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Introduction

This thematic issue is the result of the programme “Dynamiques urbaines et construction dans l’Occident médiéval” (Urban Dynamics and Construction in the Medieval West) and its final colloquium, “Pierre et dynamique urbaine” (Stone and Urban Dynamics). The aim of the project was to study construction activity in relation to the different phases of urban development in the cities of the medieval West, in order to examine the relationship between techniques, materials and builders and the transformations in urban morphology in the 13th and 16th centuries. New concepts, such as that of “transformission”, allow us to consider the social production of urban morphology in a different way. Indeed, men and societies produce particular urban systems at any given moment and according to specific contingencies and purposes. Defined by the specific arrangement of its road, plot, and building components, the urban system may – or may not – be taken over by societies that subsequently develop in the same space, through processes of readjustment. And while social practices evolve, spatial structures can continue to serve as a system for new actors who adapt them to their new needs. With these new approaches in mind, but also by drawing on the latest publications on the history of medieval construction, the project’s team has sought to point out the strengths and weaknesses of current research traditions and the most fashionable questionnaires. In their submissions, the contributors have thus highlighted the importance of the relationship between the use of specific construction techniques and the major developments in the life of the city (a general or partial boom, be it economic, demographic, etc.; a general or partial decline; a crisis; a political reconfiguration; etc.). From a methodological point of view, and unsurprisingly, the imperative need to establish an intrinsic link between the history of texts and the archaeology of material culture in order to fully grasp the objects being studied also became apparent at the same time. This critical survey has made it possible to identify the most interesting approaches to the more traditional models of urban history, which are often overly rigid

or disconnected because they only grant secondary importance to the question of materials and construction. The clear ideas and perspectives that have emerged from this dual work underline the importance of modulating the scales of analysis (both chronological and geographical) when dealing with the link between stone and urban dynamics, which is too often treated in broad terms, or quickly summarised using the term “pétrification”. The challenge here was to reconsider this historiographic point by proposing new scales, angles of observation, and terrains. The link between stone and urban dynamics would appear to be more complex and less deterministic than has long been thought.

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« De pierres dures et résistantes ». Paving Streets with Stones in Paris
(12th–15th Century) Resolutions, Symbolisms and Practices

In Paris, as in many cities, the process of paving streets in the Middle Ages was designed to meet several needs. First, such streets were intended to favour exchanges by making it easier for people and vehicles to circulate within the city. In fact, the frequent circulation of heavily loaded vehicles damaged the roads and turned the earth into mud, which tended to make them impassable, as testified by some ordinances from the 14th century. Second, the process was also intended to help city dwellers dispense with mud, which was considered to be unhealthy, by burying the existing filth under pavements, as well as by making it easier for rainwater to eliminate the dirt. This second objective is directly attested to by Rigord's narrative about Philippe Auguste's order for Parisian streets to be paved: the king was said to have decided to act in 1184 after having been profoundly disturbed by the smell emanating from the mud on the streets. In the old historiography, this episode is often described as a turning point in Parisian history, which entered a new era with the introduction of these measures.

One reason why this anecdote has become so symbolic is because of the technical constraints inherent in the process of paving streets: to be truly efficient, it requires not only significant funding but also a major coordinated effort that a central authority is more apt to achieve. This partly explains why the king gives the impression, around 1260, that by entrusting the coordination of the paving to the equivalent of the municipality (the "prévôté des marchands") he has strengthened his authority. The distinctive features of stone pavements also partly explain the key place they occupy in literature.

Studying the paving expenses incurred by the "prévôté des marchands" of Paris between 1424 and 1489 enables us to delve deeper than the original needs and symbolic aspects of the process. To help the "prévôté des marchands" finance the paving of some of the busiest streets

(called “la Croisée de Paris”), King Philippe le Bel granted them the right to lease the city gates. An analysis of the accounts of the *prévôté des marchands* shows that, for the most part, the number of paved surfaces correlates with the amount of money earned by leasing out the gates. This depended on the context, however: during the 15th century, paving costs fell during the 1440s and then slowly increased again after the end of the Hundred Years’ War. Some funding patterns, practical issues and investments logics have been studied by other researchers for Amiens, Troyes and Ghent for instance. These studies all show that, beyond the resolutions and symbolic considerations involved, the dynamics of the “petrification” of streets in the 15th century were heavily dependent on the tax revenues required to finance such work.

