50 mm, the vertical just 45 mm. An incredible feat.





Robert Mills' Rotunda Annex at the University of Virginia, 1851-1895

Benjamin Hays, PE

University of Virginia, Charlottesville, United States

Construction of Thomas Jefferson's Rotunda at the University of Virginia took the better part of four years to complete (1823-1826). Specialized labor was scarce. All phases of project were physically intense. And weather controlled virtually every aspect of the work, from the production of bricks to the transportation of specialty products like glass and Italian marble. A generation later, architect Robert Mills designed an addition to

the Rotunda - later termed „The Annex“ - that more than doubled the size of the combined building. Though larger and more complex than Jefferson's Rotunda, the Annex' classrooms were in use in just over one year (1851-1852). This paper explores a many of the construction means and methods that led to the drastic reduction in construction duration at a time with the United States' building industry was rapidly modernizing.



Bridges over the Mittellandkanal in Hanover from 1905 - 1916

Moritz Reinäcker¹, Johanna Monka-Birkner², Christina Krafczyk¹, Steffen Marx²

¹Lower Saxony State Service for Cultural Heritage, Hannover, Germany

²Institute of concrete Structures, Technical University Dresden, Dresden, Germany

The establishment of an east-west connection from Rhine to Elbe had been subject of long discussions, until the Prussian government decided to build a canal from Minden to Hanover in 1905. This canal is called the “Mittellandkanal”. This large-scaled infrastructure project coincided with the construction of a new railroad bypass for freight trains and the elevation of all railroad tracks in the city of Hanover. These three projects comprehensively changed the urban layout and the cityscape of Hanover. Even before the canal was completed, bridges were built to carry road and rail lines. Because of the width of the canal and the often-oblique crossing, the bridges had to reach spans of up to 60 meters. Depending on the type of traffic and the necessary span, different construction types were chosen for the bridges. There were structures

made of iron and rammed or reinforced concrete. In addition to the still remaining plans and literature of that time, photographs taken during construction provide insight into the construction process. The large number of high-quality photographs shows carpenters posing on their scaffolding, forges heating rivets, but also construction states of the unfinished structures. The scaffolding and cranes pictured provide an understanding of material transport on the construction site. Analyzing the photos made it possible to comprehend the construction process. Some of the bridges were produced by steel construction companies with international operations, such as the Hanover-based “Louis Eilers Werke”. To this day, all bridges on the main canal have been replaced.



Joseph Cordier (1775–1849) – a liberal engineer between the two Napoléons

Stefan M. Holzer

Department of Architecture, ETH Zurich, Switzerland

The period between Napoléon I's final defeat in 1815 and the accession to power of Napoléon III in 1851 was marked by rapid development of France's infrastructure and industry. The leading role in this development was played by the Corps des Ponts et Chaussées, which was headed by Louis Becquey throughout the entire Bourbon Restoration period (1817-1830). A statist policy prevailed in the Corps, although Becquey had initially been open to liberal ideas. However, some „dissident“ engineers from the Corps continued to keep up a much more radical liberal line. For these engineers, Great Britain offered a striking example. French engineers visited the British Isles in the 1810s and 1820s in the course of extensive study trips. They were impressed by the dynamism of Britain's economic development based on private-sector involvement and tried to transplant a similar entrepreneurial spirit to France with relevant travel reports, translations of original English technical monographs, and commentaries. The journeys to England of Charles Dupin, Joseph Dutens or Claude Navier are already well

known. Less attention has so far been paid to the travel reports, commentaries and also the engineering work of Joseph Cordier (1775-1849), to whom this article is dedicated. Cordier is an interesting figure - both for the constructions carried out under his direct supervision as for his activity in publication. His study trips to the British Isles shaped a large part of his life as an engineer. He continued to adhere to his free-market liberal convictions throughout the Restoration. After having been expelled from the Corps de Ponts et Chaussées in 1832, politics became his main field of action, as an advocate of radical liberalism, in marked opposition to his former colleagues in the Corps, who adopted a Saint-Simonian attitude during the July Monarchy. The present paper is not based on archival research, which was beyond the scope of this little contribution, but rather relies on a thorough analysis of Cordier's interesting own publications and on some other contemporary printed sources, which testify to Cordier's way of thinking and action and to his impact on his contemporaries.



Slag, Norms, and Patents. Circulating Knowledge and Experimental Laboratory Construction at the Swiss Federal Polytechnic School 1880–1900

Sarah M. Schlachetzki

Institute for Preservation and Construction History (IDB),
Department of Architecture, ETH Zurich, Switzerland

This paper deals with the largely untold story of blast furnace slag becoming an established building material in the second half of the 19th century. It is a history intimately connected to the Federal Polytechnic School in Zurich as well as to professor Ludwig Tetmajer; one linked to the Polytechnic's building stock as much as one entangled to Swiss industry interests. It coincides with the time in which national norms and standards were first installed to secure the quality of cement as a flourishing merchandise. Patents played a vital role

in the development of building products in the period under scrutiny. This paper asks not only about the scope, but also about the limits, of early multinational patenting and its relevance for any research on the history of innovation. In retracing slag's triumphal march into the building industry, the article will shed light on the heated debates around a waste product turned constructional matter. At that, it critically contributes to the history of technology and innovation—a history reaching far beyond Zurich and Switzerland into Germany and England.



Between practice and rule: codification, testing and use of plain concrete in Dutch military architecture (1870's -1910's)

Federica Marulo¹, Jeroen van der Werf²

¹Department of History of Art, Architecture and Landscape, University of Groningen, Groningen, The Netherlands

²Stichting Monumentenbezit, s-Graveland, The Netherlands

From the last decades of the nineteenth century until the dawn of the First World War, plain concrete was the main building material for fortifications in the Netherlands. Although the architecture and typology of those fortifications has been studied, the development of plain concrete itself has received only limited attention. Nevertheless, archival sources, historic handbooks and early construction regulations show plain concrete as a lively material, of which composition and recipes were tested and adjusted to meet the specific standards of military engineering. Over a short period of time, plain concrete underwent rapid evolution, manifesting in year-to-year variations in recipes and concurrent application of diverse concrete types at the same location.

Considering this premise, the paper sheds a light on the development of plain concrete and related construction

techniques in Dutch military architecture. Through the crossing of archival sources and on-site observation of case studies (i.e., the fortifications of Naarden), the emerging data show how the development of concrete served the specific military goals. Furthermore, the paper highlights how the work of military engineers was part of a general quest for knowledge in all fields of engineering, showing mutual contributions and collaborative knowledge advancements. Following this historical analysis, the examination extends to contemporary manifestations of damage in concrete constructions, contemplating potential correlations with historical construction techniques. Ultimately, it highlights how this knowledge can promote a better understanding of deterioration processes in relation to experimental construction methods, thus, supporting contemporary preservation practice.



Iron wires. The Seguin brothers and suspension bridges in the Grand Duchy of Tuscany and the Kingdom of Sardinia

Danilo Di Donato, Alessandra Tosone

Department of Civil, Construction-Architectural and Environmental Engineering, University of L'Aquila, L'Aquila, Italy

The French scientific and production scenario played a “foreign enchantment” on the technicians and government staff of the Grand Duchy of Tuscany and the Kingdom of Sardinia, showing the evident influence of the Grande Nation on these countries. In the second half of 1820s these states pushed for the first time in Italy some significant experiments of an innovative type of bridge—the wire-cable suspension bridge—which had been introduced in France, just a few years before, by Marc Seguin. This was one of the prerequisites for the construction of two important bridges over the Arno which were designed and built by the Seguin's company: the San Leopoldo and San Ferdinando bridges. As for the Kingdom of Sardinia, the fascination for the technological progress beyond the Alps led to the network of relationships

that the emerging Savoy entrepreneurship established with French and Swiss companies. This favored in Piedmont the design of first iron wire-cable suspension bridges by the Seguin brothers and the General Dufour. Piedmont's designs for suspension bridges never materialized, but the three most important bridges—La Caille, Casale, and Turin—were constructed just 15 years later, at the dawn of the 1940s. Through the research of archival sources, the paper aims to retrace the events that accompanied the construction of first wire-cable suspension bridges in Piedmont and Tuscany, to identify the features that characterized their diffusion in these countries and the role that Seguin brothers played both in terms of promotion of the construction typology and technological support.



The Hackerbrücke in Munich: a landmark of iron and concrete engineering from the late nineteenth century

Clemens Voigts

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

The Hackerbrücke in Munich, with its six iron arches crossing the railway tracks at the entrance to the main station, is one of the city's best-known and most popular historical engineering structures. Built in 1891–1892, its name derives from an old beer cellar nearby. The spans of its arches are modest at about 28.5 m and at first glance do not seem to indicate any major significance in terms of construction history. However, the Hackerbrücke marks the beginning of a development of iron structures that were to become iconic and very widespread in the German Empire at the turn of the nineteenth century. Moreover, the bridge exemplifies the history of the company that built it, the Gustavsburg factory of

Maschinenbau-Actien-Gesellschaft Nürnberg, which later became MAN.

A smaller northern part of the bridge, which was erected at the same time but in a completely different construction method, is of similar historical relevance. The construction company Dyckerhoff & Widmann built it using unreinforced rammed concrete, an innovative technique for which they were to become famous in the following years. Today, the Hackerbrücke is a technical monument representing two different construction methods and two companies that had a significant impact on the development of civil engineering in Germany in the late nineteenth and early twentieth centuries.



The Garabit viaduct as the apogee of classical French railway overpass design, 1880-1884

Matteo Porrino

Laboratoire GSA, Paris-Malaquais School of Architecture, PSL University

Designed on the basis of the Maria Pia bridge, the first railway viaduct to cross the Douro river near Porto, the Garabit viaduct, while exceeding the span of the Portuguese structure, was technically an improved version.

After its completion, the viaduct therefore appears as a virtually perfect solution to a given problem. Its beauty, still recognized today, is the result of its overall proportions and the rationality of its forms, which are intuitively apparent.

However, despite the exemplary nature of this achievement, the viaduct quickly ceased to be a model, and bridges modeled on the Garabit viaduct are few and far between. This observation leads us to question the actual place of this structure in the history of construction. We would like to place the Garabit viaduct more precisely in relation to other earlier and later railway bridges, and more broadly in the history of structural analysis. This is the aim of this study.



,Un pont sur arbalétriers': Building a three-hinged arch over the Faux-Namti Gorge in Yunnan (1908)

Di Zhao¹, Bernard Espion²

¹Department of Architecture, The University of Cambridge, Cambridge, UK

²Département BATIr, Université Libre de Bruxelles, Brussels, Belgium

This paper investigates the economic, construction, aesthetic and symbolic implications of a three-hinged arch bridge, designed by the Société de Construction des Batignolles' bridge engineer Paul Bodin for the Yunnan Railway of Indochina in 1908. Spanning a steep and picturesque gorge 112 kilometres from Lào Cai, the bridge was widely commended as one of the world's most fascinating railway structures during that period. This paper however argues that the innovative approach of a three-hinged pseudo arch that of the Faux-Namti bridge was not an exceptional case and in Bodin's design portfolio.

While the special installation processes stemmed from the challenging onsite working conditions, Bodin - who had never visited the site himself - actually produced another variation of some of his other iconic works, namely the Viaur viaduct and the Asopos viaduct. This paper combines, for the first time, numerous first-hand texts and biographical materials of the main engineers related to the Faux-Namti bridge. Through them, it interprets not only the morphological and technical links of the Faux-Namti bridge with its precedents, but also questions some alumni and kinship connections of its principle French engineers.



The Eglisau Bridge Competition of 1805–10: a Kaleidoscope of Early Modern Construction Techniques

Jasmin Schäfer

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

For the reconstruction of the Rhine bridge in Eglisau (Switzerland), the building department of the canton of Zurich organized a public competition in 1805, which was exceptionally well received. Some of the most famous master builders, architects, and carpenters submitted their design proposals. No fewer than 36 plans for the competition have been preserved in the State Archives of Zurich, along with numerous cost estimates and expertise. The designs range from trestle bridges in wood and stone, partly reusing the old piers of the predecessor, up to structures with immense single spans of up to 130 m. Based on the plans of Hans Conrad

Stadler a timber arch bridge with non-interlocking lamellas was executed in 1810. However, Stadler's construction had to be demolished about 100 years later due to the regulation of the Rhine. Despite the loss of the original fabric, contemporary sources permit to obtain a very clear idea of the former construction system. Furthermore, this contribution focuses on the research into the unbuilt projects. The rich archival material demonstrates a wide spectrum of the most diverse construction typologies, such as queen post systems, polygonal or massive arches, which can be contextualized within the contemporary techniques.



Postconstruction problems with the 85 m span timber arch bridge over the Kokra River in Kranj, Slovenia

Lara Slivnik

Faculty of Architecture, University of Ljubljana, Ljubljana, Slovenia

The timber single-arch bridge spanning the Kokra River in Kranj, Slovenia, was constructed in 1937–38, crossing a 90 m wide and 30 m deep canyon. This remarkable two-hinged structure served both as a pedestrian walkway and a driving surface, designed to support loads of up to 320 kg/m². At the time of its construction, it ranked as one of the longest timber arch bridges globally, boasting a length of 90 m and a span of 85 m—a length comparable to twenty-first century timber bridges. Upon its completion, this bridge garnered attention in the international civil engineering community, earning features in two international publications. Furthermore, its model was prominently showcased at the Erste Internationale Handwerks-Ausstellung 1938. However,

throughout its lifespan, this bridge faced a series of challenges. Just one year after it was opened to the public, the bridge had to be closed for heavy traffic due to safety concerns. Ultimately, in 1946, the bridge was permanently shut down for all traffic due to the potential, yet not entirely confirmed, structural irregularities. After unsuccessful attempts at deconstruction and controlled demolition, the decision was made to burn down the bridge. Through a meticulous examination of recently discovered documents, many of which were uncovered in Stanko Dimnik's personal archive, this paper aims to provide the first comprehensive description of this exceptionally long timber bridge, encompassing post-construction issues, repair efforts, and analyses.



The combination of timber and iron in roof structures of nineteenth-century railway stations in Switzerland

Kylie Russnaik, Stefan Holzer

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

With the advent of the public railway in the first half of the nineteenth century, new types of buildings were developed. Railway sheds served as shelters for passenger trains and station platforms and were some of the more complex and aesthetically representative buildings of the railway lines. The necessary spans, technical requirements, rationalization demands and the fact that the roof structures were visible from below resulted in remarkable timber and iron structures. Unfortunately, most of the hybrid structures of the first generation of public railways no longer exist, and only a few have survived to the present day. Four well-preserved Swiss railway sheds built in the 1850s and 1860s in Basel, Biel, and Thun (albeit translocated to new settings) serve as case studies to examine the construction principles applied in these roof

structures and understand their development. Apart from analyzing the general construction systems of the roofs, the precise use of iron was a major focus of the investigations. 3D laser scanning and detailed hand measurements were used to produce survey drawing of the railway sheds. The buildings were compared with each other and with historical plans to assess the authenticity of the surviving structures and to identify general tendencies in building technology. In addition, construction journals and carpentry treatises from the nineteenth century were used to contextualize the combination of timber and iron in roof structures. It turns out that the constructions of the Swiss railway sheds represent outstanding surviving examples of their type.



Jules Röthlisberger (1851–1911), Swiss expatriate, chief engineer at the Società Nazionale delle Officine di Savigliano in Turin (1884–1910)

Vincent Krayenbühl

Independent researcher, Lausanne (Aubonne), Switzerland

The article presents the life of Jules Röthlisberger (1851–1911), a Swiss expatriate, through the scope of his personal archives. Röthlisberger studied civil engineering at the Federal Polytechnical School in Zürich with Prof. Culmann (1821–1881). Between 1872 and 1883, he worked for the Ott metallic construction firm in Bern and designed many bridges, putting in practice Culmann's graphical statics. In 1883, he opened a consulting firm in Milan. In 1884, the Società Nazionale delle Officine di Savigliano (SNOS) in Turin hired Röthlisberger as chief engineer. Under his leadership, the company became one of the most important of Italy. He designed the arch bridge of Paderno sull'Adda/San Michele (1889), proposed to be part of the UNESCO World Heritage

list. The SNOS was active in Italy, Southern and Eastern Europe, and in Switzerland. The paper shows Röthlisberger's role in introducing in Italy the graphical statics, and the Swiss engineering practices at the time. At the SNOS, he developed a combined approach with analytical calculations. The article outlines the frequent exchanges between academic research and practice, and the openness of Europe in the construction sector between the 1870s and 1914. Röthlisberger travelled frequently. The speed of communications and travel by rail enhanced the efficiency of civil engineers at the end of the nineteenth century. During his trips he wrote numerous letters to his wife, providing a personal touch about his working conditions.



Albert Fink and the U.S. transition to statically determinate railroad truss bridges

David Simmons¹, Dario Gasparini²

¹Ohio History Connection, Columbus, U.S.A.

²Civil and Environmental Engineering, Case Western Reserve University, Cleveland, U.S.A.

Albert Fink (1827-1899) trained in construction technology at the Darmstadt Höhere Gewerbeschule and emigrated from his native Lauterbach, Germany, to America in 1849. His subsequent career as a bridge designer and builder with the Baltimore & Ohio and Louisville & Nashville railroads involved the development and use of his own Fink truss and several forms of the Warren truss. In a departure from common American practice at the time, all his bridges were statically determinate. For long-span bridges,

Fink developed methods for subdividing large truss panels. This paper highlights Fink's notable design for crossing the Ohio River at Louisville, Kentucky, placed in service in February 1870. A 122 m span of the bridge was, at the time, the longest simple-span railroad truss in the United States. Fink's design augured a seminal change in American engineering judgment regarding appropriate bridge truss forms and led to subdivided trusses becoming an American standard during much of the twentieth century.



Immigrant Engineers In New York

Donald Friedman

Old Structures Engineering, New York, USA

It is a cliché to say that New York is a city of immigrants, but it is also true. Immigration there cuts across class and occupational classifications, and has always included people in design and construction. The most famous immigrant engineer to leave his mark on New York, John Roebling, never lived there. He worked on the Brooklyn Bridge while living in Trenton, New Jersey, and died early in the project, leaving his US-born son, Washington Roebling, to complete it. Examples of immigrants who lived or worked in New York include bridge engineers Othmar Ammann and Gustave Lindenthal, tunnel engineer Ole Singstad, building engineer Gunvald Aus, building-systems designers Ernest Ransome and Rafael Guastavino, and building designers Karl

Gildemeister and Georg Carstensen. Their time in New York and their impact varies greatly: Lindenthal, Ammann, and Singstad, between them, designed fifteen major tunnels and bridges across New York's waterways; Gildemeister and Carstensen designed one building, the New York Crystal Palace, and left the US shortly after. Guastavino established a long-lived business that was later expanded by his son. By examining the work of these designers and builders, we see how they influenced, and were influenced by, development of the New York built environment. All had to adapt to the economic and technological conditions present in New York; all introduced or improved the design and construction techniques used there.



The Roeblings: migration, knowledge transfer, and tacit knowledge

Andreas Kahlow

Civil Engineering, University of Applied Sciences, Potsdam, Germany

The concept of „tacit knowledge,“ introduced by Michael Polanyi, describes a level of meaning-making in science, where knowledge is bound to a few people as „tacit knowledge.“ Only the intersubjective reproducibility of statements within a group or a community makes knowledge available to others. This leads to theory formation and thus to science.

Johann A. Röbling, who called himself John A. Roebling (1806-1869) after his emigration to the USA, combined different approaches. Even though he acted largely independently hardly willing to cooperate with other engineers, Roebling closely followed the European development in wire rope fabrication and in iron bridge construction. In the summer of 1867,

he sent his son, engineer Washington Roebling (1837-1926), on a nine-month educational trip to Europe. Washington A. Roebling appropriated the technological knowledge available in Europe in various fields. This knowledge was often implicit. In numerous letters, reports and drawings, Washington A. Roebling attempted to present his findings in a comprehensible manner. This transfer of knowledge represents a transition to objectified, explicit knowledge. The relevant correspondence between Roebling and his son Washington Roebling during 1867-68, archived at the Rensselaer Polytechnic Institute in Troy, N.Y., is evaluated for the transfer of knowledge crucial to the design and construction of the Brooklyn Bridge.



Latrine towers. Models, uses and diffusion in Mediterranean architecture from the 12th to the 14th century

Maria Teresa Gigliozzi

Education, Cultural Heritage and Tourism, University of Macerata, Macerata, Italy

Sources on the types and uses of latrines in medieval architecture are sporadic and general. Moreover, studies on the subject are rare, unlike those published for the Roman period. The aim of this paper is to study the hygienic spaces in thirteenth-century residences, in particular the latrine towers in curial palaces, analyzing their models and later applications. The historical and typological-architectural context will also be established by means of comparisons with hygienic facilities used in the Islamic context, in Norman and Swabian castles and palaces in southern Italy, in European residential and castral buildings, and in Outremer crusade architecture, with particular attention to that of the Hospitaller Order:

the Crac des Chevaliers and the Acre complex. These are two very important testimonies in the development and diffusion of the latrine tower model in Europe, of which the tower of the Pontifical Palace of Viterbo is one of the first examples. The Tower of Viterbo was built during the works commissioned by Pope Clement IV. He was a supporter and admirer of the Hospitallers, with whom he had been in frequent contact. Charles I of Anjou also had close contacts with the Hospitallers, and he was probably responsible for the construction of another latrine tower in the residence of the SS. Quattro Coronati in Rome. The Viterbo tower typology was the model for the similar structure in the Papal Palace in Avignon.

Between privy and throne. Building facilities as an expression of sophistication at the court of the Western Umayyad Caliphate (tenth century, Spain)

Heike Lehmann

Chair for History of Architecture and Urbanism,
Technische Universität Berlin, Germany

The residence city of Madinat al-Zahra was founded in the mid-tenth century, just a few years after the self-proclamation of the Caliphate of Córdoba, in competition with the Abbasids of Baghdad and the Fatimids of North Africa, who were simultaneously claiming supremacy over the Muslim community. The new caliphs' residence existed only a few decades. During its brief heyday, however, it was the site of diplomatic receptions and festivities that showcased the caliphs' self-image of rulership, creative abilities, and technological prowess. Accordingly,

the palaces were designed and furnished to a high standard. They were remarkably equipped with a variety of water basins, complex tempered baths and spacious latrines. In particular, not only the living houses but also the large reception buildings are closely associated with baths and extensive latrine facilities whose design, high quality of materials, and precision of construction are on par with those of the adjoining reception rooms. This study examines the sanitary building services of the Upper Hall in the official palace district.





A late-Hohenstaufen castle and its living comforts: the Palas of Gravina in Puglia

Judith Dreiling, Giulia Pollini

Institut für Kunst- und Bildgeschichte, Humboldt-Universität zu Berlin,
Berlin, Germany

The castle of Gravina in Puglia is one of the summer residences used by the rulers during late Hohenstaufen and early Angevin times in Southern Italy. Erected between the 1230s and 1240s, the building was embedded in nature and furnished with amenities to ensure the utmost comfort of that time. These features were primarily gathered within the Palas, i.e. the castle's section designed to host the sovereigns in the most representative chambers, offering excellent landscape view. Due to the castle's ruined state and the absence of comprehensive restoration records, the Palas was examined by combining architectural investigation, analysis of historical sources and photographs, and comparison with similar edifices. The results presented belong to the interdisciplinary project "Summer

Residences and Retreats of the Rulers around Mount Vulture". The study reveals that the medieval Palas had two stories connected by a spiral staircase. On the ground floor there was an extended hall, while the upper floor consisted of three rooms. They were orientated outwards, with huge bifora windows overlooking the landscape, where the rulers engaged in falconry and fishing. Adjoining towers, serving most likely as toilets, were accessible from the rooms equipped with chimneys. The analysis demonstrates that the Palas underwent several alterations over the centuries, including the addition of an early modern loggia. Its current state of ruin results from numerous changes in ownership, re-purposing, neglect, and weathering.





Wooden floors versus coffered ceilings: structural improvement and decorative complexity in the palaces of Cremona (1490–1540)

Alberto Grimoldi, Angelo Giuseppe Landi

Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy

In the fifteenth century, the wooden floors in the lavish buildings acquired increasing complexity. In many European cities, different solutions appear, which improve stiffness and load capacity of the floors, and configure their construction elements within an architectural and decorative design. The merchants of Cremona (at that time the second city of the Duchy of Milan) were involved into international trades: here numerous double - warping ceilings dating from the fifteenth-sixteenth century are still preserved but only their painted curved panels, exhibited in famous museums, are renowned. In the most complex sort of these ceilings, the main beams support volute-shaped corbels, between which curved wooden panels are inserted. Its height is double of the joists. The apparatus continues along the walls, dividing the ceiling into rectangular bays, with equal pattern

on each side. Above the curved panels, vertical panels are inserted between the joists.

This construction is documented in Palazzo Raimondi, a paradigm of the Lombard Renaissance (1490–1497) and survives in the Priorato di S. Abbondio, completed around 1525. Perhaps they connote the activity of local builders, the De Lera workshop; the masons in Cremona belonged to the same guild as the carpenters, which were also appreciated as builders of altars. Examples of these ceilings outside the city are very scarce, in the nearby areas from which oak timber came and, before 1530, they disappear, replaced by coffered ceilings, or better by elaborate masonry vaults. More than the reported lack of timber, functional and structural advantages seemed to prevail.



Thin Timber Domes in Restoration England (c. 1670-1680)

Luka Pajovic

Department of Architecture, University of Cambridge, United Kingdom

This paper seeks to describe, chart, and contextualise the development of a little-known method for constructing light-weight timber domes, pioneered in the work of Sir Christopher Wren and his circle. Described by an early eighteenth-century commentator as a way of building domes ‘without a Cavity as usual’, this method relied on a framework of curved principal rafters, purlins, and secondary ribs, sandwiched between leadwork and plaster, to create domes of unprecedented formal and structural integrity. The resulting domes were only one beam deep in section and featured no conventional trussing, in marked contrast to timber-framed cupolas on the continent.

While a number of unbuilt designs for thin-domed structures emerged from Wren’s office in the early 1670s, it was in the London churches of St. Mary-at-Hill (1670-74), St. Benet Fink (1670 – 1675), and St. Stephen Walbrook (1672-80), that the method was first put to use. The present paper seeks to situate these structures in the wider building culture of the time, examining, among other things, the reasons for their use by Wren, the contribution of London carpenters to their development and dissemination, and lastly – their possible origins in the work of Philibert de l’Orme and other continental innovators.