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Wood and Straw, Stone and Brick. Building Techniques and Urban Decorum in the Settlements of Late Medieval Piedmont

Drawing upon both published and unpublished documents, this study aims to examine the real building dimension of subalpine urban settlements from the 13th to 15th century, moving beyond clichés and the opinions of historiography, which are grounded to varying degrees. The 13th century has always been seen as an essential moment in the transformation of building techniques. The reopening of quarries, the increased production capacity of furnaces, as well as the first attempts to standardise the construction elements – together with more precise, stricter laws – have often been understood as clear signs of a rapid

transition from construction using perishable materials to an extensive use of stones and bricks. While the general idea seems valid, many aspects remain to be studied. It goes without saying that in the 14th and 15th centuries, one of the primary efforts of the institutions governing cities was still geared at limiting the use of wood and straw in buildings and roofs, for reasons of safety and urban decorum. Through a more careful examination of the building processes employed, from the production stage to the construction yard, as well as of the chronology of the use of bricks, we can better define the real image of some of the main settlements in Piedmont at the end of the Middle Ages.

Despite the introduction of coordinated policies as early as the end of the 13th century, which attracted and encouraged the activity of kinsmen and, at the same time, limited the use of perishable materials, many settlements, as mentioned, still consisted of houses which made extensive use of such materials in their structures and coatings. It was not until the end of the 14th century that bricks seem to have become established as the most widespread and economical solution for the construction of civil buildings. As a result, laws needed to be introduced that guaranteed a minimal degree of production and dimensional standardisation. In the 15th century, the rapidly growing demand for bricks, also supported by the political desire to carry out an extensive renovation of the building heritage in order to improve the quality of the urban space, caused problems with the supply of products. More than a production problem, this phenomenon – which is suggested by the introduction of protectionist policies – seems to relate to the difficulty of sourcing the fuel required to power the furnaces. The priority then became to protect forestry resources, but this was probably not sufficient. It was not until that point in time, on the threshold of the modern age, that stone gradually began to be used, having thus far been limited to mountainous and pre-mountainous areas.

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Ghent and the Medieval Houses of the 12th and 13th Centuries. An Example of a “Petrified” Urban Landscape?

Ghent is the fourth largest city in Belgium, with around 250,000 inhabitants. Thanks to its fortunate location at the confluence of the Scheldt and Lys rivers, the Ghent region has always been an attractive place to live. In medieval times, it was one of the largest cities of Northwestern Europe. From the 10th to the 16th century, Ghent was also the most important town of the County of Flanders. The development of medieval urban Ghent began in the 9th century. After the urban centre was expanded into a town measuring some 80 hectares, a new rampart, which underscores the emancipation of the urban community, was created.

Over a few decades, the Ghent archaeological team registered and documented some two hundred and thirty late medieval house-structures made of stone. Most of these, built using limestone imported from Tournai, could be interpreted as the remnants of multi-storied stone houses, and for nearly half of them, the upper levels are still in place today. The first floor, the most representative and best lit room of the house, was generally accessible directly from the street *via* a stairway. The upper two to four floors were very low and hardly lit at all. Several houses have kept their original roof constructions to this day. The houses were surrounded by a yard, where annexes are yet to be identified. Some chronological indications have been distinguished, which, together, could provide us with a sort of housing family tree. Originally, the enclosures must have been larger and the oldest constructions (probably from the 12th century) are always the furthest from the actual building line. By gradual parceling-out, the enclosures have been split up. A few narrow streets can be identified as separations between larger medieval premises. From the middle of the 14th century onwards, the main streets and squares of the medieval town were completely built-up, with mostly stone and even a few brick houses.

The architecture inspired by castle architecture is supposed to reflect the owners' prestige and financial means. The high stone houses can be associated with the *viri hereditarii*, the urban elite which clearly distinguished itself from the other citizens. The names of several families are recorded in written sources and in some cases it has been possible to reconstruct their original domains, such as for the families uten Hove, Bette, and van der Spiegel. These houses indirectly reflected the wealth of the internationally renowned Flemish drapers. Centuries later, they also supported the depiction of Ghent as a "petrified" wealthy city.