The Building History of a Medieval Bridge: The Pont du Diable in Saint-Jean-de-Fos (Hérault, France)

Grazia Cione, Jasmin Schäfer, Clemens Voigts

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

During the Middle Ages, several stone arch bridges of a wide span were built outside large cities, in mountainous landscapes, resting on rocky abutments, sometimes elevated high above the river level. The construction of such high valley-crossing structures was challenging and required specific technical skills and great expertise. This present contribution is devoted to the study of a well-preserved case of such a high bridge: The Pont du Diable, located within the municipality of Saint-Jean-de-Fos (Hérault, France). The structure built in cut limestones has two prominent semicircular

arches supported by a central pier. Considering that the bridge has been used for centuries, further construction measures, repairs (and enlargements) are evident. Special attention of the present study is paid to the evidence and on-site traces that might permit to deduce details of the building process. Based on the in-depth on-site investigation, recent surveys and archival research, the contribution discusses the findings regarding the construction process and the building phases of this remarkable example of medieval masonry bridge construction.



An Insight into the Building Process of Pont Valentré in Cahors (XIV Century)

Laura Carmona-López, Clemens Knobling, Jasmin Schäfer

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

Pont Valentré is a fortified bridge that was built during the fourteenth century, crossing the river Lot in the town of Cahors (Occitania, France). Built of ashlar stone, the bridge is formed by six main ogival arches and three towers, connecting the rocky landscape on its western side to the main town on the eastern side. During the construction process of masonry bridges, temporary timber bridges were useful in various aspects, such as the transport of materials. This type of structure is commonly referred to as a service bridge. The present study is based on traces of a service bridge within the construction site in the case of Pont

Valentré, which can still be identified at the cutwaters of the bridge. Observations and precise documentation have allowed an exhaustive study of the remaining features and subsequent reconstruction of the service bridge in Pont Valentré. Through this reconstruction, a possible construction sequence for the bridge was also discussed. The result of this work aims to enrich our understanding of how the service bridge was used in the construction of Pont Valentré, as well as in the broader context of building techniques of medieval masonry bridges in Southern France.



Temporary structures as part of the constructive process: a centering system proposal for the oval dome of San Carlo alle Quattro Fontane

María del Pilar Pastor Altaba

Department of Architecture and Design, Institute of Technology EPS,
Universidad San Pablo-CEU, CEU Universities,
Urbanización Montepríncipe, Spain

During the constructive process of some domes, it will be necessary the utilization of temporary structures to withstand the materials and guarantee their stability. Furthermore, in the case of oval domes, some of these structures, such as centering systems, become essential, which not only will have a structural function but will also guide the geometry of the construction and define the outline to be followed by the laying of the rows of bricks. When considering the volumetric conformation of these domes, the inherent geometry of the centering structure could be therefore considered the unequivocal link between the graphic design and the real construction. In the specific case study of the oval dome of San Carlo alle Quattro Fontane,

whose architect, Francesco Borromini, was aware of some stability principles, the thickness of the masonry, as well as the opposition of forces along the directions in which they are distributed, were also used to add stability to the whole. Thus, this knowledge of load distribution and static configuration would have been essential to design, place and size the different elements of the centering system probably used for the construction of the dome.

Based on these geometric and structural considerations, a surveyed digital copy of the real construction has been analyzed to propose a feasible centering system used during the construction of this dome.



Vaulting Techniques in Romanesque Burgundy: Advanced Large-span Groin Vaults at Sainte-Trinité in Anzy-le-Duc (1001-1120)

Marius Pfister, Louis Vandenabeele

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

After antiquity, large span vaults disappeared from Christian Western Europe. It was not until the eleventh century that they returned, and it was in this and the following century that various techniques of vaulting can be found in Burgundy. Sainte-Trinité in Anzy-le-Duc (1001-1120) with its various vaults exemplifies many of these techniques. Beyond that, the geometrically complex groin vaults spanning the nave of the church, a rather big achievement for the period, show a culmination of Romanesque vaulting techniques.

To investigate these vaults through Building Archaeology, high-precision surveys using structure-from-motion (SfM) were employed to capture the still original building fabric with all its details. Further,

detailed geometric analyses were used to reveal formwork traces and deformations. By reconstructing centerings and formwork, the construction process and design principles were uncovered. It became clear, that Romanesque builders were capable of building large-span groin vaults by employing intermediate centerings.

To show the broader construction history of Romanesque vaults, comparisons to other significant churches of the era and region, such as Saint-Philibert in Tournus (1008-1120) which was analyzed in a previous publication, give insight into the development of vaulting techniques throughout the eleventh and twelfth centuries.



The revolution in vault construction before the Gothic: Speyer Cathedral, some related examples, and the development of wide spanned vaults in the 11th and 12th centuries

David Wendland, Mark Gielen

Chair of Construction History, Brandenburgische Technische Universität;
Cottbus, Germany

The principles of the geometric design and construction of Gothic vaults mark a fundamental shift in vault conception. In reality, the underlying geometric conceptions were established well before the Gothic, and the relation to the development of rib vaults is more complex than it has been generally assumed.

The vaults in Speyer Cathedral, one of the most prominent church buildings in the Middle Ages, are exemplary for innovative vault design in the eleventh century. Moreover, here the first high vaults were built over a large church nave, and the first cross vaults with diagonal ribs appear. We intend to show the key position in the history of medieval vault construction, regarding the geometric design

as well as the new structural system. The impact can be shown in prominent vaulted structures from the early Gothic, in particular the nave of the Cathedral of Angers and the high vaults in Notre-Dame in Paris. The study is based on surveys, 3-D-Scans, and geometric analyses, aiming to understand design and construction of the vaults, the details of the masonry and stonework, as well as the structural elements.

In the context of the historical development of applied geometry we also discuss the role of stereotomy in the architecture of the cathedral. This raises the question of the origins of the canon of design exercises that is connotated with Early Modern treatises of architecture.



The cathedral of St. Pierre in Lisieux: A laboratory of vaults from the twelfth to the sixteenth centuries

Mathias Häcki, Louis Vandenabeele, Clemens Voigts, Stefan Holzer

Institute for Preservation and Construction History,
Department of Architecture, ETH Zurich, Switzerland

The cathedral St. Pierre in Lisieux in Normandy, one of the earliest French Gothic churches, is rather unknown compared to its contemporaries of the Île-de-France, such as Notre-Dame in Noyon (begun c. 1157) and Notre-Dame in Paris (begun c. 1163). Beneath the dendrochronologically dated medieval timber roofs, a variety of original four-part ribbed cross vaults are preserved. As only a few early Gothic cathedrals such as St. Pierre have survived, the design principles and construction techniques of early Gothic vaults are still poorly understood. The aim of this contribution is to analyze and compare a selection of vaults from the Cathedral of St. Pierre in Lisieux. In this article, the cathedral's construction history is briefly presented and the main

vaults over the nave, the two transepts, the choir and the axial chapel are positioned in this context. Then, four main types of vaults in St. Pierre Cathedral dating from the end of the twelfth century to the middle of the sixteenth century are analyzed in-depth. In particular, the intrados geometries of the diagonal ribs and the webs are analyzed, based on a complete digital survey of the cathedral. The extrados and thickness of the vaults are also included in this study to provide a more complete understanding of their construction. From the comparison of the selected vaults, new insights into the construction technique and design principles of early Gothic vaults are presented and similarities to other French examples discussed.



Transformation of a Temporary Mold to a Permanent Structural Member: A Strategy for without-Centering Vaulting in the Iranian Traditional Architecture

Hadi Safaeipour, Mahsa Pour-Ahmad

Center for Documentation, Architectural Studies, and Restoration, Faculty of Architecture and Urban Planning, Shahid Beheshti University, Tehran, Iran

The construction procedure of masonry vaults has been practiced variously based on the different building strategies in the history of architectural technology. One of the common methods includes using wooden load-bearing centering that bears the weight of the arch or vault from the beginning stages of the construction to the end. In this method, a set of dense wooden piles is applied to support the centering itself. This relies on the application of heavy centering, a long construction process, and lots of wooden materials. Throughout centuries and even millennia, however, a different building method has been extensively adopted for the erection of vaulted structures in the architecture of the Iranian plateau: without-centering vaulting. In the previous scholarship, this construction habit is introduced as the application of non-loadbearing pre-cast gypsum molds. Based on the available physical evidence,

however, vaulting without centering is not merely implemented by this pre-cast element; it rather encompasses a various set of construction techniques that have been practiced in the course of time. Accordingly, this paper addresses one of the intelligent strategies for the without-centering construction of brick vaults in Iranian traditional architecture: The transformation of a temporary centering to a permanent structural member. To this aim, the required information will be gathered by referring to archival materials and surveying available monuments. Then through cross-referencing these findings and by using the reverse engineering method, the form and construction procedure of the cases will be recaptured and represented. Finally, the interpretation of vault fragments and details will clarify the impact of this strategy on Iranian traditional architecture's construction culture.



Construction Technique of the Dome of Nizām al-Mulk in the Friday Mosque of Isfahan

Soheil Nazari

Department of Construction History, Brandenburgische Technische Universität, Germany

The Friday Mosque of Isfahan is one of the Iran's most prominent monuments and one of the great masterpieces in the history of architecture, in particular of the construction of complex vaults. The mosque is built around a central courtyard crowned by several vaults and two dome chambers in the main axis of the complex. The southern domed chamber, known as the dome of Nizām al-Mulk the powerful Persian vizier (1018-1092), built under the rule of Malikshāh the Seljuq (1072-92) in front of the qibla wall. The building marks a significant point in the history of Iranian architecture. Spanning about 15m and reaching a height of 26.54m at the inner apex, it is the largest masonry dome constructed in the Islamic world until that

time. As well as the addition of an iwan to the northern edge of the chamber, facing to the central yard, the concept of a dome and iwan would serve as a model for many mosque architecture during the Seljuqs until the end of the 12th century AD. While previous investigations of the building were primarily archaeological, this study focusses on the structure and construction of the dome. This includes the masonry arches of the hall, the transitional zone, and in particular the dome itself that shows a unique combination of ribs and shells. The investigations are carried out on the basis of a new survey. The geometric analyses enabled us to reconstruct the structure of the dome.





Experimental assessment of existing ideas on brick vaults by slices building process

Enrique Rabasa-Díaz¹, Ana López-Mozo¹, Miguel Á. Alonso-Rodríguez¹, Rafael Marín-Sánchez², Alberto Sanjurjo-Álvarez³

¹Universidad Politécnica de Madrid

²Universitat Politècnica de València

³Universidad San Pablo-CEU

This paper deals with brick vaults by slices, that is, those built with no formwork, where the brick is vertical or inclined, held by the mortar adherence, and the courses form thin arches, which will finally show only their headers or stretchers on the intrados. Those vaults have been built in many different cultures and periods, in particular in Byzantium, in large areas in the Iberian Peninsula, especially in the Extremadura region and, more recently, in Mexico. The paper focuses on the material aspects of brick-and-mortar placement, the form of the slices, and the sequence of operations in the construction process. Original written sources will be critically analyzed, taking

into account actual construction practice carried out by Mexican and Extremaduran bricklayers and physical models specifically prepared for this paper. This study reviews ideas of Spanish authors from the nineteenth century and statements of twenty-first century bricklayers, about the way in which the bricks should be placed, the mix ratio and use of mortar, the shape of the courses and the procedures that control the shape of the vault. Both historical sources and statements from practicing bricklayers, together with actual experimentation of the operating procedures, as well as the use of models, reinforce or deny traditional ideas.



Brick vaults without centering in the church of Calatrava la Nueva: geometry and construction

Ignacio Gil-Crespo¹, Pau Natividad-Vivó², José Calvo-López²

¹Fundación Cárdenas, Madrid, Spain

²Department of Architecture and Building Technology, Universidad Politécnica de Cartagena, Cartagena, Spain

Brick vaults can be laid out in three different ways: with brick bed planes passing through the axis of the vault, with the beds parallel to the axis, or with beds approximately orthogonal to the axis. The third kind, known as vaults by slices, avoids the need of falsework and fast-setting mortars, in particular when courses are laid in moderately sloping planes. The church of the castle-convent of Calatrava la Nueva, in Central Spain, built in 1220–1240, holds a remarkable ensemble of brick vaults by slices, including severies in rectangular rib vaults, sail vaults, quarter-of-sphere vaults and a semi-polygonal vault.

The ensemble has been surveyed using 3D laser scanning and Structure from Motion photogrammetry. While the general layout and the execution of the stone arches and ribs are acceptably precise, the geometry of the severies and vaults by slices does not follow a precise geometrical model, suggesting that neither formwork nor specific formal control instruments were used. This may be justified by the need to build the castle and the church quickly, to secure an important stronghold in the Córdoba-Toledo route in the aftermath of the decisive victory of the armies of Castile, Aragon and Navarre in the battle of Las Navas de Tolosa in 1212.





The vaults of St. Nicholas in the Lesser Town of Prague (1703–1711, 1737–1760s): the Dientzenhofers' magnum opus

Rebecca Erika Schmitt

DFG Research Training Group 1913, Brandenburg University of Technology
Cottbus-Senftenberg, Germany

Chair of Construction History, Brandenburg University of Technology Cottbus-Senftenberg, Germany

The former Jesuit Church of St. Nicholas in the Lesser Town of Prague (Sv. Mikuláš na pražské Malé Straně), is considered the masterpiece of the two Prague-based members of the Dientzenhofer family of master builders, Christoph (1655–1722) and Kilian Ignaz (1689–1751), father and son. Christoph's new vault concept of double-curved pairs of arches, although being the starting point for a new stream within Baroque architecture, was realized but not completely finished. Decades later, his son completed the building to his own unique design, drastically remodeling the existing vaults.

This study seeks to determine what this change in architectural expression means at the level of vault geometry and construction. Using a laser scan of

the building as the primary source, the complex vault geometry based on circle segments was analyzed with the help of Reverse Geometric Engineering, and the construction techniques, centering and alterations to the building's fabric were described and interpreted by means of precise extrados plans. This made it possible to reconstruct the original vault design, providing a significant contribution to long-debated questions of architectural history. Furthermore, the different approaches to vault design and construction taken by Christoph and Kilian Ignaz Dientzenhofer respectively, were clarified, showing how Kilian Ignaz utilized simpler geometry and centering but achieved more advanced structural details than his father.



Tegula cumularia. Life Cycles of Brick and Tile in Pompeii

Julian Bauch¹, Pia Kastenmeier²

¹German Archaeological Institute, Berlin, Germany

²Fraunhofer Institut für Bauphysik IBP, Holzkirchen, Germany

The use of building components made of fired clay is one of the main features of ancient architecture on the Italian peninsula. Surprisingly, the role of this material within the building industry of Pompeii is still unclear in many respects. An ongoing project on the architectural terracottas currently stored in the depository San Paolino of the Parco Archeologico di Pompei is attempting to reconstruct the life cycles of this important group of building elements. The article presents some preliminary results concerning the production, use and reuse of these

components. It is shown that overall terracotta production in Pompeii was primarily demand-driven and did not reach the industrial scale that can be reconstructed for Rome and the Tiber Valley. Furthermore, it can be shown that the production of architectural terracottas in Pompeii was subject to economic dynamics that led to a variety of strategies in the local building industry. The reuse and redecoration of terracottas appears to be a key feature of Pompeian construction and is directly related to the overall context of building within the city.





Building service solutions in the first half of the 13th century CE. - Variations of the same tasks in the two towers of the Margraves of Baden in Besigheim

Jonas Lengenfeld M.A.

Chair of Construction History, BTU Brandenburgische Technische Universität Cottbus - Senftenberg, Cottbus, Germany

The relative chronology and ideas behind development in medieval building services are often difficult to prove. Especially concerning the High Middle Ages, the acquisition of knowledge is hindered not only by the large amount of unpublished unknown or destroyed objects, but also by the lack of written sources.

With the two towers of Besigheim in southern Germany, well-preserved examples of stately architecture extant to this day. A detailed Building Archeological survey of them can offer us a regionally and temporally fixed insights into building services, their variations and the ideas which underpinned them.



The spiral staircase attached to the so-called Gothic Wall of the Cathedral of Jaen (Andalusia, Spain) and its relationship with Mediterranean cases

Alberto Sanjurjo Álvarez, Rocío Carvajal Alcaide

Universidad San Pablo-CEU, CEU Universities, Madrid, Spain

On the eastern façade of the cathedral of Jaen, attached to the so-called Gothic wall, there is an open-well stone spiral staircase, probably built in the early years of the 16th century. In the northern area of the tower, we also find another spiral staircase, built in the first third of the 18th century, with very similar characteristics. The originality of both staircases lies in their intrados surface that presents some helicoidal grooves. There are very few built examples of this type of spiral staircase and those known so far have been linked to Mediterranean Gothic architecture.

In this work we have analyzed from a geometric and constructive point of

view the Gothic staircase of Jaen, as well as similar examples, especially the one located in the Lonja de la Seda of Valencia. This study of stereotomic analysis has allowed us to deepen our knowledge of the construction process of the cathedral of Jaen, establishing two clear stages in the construction of the Gothic wall and the spiral staircase. We have confirmed the direct relationship between the Valencian example and that of Jaen, confirming the theories of a transfer of knowledge between the Mediterranean area and Andalusia in the last years of the 15th century and the beginning of the 16th century.



Building the international baroque: stone in a brick city, and the pronaos at Superga

Edoardo Piccoli, Cesare Tocci, Elisabetta Culla

Politecnico di Torino

The slender pronaos of the Basilica di Superga (1717–1733) evokes the post-and-lintel systems of ancient Roman temples. However, the in situ study of its construction and the related archival sources shed light on the challenges of building in stone in a site, and city, where stone was scarce, expensive, and not easily adaptable to the “grand manner” sought by the designer, Filippo Juvarra.

At Superga, eight Corinthian columns support an entablature made of an architrave, frieze, cornice, and tympanum. Regular and even conventional in its form, the structure is far from ideal in its construction. While columns and capitals were made of stone drums, the entablature is a complex assemblage combining stone blocks, stone slabs and brick masonry. The pronaos projects 12 m outwards and its ceiling was composed of a half-brick

masonry cloister vault, hooped by iron tie bars. The challenge was complicated by the stone’s flaws: not available in large blocks, hardly extracted.

The paper ultimately deals with the issue of knowledge transfer about structural stone construction in the early 18th century. Superga acts as a comparative case study to Juvarra’s previous experiences, sources and similar European buildings.

The paper will present the first analysis of the pronaos construction, as it is based on direct access to the structure. While construction in Juvarra’s time has been briefly analyzed by some authors (Dardanella 1999, Gritella 1986), studies on Superga’s construction are solely dedicated to the double-shell masonry dome (Gritella 1991) and its wooden centering (Holzer 2021).



Construction Materials, Building Costs, and the Emergence of Building Estimates in 18th Century Germany – Building and the ‘cameralistic economy of resources’

Torsten Meyer

Montanhistorisches Dokumentationszentrum Deutsches Bergbau-Museum Bochum, Leibniz Research Museum for Geo-resources, Bochum, Germany

A new understanding of economy emerged in the German states since the mid-eighteenth century. Until then, the economic discourse had only focused on increasing the wealth of the rulers. Now the focus shifted to the ‘citizens’ and their needs. With this new orientation, two topics were prioritised: As the early modern economy was characterised by scarcity, the question of how to use resources in the best and efficient way gained significance. Secondly, efforts were intensified to find substitutes for scarce raw material. In particular, the comprehensive exploration of the ‘three kingdoms of nature’ (animals, vegetables, minerals) became the status of an economic guiding programme. In this context, the new genre of building estimates emerged in the 1740s. The genre

combined aspects of precise resource calculation, which incorporated quantitative needs as well as monetary evaluation. Calculability and monetarisation of resources have become increasingly integral. The paper sketches this development while integrating the new genre in the economic discourse of the eighteenth century. In the contemporary concept of a ‘cameralistic economy of resources’ the genre of the building estimates played a key role that had previously been overlooked: In contrast to other cameralistic genres, building estimates were characterised by their monetary calculability. By placing the genre of building estimates in the context of eighteenth-century cameralistics, the paper is also a methodological plea for a construction history that is well informed by cultural and social history.



When Patronage Undermines Construction. Negotiating the Uniate Architecture in Eighteenth-Century Poland-Lithuania

Melchior Jakubowski

Institute of History, Polish Academy of Sciences, Warsaw, Poland

This paper demonstrates that patronage could be not only beneficial, but also detrimental for a building project. It considers constructions undertaken in the Uniate (Greek Catholic) churches in the Polish-Lithuanian Commonwealth in the second half of the eighteenth century. The positive impact of patronage is well known; therefore, the paper focuses on the opposite cases, when it slowed down construction or even put it to a halt. First, the analysis addresses three monasteries founded by Franciszek Salezy Potocki and built (to a certain extent, though) under the patronage of his son, Stanisław Szczęsny Potocki. In Krystynopol and Strusów, the changed political situation (partition of Poland-Lithuania) and lesser interest of the patron resulted in incompleteness of the projects, while in Humań, the Basilians

had to adjust to Potocki's wishes. The noble patrons disallowed building new monastic complexes in Zamość and Szczepłoty, or postponed it for decades, like in Kazimirów. Eventually, the last paragraph addresses the problem of state patronage in the case of Uniate cathedrals in Chełm and Przemyśl. In both places, the same bishop - Maksymilian Ryłto - was responsible for building a new church. However, the cathedral in Chełm was successfully completed, while in Przemyśl the old edifice was pulled down and the new one not erected because of the involvement of the Austrian emperor Joseph II. To conclude, Uniate architecture serves here as an example of interplay of various actors on construction sites that resulted in creating (or not) the final shape of a building.





Administration in the mid 17th century court of Savoy

Valentina Burgassi

Department of Architecture and Design DAD, Politecnico di Torino,
Torino, Italy

This research aims to delve into the construction techniques employed at the Savoy Court, bridging the gap between theoretical concepts and practical applications. It seeks to directly examine how the instructions provided by architects and engineers align with the existing structures, many of which endure despite the transformations brought about by time.

Drawing from an extensive analysis of documents spanning the 17th and 18th centuries, the study uncovers the meticulous bureaucratic and managerial procedures adopted at the Savoy construction sites. These procedures, illuminated by the systematic analysis, unveil a well-organized technical framework employed

in executing projects, whether commissioned privately or for public purposes. The significant role played by the Council of Artillery, Buildings, and Fortifications in Piedmont is evident in overseeing fund allocation and the detailed recording of transactions, now preserved in the State Archive of Turin.

This study encourages for the continuation of research into the complex organizational structures governing Savoy construction processes. It also emphasizes the necessity for parallel investigations into similar cases across Italy and Europe, offering a comprehensive understanding of historical construction practices.





What competences were required of Paris building experts in the early modern era?

Robert Carvais

CNRS, Centre de théorie et analyse du droit,
Université Paris Nanterre, France

People chose to become surveyors by acquiring a dedicated office for various reasons. Did that mean that they had some additional ability compared to their colleagues, fellow contractors, building craftsmen or even architects or engineers?

The functions of the expert were rather vaguely defined and, above all, did not provide for any specific competence apart from the candidate obtaining letters of provision from the King, paying the price of the office and taxes, and being

approved by the company of experts, and being attested as an honest man.

Three types of criteria were applied for access to the function of expert: financial capacity, social morality and scholarly and practical competence. We first examine these institutional determinants for an expert and then - after describing their limitations - test other empirical hypotheses that are enlightening in a number of ways: original profession, experience (or seniority in the position) and the final choice in the event of conflicting opinions.



Building Art: the decorative terracotta of Palazzo Fodri in Cremona (IT)

Angelo Giuseppe Landi, Martina Adami

Dipartimento di Architettura e Studi Urbani, Politecnico di Milano, Milan, Italy

Revalued during the 19th and 20th centuries, Palazzo Fodri is still today the best-known example of a Renaissance private palace in Cremona. Its critical acclaim derives from the use of decorative terracotta tiles, studied principally by art historians as a well-known construction practice which translates into artistic works mainly in the second half of the 15th century. However, despite a fervent season of studies over the last decades, previous researches do not return the useful and necessary information to design a conservation project and to delve into the ceramic history of construction: in fact, these studies concentrated on figurative analyses, on the identification of artists and workers involved in the construction sites and their relationships, on the mixture's characterization, without being able to propose

hypotheses regarding the production process of decorative terracotta.

The conservation project of the external façades of Palazzo Fodri and the possibility of dealing with its ceramic artefacts on the construction site constituted the stimulus and the opportunity to develop a knowledge project open to unedited research perspectives, thanks to a campaign of studies on terracotta from a technical-scientific point of view and through a multi-scale and multidisciplinary approach, especially paying attention to production and assembly techniques. Investigating a specific example such as Palazzo Fodri has allowed to partially fill a gap in the history of ceramic technology in the Modern Age and to analyse a specific case study with updated tools and methods, thanks to which it was possible to orient the intervention project.



Contribution to the history of roofing slate in Southern Brabant: a methodological approach from the Brussels case study (Belgium)

Paulo Charruadas¹, Eric Goemaere², Philippe Sosnowska³

¹Research Center in Archaeology and Heritage, Université libre de Bruxelles, Belgium

²Geological Survey of Belgium, Royal Institut of Natural Sciences, Belgium

³Unité de recherche interfacultaire mixte Art, Archéologie et Patrimoine (AAP), University of Liège, Belgium

The text highlights the importance of roof coverings in architecture. It points out significant gaps in historical and technical knowledge of the materials used in roof construction, particularly in north-western Europe, where comprehensive studies are scarce. While roof tiles have received research attention in Belgium, slate has been understudied and confined to specific locations or time periods. In the context of Brussels, initial assessments have been made regarding roofing materials like slate, thatch, and roof tiles during the late Middle Ages (thirteenth–sixteenth centuries), paving the

way for future investigations. However, a consolidated summary of roofing materials in Brussels is still missing. The text aims to mark a milestone in research on slate use in Southern Brabant and in Brussels. It employs an interdisciplinary approach, merging archaeology, archaeometry, and information collected in the historical archives. Research objectives include establishing a chronology of slate use, examining the organization of the slate roofing trade and guilds, exploring material and economic aspects, and addressing the reuse of slate in other structural work.