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A City Made of Wood, Stone, and Brick. The "Petrification" of Urban Housing in Relation to the Question of Plots (Brussels, 13th–16th Century)

The use of stone and brick in the cities of the Low Countries (present-day Belgium and the Netherlands) has traditionally been understood based on normative sources. This approach, which has long been dominant, nonetheless offers a relatively unnuanced vision: municipal authorities' actions are brought to the fore whereas the complexity of the urban territory is overlooked. In particular, this masks the local peculiarities of certain neighbourhoods and relegates the mechanisms at work at the local scale of the plots and the urban fabric to the background. Involving an innovative analysis that combines both historical and archaeological perspectives, this study aims to propose a new approach by focusing on urban geography and the relationships between dwellers on their plots.

Firstly, we offer a *status quaestionis* regarding the building materials landscape in Brussels from a diachronic perspective. What materials were available in and around the city (given the natural environment and the operating conditions)? What were the regional and interregional contexts? What production structures were in place (especially for brick and stone) and how has the building materials market developed? This part of the study sheds light on why, before the 18th century, Brussels was characterised by the use of locally sourced construction materials, mainly originating from its hinterland (spanning roughly twenty kilometres around the city). To underscore the distinctiveness of the different neighbourhoods, we then attempt to map written records and archaeological data (regarding timber-framed houses, stone and brick houses, and party and/or common masonry walls, for the period of 13th–15th century). The result reveals an overwhelming opposition between the central area, where the main market spaces were located (especially around the Grand-Place), and the peripheral areas (characterised more by handicraft districts), on the margins of and outside the first city walls. Finally, we try to analyse the practical functioning of the plots by using some significant property deeds, archaeological data, and urban regulations. The result, combined with previous studies, enables us to grasp the geographical, chronological, and human complexity of the petrification process.

In conclusion, we call for a comprehensive approach adopted from a “ground level” perspective and on a case-by-case basis. This Brussels-focused case study marks an initial step in that direction and, needless to say, will require further development.

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Building Stone in the Architecture of Orléans between the 12th and 16th Century (France)

Orléans boasts numerous natural resources that could have been used for the construction of structural works in the Middle Ages. These include: hard limestone from neighbouring towns or from the centre of the city itself, thanks to underground quarries whose locations testify to periods of urban expansion; wood from a large forest adjoining the north of the city; and clay from the Sologne and the Orléanais, which has been used since Antiquity to produce bricks and tiles. Its position as a warehouse-town and commercial port located on the northern loop of the Loire River is also a major asset for the supply of stone sourced from quarries located upstream or downstream, up to a distance of a hundred kilometres.

Through observations based mainly on archaeological building studies, cross-checked with archives (notarised deeds, building contracts, and accounts), we gain a better understanding of the reasoned choices made by builders and project managers working on various buildings in the town between the 12th and 16th centuries, whether these were houses, churches, or public and military buildings. They underline the frequent reuse of materials and masonries, together with the implementation of construction techniques that combine stone and wood.

Thus, after the Hundred Years' War, lake limestone rubble and timber-framed architecture were used to reconstruct houses and create housing estates located, respectively, in the previously occupied districts and those resulting from the expansion of the town (new urban enclosures dating from the 15th and 16th centuries). From the 12th century onward, the use of ashlar was centred on some specific architectural elements, but also on the façades of wealthy residences or huge private mansions, competing with the use of bricks from the 1500s. The analysis of the accounts of Saint-Aignan in the years 1468–1469 and 1471–1472, regarding the reconstruction of the collegiate church

and the creation of a new urban enclosure, sheds light on the terms of supply of some types of stones whose use significantly increased from the 15th century onwards. Moreover, a certain hierarchy can be seen in the use of several types of lithic materials within one and the same elevation or between the different walls of one and the same building (hard lacustrine limestone from the Orléanais, Jurassic Era limestone from the Nivernais, and tuffeau stone from the Cher valley); these are the result of both technical and aesthetic choices and reveal the development of economic networks.