The Introduction and Manufacture of Cast Iron Water Supply Pipes, 1600-1850

Lei Song, James W. P. Campbell

Department of Architecture, University of Cambridge,
Cambridge, United Kingdom

The transition from traditional materials to cast iron for water supply pipes between the 15th and 19th centuries is a crucial part of the history of water distribution. This paper offers the first comprehensive account of this transition, drawing on a wide range of sources, including historical archives, patents, archaeological findings, and secondary materials. The historical evolution of cast-iron water pipes is explored, with a particular focus on the period from the 15th century when isolated examples of cast iron pipes were first documented, to the 17th century when a significant cast-iron piping system was installed at Versailles. The 18th century in Britain witnessed innovation and development in the use of cast

iron pipes, replacing traditional materials like wood and lead. Key inventions, including patents related to cast iron pipes, are discussed. The 19th century saw the expansion of cast iron pipes in the United States, with Philadelphia among the earliest adopters. Cast iron pipes revolutionized water distribution due to their strength, durability, and efficient water flow characteristics. This paper provides a comprehensive historical overview of the introduction and manufacture of cast iron water supply pipes from the 15th century to the 19th century, shedding light on a critical technological transformation in water infrastructure that continues to impact water distribution systems today.



The construction of gaiola pombalina in pictures: Historical photographs and the timber seismic reinforcement system in Lisbon, 1870-1910

João Mascarenhas-Mateus, Caio Rodrigues de Castro

CIAUD – Lisbon School of Architecture, University of Lisbon, Lisbon, Portugal

The paper presents the results of the analysis of a series of historical photographs, some almost 150 years old and which, for the first time, are identified and interpreted as showing buildings at various stages of construction using the gaiola pombalina (Pombaline cage) system. Until now, none of these photographs had been identified as representative of this type of construction. In fact, they are often general views of the city or images intended to record the growth and urban transformation of certain streets or neighbourhoods. After analysing coeval sources and recent studies to identify and distil the main rules of the “grammar” of timber-frame construction, each image is analysed to ascertain whether they observe these rules of composition and execution in the various framing

elements of such structures, as well as the order of execution of the masonry. Graphical restitutions of the information yielded by the historical photos allow a deeper and more rigorous analysis. The study proves that the gaiola system continued to be used in the second half of the nineteenth century during Lisbon’s growth and until the 1910s to execute the urban plan drawn up in 1879. As far as the construction process itself is concerned, the study of these historical images confirms most of the geometric models and execution rules mentioned in the technical literature published during the period of the buildings’ construction. The photographs also allowed us to identify construction practices not mentioned in the technical literature.



Anonymous stucco workers behind great architects: stucco decorations as choral creations in the late Baroque Naples (17th-18th centuries)

Damiana Treccozi

Scuola Superiore Meridionale, Archeologia e culture del Mediterraneo Antico

Until the 1980s, historiography has concentrated on the study of great architects, considered the only responsible for the whole building process. Not much attention was dedicated to those artisans who accompanied them throughout their works. Such a historical approach may be widely observed in many European contexts, and it is certainly applicable to 18th century Naples as well. This historical period is particularly significant in Neapolitan architecture, as it represents one of the most iconic examples of local inventiveness. Domenico Antonio Vaccaro (1678-1745), Arcangelo Guglielmelli (1648-1723), and Ferdinando Sanfelice (1675-1748) managed to coordinate artisans to reach a really fine balance between the three main arts thus succeeding in accomplishing a perfect synthesis between architectural spatiality and decorative apparatuses. In such a

process, a great role was played by decorative mortars and by those craftsmen molding them. Some stucco workers became quite renowned. Lorenzo Vaccaro, Giuseppe Troise, Pietro Scarola, and Pietro Buonocore, for instance, emerged from anonymity becoming very popular. Moreover, relationships between craftsmen and architects were never exclusive. This implicated an exchange of technical and artistic knowledge among artisans who were involved in different architects' building sites and perhaps contributed to creating a recognizable stylistic language spread also beyond the city of Naples.

The paper aims to reconstruct the role played by stucco workers in the traditional building process in 18th century Naples, also questioning the actual authorship of artworks.



Design and construction of provisional works for the maintenance of extra-ordinary buildings in the eighteenth century: the wooden scaffolding for the main nave of St. Peter's Basilica in the Vatican.

Nicoletta Marconi, Ilaria Giannetti

Department of Civil Engineering and Computer Engineering,
University of Rome Tor Vergata, Rome, Italy

Restoration works conducted in St. Peter's Basilica since the late seventeenth century provide evidence of the technological evolution of scaffolding systems in pre-industrial times. As recent studies have shown, the Vatican scaffoldings were considered a benchmark. Their prolonged fortune is evidenced by their citation in Northern European carpentry manuals until the early twentieth century. This paper provides an insight on geometric, structural, and functional details of maintenance scaffolding in the 18th century through the

combined use of historical analysis and, both physical and digital modelling. The scaffolding designed in 1773 by Pietro Albertini for the restoration of the main nave of St. Peter's Basilica in the Vatican is presented as a case study. The combination of historical studies and both digital and physical modelling allowed to acquire novel elements, and to correct some previously assumed hypotheses on the scaffolding, thus improving the understanding of pre-industrial building maintenance technology.



Narratives and Silences in the History of the Industrialization of Construction

Gregory Dreicer

Independent historian, Berkeley, CA, USA

Can we approach the history of construction as a “narrative of human civilization?” (Lorenz 2005, 40). This article, framed loosely as a narrative, recounts my attempt to do so. I confront the stories that have shaped our understandings of technology through an investigation of the lattice, an internationally known “American bridge” that crystallized the industrialization of building during the nineteenth century. It enabled the construction of long, level structures out of small, uniform parts, on a mass scale, and fast. It announced the reinvention of the beam. This solution to builders’ longstanding challenges provided an open-source code for exchange, collaboration, research, publication, and modification (Dreicer 2025).

Silence surrounds the lattice’s chief value: how it was built. Inventor Ithiel Town

never publicly revealed how because he was protecting a process that could not be patented. An even deeper silence surrounds the design of the process. Considering the impact of the lattice as a prototypical industrialized structure, we might consider this one of the most consequential mysteries in the history of industrial capitalism. But the grand narratives that frame history have produced silences in our knowledge of how engineers, construction workers, and innovators transformed building. Under Town’s supervision, enslaved Black people took part in what we today would call the innovation team. With their participation in the building of the earliest lattice bridges, Town worked out structural, constructional, and managerial methodologies



Construction History, Above and Beyond. Setting up a Dialogue with other Historical Disciplines

**Laurence Heindryckx^{1,2}, Michiel Dehaene³, Dave De ruyscher^{4,5},
Rika Devos¹, Johan Lagae³, Ine Wouters², Tom Broes^{3,2},
Simon De Nys-Ketels^{1,4}, Robby Fivez^{2,3}, Igor Bloch^{3,2},
Louis Debersaques^{4,2}, Robrecht Verstraete^{1,3}, Stephanie Van de Voorde²**

¹Department BATir, Université libre de Bruxelles, Brussels, Belgium

²Department of Architectural Engineering,
Vrije Universiteit Brussel, Brussels, Belgium

³Department of Architecture and Urban Planning,
Ghent University, Ghent, Belgium

⁴Department Metajuridica, Vrije Universiteit Brussel, Brussels, Belgium

⁵Department of Public Law and Governance, Tilburg University,
Tilburg, the Netherlands

Numerous scholars have underscored the inherent interdisciplinary character of Construction History over the past two decades. However, interdisciplinary exchanges with other historical disciplines are rare and not always explicit. In the ongoing research project (2022-2026), entitled 'Construction History, Above and Beyond. What History Can do For Construction History', 13 scholars aim to set up a true dialogue between construction history and other fields of history, in order to bring out the full richness and relevance of Construction History as an 'inter'disciplinary link between various fields of history, with mutual added

value. The project is strategically built around the dialogue between Construction History and Colonial History, Legal History and Planning History. The systematic and methodical cross-overs in terms of methods, theories and concepts from these fields allows to address important knowledge gaps, for instance by expanding the range of actors, sources and types of knowledge. In this paper, we will discuss the overall set-up, objectives and methodology of the research project, as well as the first insights into the challenges and added value of such interdisciplinary collaborations



A History of Highs and Lows. The College of Civil Engineering in Cottbus, GDR, in the 1950s and 1960s

Elke Richter

Professorship of Building History and Architectural Conservation, Hochschule Anhalt, Dessau, Germany/ Building History, Brandenburg University of Technology Cottbus-Senftenberg, Cottbus Germany

After the Second World war, not only the German cities and buildings but also the educational infrastructure was destroyed, be it physically or in a figurative sense. That coincided with high demand for specialists, especially in the building sector, to realize the reconstruction of the country. In East Germany/German Democratic Republic (GDR), the brain drain to West Germany amplified the problem. To build up study capacities for Civil Engineering, the existing faculty at the Technical University Dresden was reorganized in the late 1940s. In 1953, preexisting schools in Leipzig and Weimar were enlarged to also train civil engineers, and one college was newly founded in Cottbus (HfB Cottbus). In this centrally-planned reformation of the educational infrastructure, the case of Cottbus occupies a special place and forms the case

study of this contribution. As it had no predecessor institution, it needed – as an institution and as a campus – to be built up almost from scratch. Three designs show how the architectural and spatial requirements for a modern university were adapted over time, where the aim was to form a new socialist academic elite (“Socialist Intelligentsia”) that should be not only professionally but also ideologically sound. The case of Cottbus, rather than telling a success story, shows the disruptive character of central-state planning in the education sector, even if it concerned the building sector as one of the key industries. A predicted oversupply of graduates led to the closure of the HfB Cottbus after barely 10 years, and students and staff were immediately redistributed to the other universities.



Learning ‘through’ History: Remaking the Sydney Opera House 50 Years Later

Paolo Stracchi¹, Luciano Cardellicchio², Paolo Tombesi³

¹School of Architecture, Design and Planning, University of Sydney, Australia

²School of Built Environment, University of New South Wales, Sydney, Australia

³École Polytechnique Fédérale de Lausanne, Switzerland

The construction of the Sydney Opera House (SOH) remains one of the most celebrated endeavours in contemporary building culture. Recently, the authors of this paper initiated a comprehensive reconstruction of the remarkable construction efforts undertaken by the Australian contractor, Hornibrook Ltd., in the design and fabrication of the SOH’s iconic sails. The research team amassed a collection of historical construction documents generated by the contractor. These documents include shop drawings, site meeting minutes and technical reports, all of which elucidate the cutting edge methods, technologies and processes employed in the assembly of the building’s roof. Beyond enriching the existing historical narrative of the SOH, this archival material acted as a catalyst for the formation of an innovative Architecture Design Studio focused on Design for Construction (DfC), an all-inclusive approach that seamlessly

integrates design, part production and on-site assembly. In 2022, the Master of Architecture program at the University of Sydney integrated this approach into its course. Students delved into the construction history of the SOH by scrutinizing these archival documents. These enabled them to evaluate the original assembly methods and suggest improvements through the application of contemporary technologies. Areas of inquiry encompassed robotic formwork fabrication, on-site robotic assistance, design considerations for maintenance, and training for on-site labor. This paper illuminates the educational journey and its resultant insights, advocating for the incorporation of construction history into architectural education. It underscores the pedagogical value of historical documents in enhancing the comprehension of present-day challenges that arise between a building’s conceptual design and its construction.



Building Parliament: the masons of the Palace of Westminster c.1839–c.1860

Alexandrina Buchanan

School of Histories, Languages and Cultures, University of Liverpool, Liverpool, United Kingdom

This paper discusses the potential for researching the hitherto anonymous workforce of nineteenth-century British construction associated with specific sites, taking as a case study the Palace of Westminster reconstructed after a fire in 1834. The project aims to build on previous prosopographical studies of nineteenth-century British construction workers, combining biographical and prosopographical methods

to uncover, reconstruct or imagine the lives of the subjects of those records. It discusses the available sources, including their strengths and weaknesses; the workflow for the research, and the challenges associated with the methodology. Analysis of the data offers insights into workforce mobility, health and politics and suggests the value of such methods both for construction history and for interdisciplinary research.



How prosopography serves construction history-working with the lives of civil engineers

Mike Chrimes

Vice Chair, Panel For Historical Engineering Works,
Institution of Civil Engineers, London, UK

The compilation of a three volume Biographical Dictionary of Civil Engineers of Great Britain and Ireland over more than 20 years enabled the collection of a large amount of data about the lives and works of several thousand civil engineers, active 1500-1920, for the first

time. This work has revealed the value of prosopography in enabling the comparison between individuals within the civil engineering profession, and beyond, and identifying where more work needs to be done to provide a full picture of the life of civil engineers in the period.



Military engineers as thought collective - Understanding governmental building projects in the Habsburg monarchy around 1850

Frank Rochow

Chair of Architectural Conservation, Brandenburg University of Technology
Cottbus-Senftenberg, Germany

This paper focusses on the elaboration of fortification building plans in the Habsburg Monarchy after 1848/49 and the involved military engineers to detect conditions and processes of state administrations for the translation of abstract societal ideas into concrete built manifestations. Deriving from the analysis of individual biographies, it is shown that these engineers formed a thought collective (Ludwik Fleck) with the respective style of thinking. The features of this particular style and the existence of a collective are identified in a phenomenological manner at first. Afterwards, the close scrutiny of

individual biographies reveals the fruitfulness of the prosopographical approach for determining the characteristics of a thought collective and the mechanisms of its re-production. Furthermore, the question will be followed how changing the style of thinking was possible within the framework of the thought collective of the Habsburg military engineers. On a methodological level, Fleck's concepts are tested detached from their original formulation and their usefulness for illuminating our understanding of modern planning history of state-led building projects is exemplified.



Mind make the shape.

The shell construction in the middle of the 20th century - approach via prosopography

Elke Genzel

Department Engineering and Computer Sciences,
Hochschule für Technik und Wirtschaft (HTW), Berlin, Germany

Shell construction in their heyday in the mid-twentieth century has already been studied in many ways by construction history researchers. It would be interesting to continue with an investigation that understands the shell builders as a collective community. A method of investigation known from sociology—prosopography—should be applied here. What other insights could be gained from the same object of investigation using the methods of prosopography? Since the focus is not only on the supporting structures themselves and the famous actors, but all data on the group of shell builders is collected and structured, it is hoped

that the developments in shell construction can be recorded more profoundly and precisely. The focus is on the engineers who belonged or still belong to the IASS (International Association for Shell and Spatial Structures) —several hundred members to date. The IASS was founded in 1959 by Eduardo Torroja in Madrid. The aim is to find out which engineers took up Torroja's ideas, how these ideas were applied and how they have changed. How did the shell builders inspire each other and, above all, by which character traits of the actors was shell construction most influenced?



Construction history of nailed board trusses in correlation with German engineering biographies in the middle of the 20th century

Iris Engelmann

Bauhaus-Universität Weimar

The biographies of around half a dozen timber construction engineers, who were primarily involved with nail-board trusses between 1930 and 1960, are the focus of the study. The different life paths of the men, who had previously worked as editors, architects or engineers, intersected before 1945 in Niesky at the company Christoph & Unmack and at FOKORAD – the leading state construction office for prefabricated wooden barracks at the time. After the war, the subsequent stages of their life reflect the historical developments in the construction of board trusses in post-war Germany: On the one hand, the centrally organized further development of standardized roof trusses in East Germany was established in Leipzig at VVB

Holzbau. A significant proportion of the workforce was taken over from Niesky. On the other hand, in-house developments of serially produced roof trusses emerged in West Germany, although type templates were also published here. This examination of collective biographies across the system change points to a direct link between the serial production of barracks during the Nazi era and the nailed board trusses that were erected on numerous agricultural buildings in East Germany until 1990 and are still in use today. Of particular interest here are the personnel links between the employees of FOKORAD and the VVB Holzbau and successor institutions, which was later based in Leipzig and responsible for project planning during the GDR era.



Defining the Teaching of Construction to Architects. Construction Teachers at Architecture Departments of the Ecole des Beaux-Arts in Paris and the Technische Hochschule in Munich between 1920 and 1968

Gabriel Bernard Guelle

Laboratoire Architecture, Territoire, Environnement (ATE), Ecole Doctorale Homme, Sociétés, Risques, Territoires (ED HSRT), Ecole Nationale Supérieure d'Architecture de Normandie, Université de Rouen Normandie, Rouen, France

Between 1920 and 1968, construction teachers at the Architecture departments of the Ecole des Beaux-Arts in Paris and the Technische Hochschule in Munich contributed to defining their discipline and its methods. Despite studies of their teaching, they have never been considered as a cohort of professionals who participated in academic and professional networks. While existing literature hints at the benefits of a comprehensive approach to construction education and its instructors, research thus far has primarily focused on their individual contributions. Therefore, this study presents a comparative prosopography of these construction teachers to

demonstrate how their profiles reveal the objectives and strategies of their respective institutions in teaching construction, while shaping the definition of construction knowledge for architects. Using data from published works, private sources, and public archives, the study compares the educational, professional, and technical backgrounds of six French and seven German construction teachers and demonstrates how these characteristics influence the discipline and its teaching. The aim of this article is to uncover the interdependence between academic and professional networks and demonstrate how their relations shape architectural education.





Architects as researchers. The first doctor-engineers (Dr.-Ing.) in architecture

Andreas W. Putz

Professorship of Recent Building Heritage Conservation, School of Engineering and Design, Technical University of Munich, Munich, Germany

This article takes a look on the first architects to gain a doctorate at TH Dresden between 1902 and 1921. Making use of a prosopographical approach and network analysis, the social, academic and intellectual relations of this group of doctoral candidates are highlighted. Why were they interested in pursuing a doctoral degree in the first place, and was this purpose to be achieved in their later careers?



Reinforced concrete Catholic churches in Republican China (1912–1949)

Thomas Coomans¹, Yitao Xu, Jianwei Zhang²

¹Department of Engineering Architecture, KU Leuven, Leuven, Belgium

²School of Archaeology and Museology, Peking University, Beijing, PR China.

Did reinforced concrete frame construction technology have an impact on the architecture of Catholic churches in China during the Republican era (1912–49)? This paper does not constitute an investigation into concrete churches in the treaty ports, where Western construction companies and architects were established and new construction techniques readily available, but questions the extent to which reinforced concrete slowly penetrated the country in the 1920s and 1930s. How far did Catholic missions adapt to this contrasting and changing context? What professional contribution could they rely on, both inside and outside their missionary societies? Was the use of reinforced concrete in churches merely a technical issue or did it also have an aesthetic impact? These

questions are new and challenging to answer due to the shortage of surviving concrete churches, the lack of available sources, and the limited research on churches compared with other types of reinforced concrete urban buildings that more explicitly embodied architectural modernity. After an outline of the context of Catholic missions and reinforced concrete in Republican China, three large concrete churches from different time-space contexts—in Jiaxing (Zhejiang), by the French Lazarists; in Qiqihar (Heilongjiang), by the Swiss Missionsgesellschaft Bethlehem; and in Yichang (Hubei), by the Belgian Franciscans—and the journey of a Spanish Jesuit brother-architect specialized in reinforced concrete buildings in Wuhu (Anhui) will be presented and are discussed in the conclusion.



From Timber to Globalization: Exploring the Construction History of Fraser Mills in Coquitlam, British Columbia, Canada

Yiting Pan¹, Jasmine Moore²

¹China-Portugal Joint Laboratory of Cultural Heritage Conservation Science supported by the Belt and Road Initiative, Soochow University, China

²Coquitlam Heritage Society, Coquitlam, Canada

This study investigates the development of Fraser Mills in Coquitlam, British Columbia, one of the largest lumber mills in the world in the early twentieth century. This study not only provides an intersection of the timber supply, mill technology, and labour force on the west coast of Canada but also serves as a case study to explore how offshore Eurasian construction history in a third location like Western Canada interacted with the processes of globalization in the early twentieth

century. This study examines globalization not only in terms of the transfer and application of mill technologies but also from the perspective of European and Asian settlers utilizing indigenous forest resources for regional-global construction endeavors. Additionally, it highlights how the construction of diverse ethnic neighborhoods around sawmills reflected and reinforced historical “power dynamics” in the urban landscape.



Shaping a new building culture in Soviet Union: Soviet engineers in Italy

Christian Toson

Department of Architecture, Iuav University, Venice, Italy

This article explores the process of technological transfer regarding structural engineering and building systems from Europe to the Soviet Union between 1954 and 1963. Travel reports held in Russian archives allow to reconstruct the strategies and the trajectories chosen by Soviet engineers to catch up with their western colleagues and enhance a building revolution in the USSR. The specialists needed to acquire knowledge in the field of concrete technology, and in particular in prestressed and precast

concrete structures, fundamental for the development of industrialized construction in the USSR. Besides this, it was necessary to reform the research and administrative system: new calculation methods, research facilities, design offices and the definition of standard and regulations. An important role was played by Italian engineers, who had numerous exchanges with the Soviets and facilitated their inclusion in the international scientific community, after years of isolation during Stalinism.



Industrial half-timbering in Japan: French technology transfer and Japanization from the late 19th to early 20th century

Akio Sassa¹, Manabu Fujimoto²

¹Ecole Nationale Supérieure d'Architecture de Strasbourg, France

²Institute of Industrial Science, The University of Tokyo, Japan

Various types of timber-framed masonry, developed originally in Europe, found their way to Japan from the 1860s. Among them, industrial half-timber [Type 1b of Fig. 2], modernized half-timber born in the mid-19th century, was introduced first by French engineers to construct the Yokosuka Arsenal (1865) and Tomioka Silk Mill (1872), symbols of industrialization that stimulated a construction boom. Doubled floor beams expressed on the facade of Yokosuka and Tomioka are characteristics that later became popular in France. Curiously, industrial half-timber did not take root in its original form despite its similarity to Japanese traditional framing; instead, its components seem to have diffused gradually and separately. In this paper, we try to clarify how industrial half-timber developed in France and how it was transferred to Japan, where it

underwent Japanization. To identify the factors which slowed its diffusion, we also examine how other types of timber-framed masonry were considered and practiced in Japan. It is likely that the timber frame enclosed by masonry walls [Type 3] was preferred for its resistance to fire and weather, despite its seismic fragility as revealed by the 1906 San Francisco earthquake. Timber-reinforced masonry [Type 2] practiced after the 1883 Ischia earthquake attracted attention but was not considered as efficient; instead, iron-reinforced masonry was implemented without scientific testing. After the fragility of masonry in the 1923 Tokyo earthquake, timber-framed masonry was no longer used in major construction; steel frames and RC frames with RC shear walls and RC floor slabs rapidly became dominant.



The Development and Decay of Traditional Masonry Craftsmen: a Study of the Last Generation of Stone-carving Teams in the North-east of Taiwan

En-Jia Li¹, Nan-Wei Wu²

¹Master of Architecture and Urban Design, National Taipei University of Technology, Taipei, Taiwan

²Department of Architecture, National Taipei University of Technology, Taipei, Taiwan

The rapid industrialized development in Taiwan after the Second World War brought both economic growth and the potential decay of traditional craftsmanship. Nonetheless, the inheritance of a traditional technique not only symbolizes the continuity of human civilization but also illustrates the evolution of regional history.

Although most stone-carving craftsmanship in Taiwan can trace its origins back to nineteenth-century China, regional differences in the vernacular environment and characteristics of stone materials had inevitably developed. This adjustment also resulted from changes in time and the degree of the involvement of mechanical equipment. Nowadays,

along with their materials, these master craftsmen and their invaluable skills are gradually fading into history.

This study comprised a deep field study in the north-east of Taiwan, focusing on a team of masonry craftsmen led by Master Chen. Their specialist traditional techniques, which could be considered as intangible cultural assets by studying the existing stonemasonry class in north-eastern Taiwan, has been traced from the masters' early practices, which started in the 1920s, until the present day. The organization and formation of the team, the transfer of techniques and the use of tools and construction methods are documented as evidence of this unique traditional skill.



Constructing Coldscape in Treaty-Port Shanghai

Zhengfeng Wang

Leiden Institute for Area Studies, Leiden University, the Netherlands

During the 1920s and 1930s, mechanical refrigeration became widespread in various building types in Shanghai, a city that had been open to foreign trade and residence since the mid-nineteenth century. The purification and conditioning of air to control its temperature, humidity, and movement facilitated the cooling and refreshing of the interior atmosphere. Meanwhile, cold storage facilities played a crucial role in preserving perishable food and overcoming seasonal availability constraints. Architects, engineers, contractors, property owners, occupants,

and government authorities all actively participated in shaping the development of this refrigerated landscape. Inspired by Western advancements, the creation of artificial environments through innovative technology and standardized control held the promise of enhancing sanitation and thermal comfort. However, in practice, achieving this goal, guided by building codes and municipal regulations related to public health and fire safety, often required compromises to adapt to local conditions and actual usage.



A visual approach to structural design: photoelasticity as a collaborative tool in Gengo Matsui's work

Federico Bertagna¹, Tazuru Harada¹

¹Chair of Structural Design (Prof. Dr. Jacqueline Pauli),
Dept. of Architecture, ETH Zurich

²Chair of Architectural Behaviorology (Prof. Momoyo Kaijima),
Dept. of Architecture, ETH Zurich

This paper focuses on the role of photoelasticity as a design tool in the work of the Japanese structural engineer Gengo Matsui (1920-1996). The objective is to shed light on the operative dimension of these experiments, investigating their role as part of a holistic design process to which both the architect and the structural engineer actively contribute. The paper reconstructs the role of photoelasticity through a comprehensive literature review including Matsui's original publications as well as direct accounts by his students and collaborators. The paper also discusses the decline of photoelasticity after the introduction

of Finite Elements Analysis (FEA) software in structural engineering practice. Despite the undeniable superiority of contemporary FEA software in terms of modelling processes and retrieval of results, the question on how to establish a common ground between architect and structural engineer persists in contemporary practice. Matsui showed that a visual approach to structural design as offered by the photoelastic experiments is a possible way for the establishment of this common ground, suggesting that photoelasticity can still be a source of inspiration today.



Acceptance and Development of Trocken Montagebau in Japan

Ren Sakuragawa¹, Leo Tanishige¹, Kohji Takeuchi², Tomoyuki Gondo¹

¹Department of Architecture, the University of Tokyo, Japan

²Department of Architecture, Aichi Sangyo University, Japan

Trocken Montagebau (i.e., dry assembly construction) is a concept for industrial housing production mainly developed by Walter Gropius in the 1920s and that was quickly adopted by various Japanese architects. In particular, Ken Ichiura focused on dry construction during World War II and contributed to the development of panelized wooden houses. This paper reviews the acceptance and development of Trocken Montagebau in Japan as part of an effort to grasp the contemporary development of dry construction techniques around the world. The review focuses on dry construction

housing works designed by Japanese architects in the 1930s and the development of panelized wooden houses by the Housing Corporation during World War II. Two key aspects for the acceptance and development of Trocken Montagebau in Japan were identified. First, the industrialized housing production was motivated by the need to supply housing for the common people as a response to wartime shortages. Second, the themes of comfort and flexibility discussed in the 1930s were increasingly lost in favor of practical necessities during wartime.



The architectural and building culture of the Benedictines congregation ,de Unitate' in the Renaissance.

A network of monasteries and building sites

Gianmario Guidarelli

Department of Civil, Environmental and Architectural Engineering,
University of Padova, Italy

The aim of this paper is to discuss the architectural culture of the Cassinese Benedictine congregation in Italy from the fifteenth to the eighteenth century. The renewal of the spiritual life of the monk elaborated by Ludovico Barbo, the founder of the Congregation, required the centralisation of all decisions concerning the building activity of the 111 monasteries, leading to the formation of a unitary architectural culture. The introduction of the cell led to the need to build monasteries with many cloisters and the increase in the number of monks forced the construction of gigantic churches. The resulting considerable increase in construction costs was multiplied by the simultaneous opening of many building sites throughout Italy. Common building regulations standardised and centralised the layout of the monasteries and

the decision-making process, but also the organisation of the building sites. An enormous quantity of unpublished documents allows us to demonstrate that between one building site and another, teams of workers, building materials (such as bricks, made in kilns specially built by the monks, or stone quarried from mines owned by some abbeys, or wood taken from forests cultivated by the monks) and technologies circulated, especially the multiple dome system adopted in churches (Santa Giustina in Padua, San Sisto in Piacenza, etc.). It is possible to study this phenomenon from a comparative perspective and thanks to the experimental use of the Building Information methodology Modeling (BIM) that will allow to manage a large amount of heterogeneous data (archival, bibliographic, material, geometric-spatial).



Planning through Distant Geographies: Uncover a GDR-Cuban Collaboration in the Nuevitas Cement Plant Construction

Juliane Richter

Bauhaus-Universität Weimar; Leibniz Institute for Research on Society and Space, Erkner, Germany

This article examines the collaborative dynamics behind the construction of the cement plant in Nuevitas, Cuba, in the 1960s, representing a facet of „socialist globalization.“ Contrary to the prevailing notion of the German Democratic Republic merely exporting a cement factory to Cuba, the study delves into the intricate collaboration and division of labor between construction firms of both nations. Through an analysis of the plant’s historical foundations, the planning, and construction history, the article illuminates the operational intricacies of such international collaborations, revealing the multifaceted dimensions of a

project transcending „distant geographies.“ This exploration encompasses the identification of planning principles, encountered obstacles, and divergent agenda settings during implementation. Additionally, the study evaluates the plant’s role in regional urban-rural development, considering its impact on local landscapes and social dynamics. Grounded in extensive archival research from Berlin, Saxony-Anhalt, and Havana, the article contributes to a comprehensive understanding of the complex dynamics inherent in global collaborative construction projects.



Legal expertise in professional construction periodicals: the Belgian building sector shaping and shaped by processes of juridification, 1918-1940

Simon De Nys-Ketels, Rika Devos

BATir, Université Libre de Bruxelles, Belgium

From the beginning of the 20th century onward, the construction sector in Belgium and beyond underwent a process of juridification, with a steep increase in building regulations. As legislation became ever more detailed and elaborate, law increasingly pervaded the construction sector in unprecedented ways. Nevertheless, the multitude of actors most directly touched by this growing legislative complexity—from architects and engineers, to contractors and suppliers—rarely received any legal training. Although the dissemination of legal knowledge thus became critical for the building sector, the ways in which such vital expertise circulated has received limited scholarly attention. This paper analyses three professional periodicals published during the interbellum, and the

far-reaching roles the professional press played during these processes of juridification. We argue that through their magazines, the editorial boards went beyond the mere communication of construction law or the simple spreading of information on emerging good practices, novel technical standards, building certification and state legislation. They also coproduced construction law, through active development of legal expertise, lobby work, and strategic manoeuvring within the legal landscape. Lastly, they also sought to claim construction law. With the juridification of the building sector, an expanding legal market emerged which even non-legally trained building actors such as architects and editorial boards strategically banked on by developing professional legal services and support.



The Tacit Turn? Designing the Silent Laboratory

Fiona Smyth

School of Art History and Cultural Policy,
University College Dublin, Dublin, Ireland

On July 9, 1938, physicist Erwin Meyer lodged a patent with the German authorities in Berlin for a „Sound Absorbing Arrangement with High Efficiency“. 13 years later, on May 23, 1951, that patent was granted. The „sound absorbing arrangement“ was a mathematically determined, wedge-shaped element, designed for use as a surface lining in acoustic laboratories. Used in multiples to construct a deeply corrugated surface, it was envisaged to create a silent environment—a standardised backdrop against which to assess the sound-absorbing properties of different materials for domestic construction. In 1942, nine years before the German patent was granted, a similar technology was harnessed in the creation of a tiny concrete chamber, situated at the junction of Kirkland and Oxford Streets in Cambridge, Massachusetts. This latter chamber,

designed by the engineer Leo L. Beranek, was named anechoic (free from echo). It was designed and utilised for military research. By the 1950s, anechoic chambers were ubiquitous, utilised in different ways and for a broad range of purposes in multiple nations. However, little is known of the transfers of knowledge or of the developmental exchanges in the design and construction of anechoic chambers which took place between Europe and the USA immediately surrounding World War II. This paper explores the evolution of construction methods for the silent laboratory, the modes of technology transfer that were evoked and the different applications which emerged as consequences. It examines transfers of knowledge regarding the technology and its uses in terms of the formal, informal, forced, and tacit.



„Model“ Workers' villages? Company rule and adobe-brick houses in late colonial Africa

Beatriz Serrazina

Dinâmia'CET, Iscte-IUL, Lisbon, Portugal

In the early 1920s, a severe influenza epidemic in the Panda mining camps, recently founded by Union Minière in southern Belgian Congo, shed light on the importance of housing material conditions. Due to medical studies and reports, a solution was soon to be found in single-family adobe houses. Bricks arguably offered plenty of “benefits”: they were cheap, made with local raw materials, easily assembled on site and did not require much expertise or heavy machinery. For the following decades, adobe was put forward by mining enterprises as a tool for and a symbol of control, neatness, salubrity, productivity and social hierarchy. When industrialization and urbanization issues became strongly entangled in the 1950s, the materialization of workers' houses was not only a case study for scientists but also a key instrument to counter

international politics and anxieties about African housing. This paper questions the role of the adobe-brick components in shaping the built environment in late colonial Africa. What was their impact on house design, construction sites and building teams? To what extent did they compete with other technologies, namely concrete and stone? The overlooked histories of mining villages' construction illuminate significant trans-imperial circuits of knowledge transfer, running from the first on-site connections to the late international expert meetings. Far from being “workingman's paradises”, as most company official reports suggested, adobe villages materialized multiple combinations of economic, social, moral and power guises, thus offering new perspectives on colonial construction, away from canonized actors, materials and norms.



Système Grévisse. The Lubumbashi post-war housing scheme, between colonial guidelines and reality

Igor Bloch¹, Simon De Nys-Ketels²

¹Faculty of Engineering and Architecture, Ghent University, Ghent, Belgium

²Building, Architecture & Town Planning, Université Libre de Bruxelles, Brussels, Belgium

This paper contrasts the official policy guidelines and ambitions behind the Système Grévisse, a self-build housing scheme in post-war Elisabethville, Belgian Congo, with the city's everyday realities of colonial construction. The Système Grévisse was an unconventional sites-and-services scheme introduced in 1949 in Elisabethville (present-day Lubumbashi, DRC), which offered loans and building materials to self-building unskilled citizens. While it aimed to address the city's ongoing housing crisis and empowered Congolese families to construct their own homes independently, it also served as a tool for control of the colonized population through construction guidelines and financial criteria of the funding organization called the

Fonds d'avance. However, these official state policies often contained vague and perplexing building regulations and contradictory guidelines. It offered African self-builders the unintended leeway to "make do" with local construction techniques and materials that differed from official regulations. Moreover, it provided opportunities for self-builders to rely on a burgeoning number of native contractors known as artisans libres, a professional group that the colonial state sought to restrict due to quality concerns and unregulated labor practices. As such, our paper aims to emphasize the importance of understudied actors such as (African) self-builders and small-scale independent contractors within (colonial) construction history.



The Transformation of Traditional Construction under Ethnic Migration: the Construction Systems of the Bunun Architecture

Liang-Ping Yen

Department of Architecture, Tamkang University, New Taipei City, Taiwan

This paper discusses the construction systems of Bunun architecture in Taiwan. Research into Bunun architecture was initiated by the Japanese scholar Suke-taro Chijiwa, who recorded 21 houses in Nantou, Taitung and Kaohsiun in 1937 and 1938. He divided Bunun architecture into the concave type and the flat type according to the forms of the floor. Studies of Bunun architecture in Hualien, however, have shown that there were actually two different construction systems, a mixed system and a timber system. If we compare the construction systems

of cases in Hualien with other cases in Nantou, Taitung and Kaohsiung and place them in the context of migration history and geographical location, it is not difficult to discover relationships between construction systems and sub-groups within Bunun. Based on this understanding, the current study divides the construction system of Bunun into the Takbanuaz and the Isbubkun systems, and the differences between them became even greater after their migrations. This shows the transformations of construction system during migrations.



Women, colonialism and building sites. Gender experiences in former African territories ruled by the Portuguese through colonial archives

Ana Vaz Milheiro

Dinâmia'CET, Iscte - University Institute of Lisbon, Portugal

Recent studies on the interaction between labor and colonialism have been challenging the claim that „the history of labor in public works construction is generally presented as a male experience“ (Jha 2020). Following the still prevalent narratives, previous research that intersected Portuguese colonialism and unskilled labor also followed a male-oriented direction. Research on the hierarchies established on and by the construction site is still scarce, and the gap is even greater when women are involved. Despite the vast international literature, there are no narratives that

frame women's roles in public works in the former African territories under Portuguese rule (Angola, Mozambique, Cape Verde, Guinea-Bissau and São Tomé and Príncipe). This article aims to explore how women filled these gaps, discussing the extent to which they took on logistical roles, incorporated unskilled tasks (quarrying stones; carrying mud), or influenced program and architectural agendas with an impact on design and construction systems, until they achieved greater empowerment during the colonial war/ liberation (1961-74).



Building and second-hand materials in times of crisis. Questioning a constraining context on the supply of building sites in the late Middle Ages and early modern period

Marion Foucher

Artehis UMR CNRS 6298, University of Burgundy, Dijon, France

Thanks to the renewal of construction history and building archaeology these past decades, it is now well admitted that reuse of construction materials has been a widely spread practice through every times and cultures. By exploring the great variety of actors, technics, meanings and even economical purposes behind this one idea of „reuse“, it has become obvious that specific contexts of each case of salvage and reuse have greatly shaped the architectural projects and economic landscape of the building site. Considering particularly the medieval and early modern periods in France, this paper proposes a survey on a particular context for the builders: the times of crisis. Human or natural catastrophes

have deeply affected the domain of the construction –either beforehand, during or afterwards the events– with a recurring sense of urgency. From tough times to open wars, shortages or price inflation of building materials, budgets' decreases, cuts in provisioning networks, etc. have disrupted routines in construction works thus leading to reuse practices that did not exist before. In the end, the crises have also produced an amount of ruins, fragments, rubble that has to be removed for the life to go on. From cleaning a place to restore confidence, memory and heritage, dealing with the aftermath eventually imply another range of reuse practices.



Looking for Construction Process in Early Modern Paris: demolish to build better

Léonore Dubois-Losserand

EVCAU, Ecole nationale supérieure d'architecture de Val-de-Seine,
Paris, France

In order to reconstruct the act of building as a whole and to put it into a long-term perspective, the Early Modern period is an appropriate time for the historian to draw on a relatively large number of sources. The archives show us several building sites that allow us to piece together the chain of events. The site of the demolition of the Bastille in 1789 provides insight into all the players involved and some of the tools used, complemented by the study of graphic documents showing demolitions in Paris. Townhouses are also the site of recurrent demolition turnovers, leading to the reuse or sale of the materials removed. The ways in which reusable parts were salvaged, or rubbish discarded, highlight a circular economy driven by the desire to

reduce costs and the need to remove the clutter from a city saturated with building sites that sometimes did not comply with urban planning regulations. Some of the bigger sites, such as the church of Saint-Sulpice, confirm this everyday economy of the site and make it possible to identify certain traces of reuse, even if it is not always easy to find them. Of all the sources that can be used to reconstruct the act of building in its entirety, those from the archaeology of building for the Early Modern period are still underrepresented in academic work and should be the subject of more extensive collaborative work in the future, in order to follow the outline of construction history within the broader scope of long-term history.





Spolia Britannica: Aspects of Architectural Salvage in Britain

Michael Heaton

Professional archaeologist and building historian, Warminster, G.B.

The historical re-use of building materials, in some circumstances known as spolia, is an established subject of international academic study, but one in which Britain - as opposed to Britons - hardly features. There, apart from a small number of studies of Roman material in early medieval churches, such use is considered to have been purely economic. However, using case studies from his professional work in southern Britain the author identifies instances of

materials, components and architectural details being used for innovative, aesthetic and cryptic purposes during the seventeenth and eighteenth centuries, particularly by Catholics and other religious Nonconformists. He also suggests that in addition to their architectural function as spolia, the supply and use of such materials also functioned as mediums of wealth exchange, knowledge transfer and social cohesion.



Small but significant. Tracing the emergence and evolution of the demolition profession in Brussels (1860–1970)

Lara Reyniers, Stephanie Van de Voorde, Ine Wouters

dpt. of architectural engineering, Vrije Universiteit Brussel, Brussels, Belgium

This paper examines the significance of the demolition profession in the construction industry, specifically its unique role in the development of salvage practices. Focused on the case of Brussels spanning the years 1860 to 1970, our research explores the emergence of demolition contractors, their professional backgrounds, careers, and pricing strategies. Our findings reveal that the demolition profession developed as a niche sector within the construction industry, emerging in response to the growing demand for demolition services. Despite its modest size, the demolition sector played a central role in enabling salvage practices, driven by a financial reliance on the trade

in second-hand materials. However, this financial dependence rendered the demolition profession more precarious and volatile compared to other construction jobs. A significant transformation took place with the evolution of pricing strategies after the Second World War, diminishing the importance of second-hand materials for demolition contractors' incomes and thereby opening the door for an increase in demolition waste. Consequently, a study of the demolition profession offers insight not only into the motivations behind salvage practices but also into the challenges associated with demolition waste management, especially in the post-war era.



Structural component reuse of precast and cast-in-place reinforced concrete in architecture since the late 1960s in Europe

Célia Küpfer, Corentin Fivet

Architecture Department, Ecole Polytechnique Fédérale de Lausanne (EPFL), Fribourg, Switzerland

The reuse of concrete pieces salvaged from structures undergoing transformation or demolition into new architectural projects has gained a sudden and visible interest over the past five years. However, the practice of reusing concrete pieces in new structures has a little-known several-decade-long history, with documentation referring to precedents as old as the late 1960s. Based on a pre-existing database of built and unbuilt precedents in Europe and new literature search, this research discusses the co-evolution in time and space of the reuse of two types of reinforced concrete:

precast reinforced concrete and cast-in-place reinforced concrete. Results highlight the diversity of precast elements reused since the late 1960s and the emergence of cut cast-in-place concrete reuse since the late 2010s. More importantly, the study highlights the scarcity of the practice and how its nature compares to other material reuse activities. Finally, the study questions how, in the absence of a radical decrease of demolition activities, reusing concrete rather than crushing it may become a more common practice.



Value through the Ages: An evolving landscape of demolition, salvage, and reuse in North America, 1890s–2010s

Juliette Cook¹, Rashmi Sirkar²

¹Architecture, University of Waterloo, Cambridge, Canada

²Architecture, University of Toronto, Toronto, Canada

This paper investigates changes in demolition and salvage practices in North America from the 1890s to the 2010s. While prior research has documented associated transformations within the construction industry, this paper establishes a greater understanding of the interconnected shifts in real estate economics, material supply chain, mechanical invention, labor, and waste management, and how these have had a lasting impact on broader material culture. New York City, Chicago, and Toronto serve as case studies for the evolving conditions across the continent and across the 120 years of

interest, allowing various policies, regulations, codes, and other more informal trends to be cataloged. The authors' field research, including interviews with key actors in contemporary practices of deconstruction and material reuse, provides key insights to past and present perceptions of buildings and their material components. Studying the evolution of deconstruction and reuse in its actor-network context sheds light on ways we can learn from the past in our present efforts to adopt environmentally sound practices for building and unbuilding.



(De)constructing gender? Women laborers and building site photography in western India, 1850–1990

Sarah Melsens

Centre for South Asian and Himalayan Studies, CESAH (CNRS-EHESS), Paris, France and FLAME University, Pune, India

In India women, both historically and today, form a considerable part of the labor force in construction projects. Official records, such as colonial building specifications and twentieth-century industry reports contain normative descriptions of women, mostly associating them with ,unskilled' work. Seeking to leverage the potential of photography to ,spring leaks' to alternative viewpoints, this paper studies photographic evidence from building sites in Western India for the compliance with or challenging of gender norms. The study draws upon four sets of images of railways and road construction work which offer snapshots of the period before and after Independence in 1947. Photographs are contextualized

with contemporary sources, to simultaneously question the position of women on the building site and their representation in the historical record. The findings suggest that gendered task divisions in infrastructure construction—though more dynamic than has often been assumed—have changed little over time. Yet photographic depictions of women vary considerably as visual tropes evolved. The paper reveals how the depiction or absence of women in photographs of construction work is related to gendered labor divisions, building site regimes, the production contexts of the photographs, as well as to evolutions in the medium of photography itself.



„Unfortunately, the toll is high for some of your blacks“: Moments of Crisis in the Belgian Congo’s Construction Industry

Robby Fivez

Department of Architectural Engineering, Vrije Universiteit Brussel, Belgium

Throughout the Belgian occupation of Congo, construction sites were thwarted by all sorts of failures, accidents, and labor strikes. These ‚moments of crisis‘, not only confirm the continuous struggle of empire builders to build, or the difficult translations of technologies, however. They also allow to identify the otherwise anonymous construction workers, who, ironically, often had to pay the price for mistakes made elsewhere. Guided by the theoretical approach of STS scholars, this paper understands the myriad of building

site accidents happening on the construction sites of the Belgian Congo as a prism through which individuals, the relations between them, the tools and machinery at their disposal, or the conditions in which they had to work, become visible. As this conceptualization of ‚moments of crisis‘ is the direct outcome of the cross-over between construction history and colonial history, the paper also carries a meta-argument about the importance of crossing disciplinary boundaries for the field of construction history.



From barrack-hut to Ritz: Housing solutions on the construction site of the Grande Dixence dam, 1950-1965.

Rune Frandsen

Konstruktionserbe und Denkmalpflege, ETH Zürich, Switzerland

This paper examines how the transformation of the landscapes of the Swiss Alps following World War 2 necessarily coexisted with an oft-overlooked architectural tradition of workers accommodation. The controversy around the construction of a 9-storey housing block on the construction site of the Grande Dixence dam (1950-1965), in the canton of Valais serves here as case study. Quickly nicknamed the “Ritz” after its construction during the 1953-1954 winter, in reference to the luxury hotels, the building serves today as poster child to the supposedly exemplary living conditions of the workers there and is presented as a turning point away from the use of barrack-huts which were the staple of such construction sites. Freely drawing from actor-network theory and based on archival research, the paper analyses the lineage, inception, and critical reception of the block,

with a focus on the actors instrumental for its construction. Two things emerge from this analysis. First, it is made clear that the Ritz is to be understood as an exception to the architectural production typical of workers’ housing on large infrastructure construction sites rather than as setting new standards. Second, it shows that the *saisonniers*, the men and women which were necessary for the construction of these infrastructures and hired in precarious and ethically debatable conditions, were instrumentalized by the State of Valais for the construction of the Ritz. However, they eventually did not profit from its construction. In summary, the paper presents a critical and social reading of what is traditionally presented in purely technical terms as the first example of metal-clad steel-frame building in Switzerland.



Crisis or Tradition? Women Construction Laborers in Late Medieval Valencia

Shelley E. Roff

School of Architecture, The University of Texas at San Antonio,
San Antonio, USA

This paper presents an analysis of women who were recorded laboring on the construction project to rebuild Valencia's city walls in the late fourteenth century. The building accounts document gangs of women working in conjunction with similar-sized gangs of men, who supplied and worked with specific materials and tools at determined junctures in the construction of Valencia's fortifications. I will discuss these women's value in the financial and social organization of the project and their import to its timely completion and success. Although historians encountering women laborers in the past

have assumed that they appeared mostly in times of crisis, the growing research on women in construction is starting to build a new impression. This paper proposes that in late medieval Spain, women were an integral part of certain kinds of construction projects, especially fortifications. It is the materials and method of building a fortified wall in certain geographic regions that necessitated the employment of a female labor force, demonstrating yet another little-discussed aspect of women's role in the history of the built environment.



Building with limited resources in times of revolution. Construction processes in Social Housing by Álvaro Siza in the early 1970s

**Clara Pimenta do Vale, Teresa Cunha Ferreira, Tiago Cruz,
Joaquim Teixeira, Rui Fernandes Póvoas**

CEAU/Faculty of Architecture University of Porto, Porto, Portugal

The aftermath of the Carnation Revolution (1974) in Portugal included high demand for affordable housing despite the longstanding context of post-war resource scarcity. This paper addresses the development of the innovative and qualified construction process by the Local Ambulatory Support Service (SAAL) that emphasized popular participation and self-construction. This paper aims to deepen analysis of the participatory housing construction process within a context of resource scarcity, focusing on the actors, the construction systems and building materials. Following previous experiences, Álvaro Siza designed two neighborhoods in Porto for SAAL: S. Vítor [1974-1975] and Bouça [1975-1978]. While the former responded swiftly to the urgent need for housing, with modules designed for self-construction using readily available materials, the latter represented an adaptation of a pre-revolution project optimized for economy

through its rational design and material use.

The research methodology incorporates the cross-analysis of archival and bibliographical research, in situ analysis of the buildings, and the production of 3D drawings of representative construction sections and details.

This paper aims to deepen the analysis of the construction process of participatory housing in the context of scarcity of resources, focusing on the building actors, construction systems and materials. The results demonstrate the innovative and qualified solutions achieved through strategies such as self-construction, simple finishes, prefabrication and high design standards underpinning the control of all details. In a context where interventions with a strong urban character were being debated, Siza recognizes the „difficulty in assuming the boundary between plan and project“ (Siza 2000, 85), reflected in various interventions at different scales.



Exploring the Gulag as built heritage: Construction techniques and architecture of the Chtchoutchi camp in Siberia

Jérôme André

Institut d'Archéologie et des Sciences de l'Antiquité,
University of Lausanne, Lausanne, Switzerland

In the early 1950s, Joseph Stalin ordered the construction of a railway line in the Far North known as the Polar Mainline or Project 501-503. Its purpose was to connect Tchum to Igarka, spanning 1400 km of tundra and crossing the Ural Mountains. The construction of the railway also required the establishment of camps to house the inmates and guards responsible for their custody. Over 200 camps were planned along the railway track. In 2019, a Russo-Swiss expedition set out to study one of these camps in the Yamal Province, the Lagpouknt 93, known as Chtchoutchi.

This article discusses the historic and geographic context of the Chtchoutchi

camp before describing its architectural features. Based on the preserved remains, the construction technique of the buildings is presented in detail. The characteristic use of modular and partially prefabricated elements allowed the mass production of the main components (walls, doors, windows) off-site and accelerated the on-site construction, which was mainly limited to the assemblage of normed pieces. Nevertheless, a close comparison of archaeological remains and archival documents suggests that despite the numerous similarities, every camp was unique.



Construction works, xibalo and the Maxaquene cove embankment in Lourenço Marques, in Portuguese East Africa

Lisandra Franco de Mendonça

Lab2PT – Landscapes, Heritage and Territory Laboratory, EAAD – School of Architecture, Art and Design, University of Minho, Guimarães, Portugal

At the Mozambique Historical Archives, I came across a photographic collection from the construction works of the railway-port infrastructure of Lourenço Marques (now Maputo), dating from 1887 to 1918. A group of images captures the excavations and earthmoving work carried out for the embankment of Maxaquene cove, done using forced labor recruitment (xibalo). The embankment, part of the construction of the new quay wall, began in 1897. The costs, lack of resources and the delay in the superior resolution of certain provisions of the project led to its almost immediate abandonment. The landfill restarted in 1915, with a three-contractor consortium, gaining an area of about 1000 000 square meters from the bay. Hitherto, the field of construction history has paid little attention to the modes of production concerning colonial building culture in

former Portuguese Africa. However, the limited research available on this topic shows that it uncovers relevant aspects of the architectural, economic, and social history of these contexts by allowing us to understand, for example, how and when a racialized categorization of materials and labor force was introduced herein, engendering the capitalization of “difference.” I argue that formulating answers to these questions associated with the impact of new infrastructures and building techniques, or the organization of the local workforce, opens up new lines of inquiry for writing a history of these environments. The analysis of the above collection in the light of public works reports allows us to broaden this understanding. To illustrate this statement, I will discuss documentation concerning mostly the commencement of the Maxaquene Landfill.



On “Borrowing” and “Othering”. Unpacking the practices, networks, and biases underpinning two manuals on building in the tropics around 1940

Johan Lagae¹, Monika Motylińska²

¹Department for Architecture and Urban Planning,
Ghent University, Ghent, Belgium

²Research Area “Contemporary History and Archive”,
Leibniz Institute for Research on Society and Space (IRS), Erkner, Germany

Considering the growing interest in 20th-century building in the tropics, as well as in practices of sustainable building in the “Global South” nowadays, this paper focuses on two interwar publications, Friedrich Vick’s 1938 book *Einfluß des tropischen Klimas auf Gestaltung und Konstruktion der Gebäude* and a 1940 report written by Egide-Jean Devroey, entitled *Habitations coloniales et conditionnement d’air sous les tropiques*. Published at a time when scientific research into thermal comfort and the use of air-conditioning was still in full development, both publications, written by a German and Belgian engineer respectively, address the difficulties met when translating this research from the temperate to the hot-humid climate zones. While both authors drew

extensively on their own experience in the tropics, Devroey’s 1940 report extensively “borrowed” from recent scientific insights on building physics developed in France and the US, as well as from “best practices” in other colonies. Devroey’s explicit reference to Vick’s internationally lesser-known work invites us to consider the interwar circulation of knowledge on building in the tropics beyond conventional metropole-colony connections and across imperial and linguistic boundaries. Yet confronting Devroey and Vick’s work also enables us to unpack how climatic design in the tropics was informed by various normative assumptions of settlement, race, labor, and productivity, which undergirded extractive colonial economies.



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