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The Relationship between Stone and Other Building Materials in Portuguese Cities in the Middle Ages

The aim of this paper is to analyse how stone was combined with other construction materials in order to determine whether the tendency to increase the use of stone in Portuguese towns between the 13th and 16th centuries is a question worthy of further analysis. The answer is not simple or unique, however, and includes several chronologies. Thus far, only a few studies have considered the question of building materials as their central object of analysis.

To this end, this paper analyses different typologies of buildings as well as the combined application of different building materials. We have used data from written and archaeological sources, along with information recovered from surviving buildings.

The paper begins with a general view of construction in medieval Portuguese towns and the access to different types of building materials, such as stone and timber, among others.

To further develop this approach, we then analyse specific types of buildings or constructed structures, such as urban defensive systems, cathedrals, and other religious buildings, royal or feudal palaces, town hall buildings, and a series of other types of buildings, such as hospitals from the late 15th century onwards, royal customs buildings and butcheries and structures with a related economic purpose. Indeed, the materials used in Portuguese medieval urban constructions display great variability; this was due not only to the diversity of the raw materials available in the different regions but also to the ingenuity, talent, and techniques of the men working them.

In relation to the increased use of stone in towns from the 13th to early 16th centuries, known as the *pétrification des villes*, we conclude that this model – which has been proposed for several European towns and regions – cannot be easily applied to Portuguese towns. The dominant factor during this period seems, instead, to be the coexistence of several different materials in urban constructions such as stone and timber, of several different types and qualities, as well as bricks, clay, and other materials.

We conclude by suggesting that this increased use of stone could possibly be observed in an earlier time period, from the 11th to the 12th centuries, which nonetheless precedes the period studied in this paper.

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To Build a “Straight Wall of Stone and Lime”. The Paradigm Shift in Standard Construction Practices in Late Medieval Portugal

As Jacques Le Goff observed, “[...] the Middle Ages is, for us, a glorious collection of stones: cathedrals and castles. But these stones represent only a small part of what existed. We were left with some bones of a body made of wood and even more humble materials...”. This observation is essential for understanding, on the one hand, the almost total disappearance of standard medieval houses and, on the other, the persistence of a very significant number of others, dating from the 16th century onwards. In other words – and in response to the challenge posed by the colloquium “Pierre et dynamiques urbaines”, held in Albi in 2019, – this paper focuses on the changes witnessed in construction practices during the 15th and 16th centuries, of which the royal directive “to build a straight wall of stone and lime mortar”, as set out in the title, is a clear example. The main question is to ascertain whether the “petrification of standard urban construction” also occurred in Portugal, similarly to what happened in other European countries, that is, whether or not stone became predominant over other materials and how this led to structural changes.

Along with the existing studies on the question and the scarce remaining material vestiges, which have generally been overly altered and studied with little input from archaeology, this paper also draws upon a recently identified iconographic source: the 16th-century painting of Rua Nova dos Mercadores in Lisbon. The painting was most likely produced by a Flemish artist, and is now part of the Kelmscott Manor Collection (London). Adopting a frontal view, as if the painter, and thus the observer, were standing on the opposite side of the street looking at the facades, the scene offers an unprecedented view of a row of almost thirty buildings belonging to what historians have identified as the upper segment of standard urban housing, the houses of merchants. These buildings – several stories high – were systematically located in central and commercial areas, with porticoes on the ground floor.

Through a thorough analysis of this image, written sources relating to Rua Nova, and coeval regulations on construction, the architectures represented in the painting can be identified with the types of buildings that – present in various Portuguese cities, even if in modest numbers compared to Lisbon – were repeatedly condemned and progressively replaced with others, built with straight walls made of stone and lime.

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The Timings and Processes Involved in the Transformation of Genoa, from Wood to Stone

The city of Genoa, once the capital of the Mediterranean Sea, is characterised by a large and well-preserved historic centre, consisting of many residential buildings dating back to the 12th–14th century AD. These four or five-storey houses are characterised by stone colonnades, stone or brick walls, and the white marble of gothic-style windows.

The medieval Genoa that can be reconstructed by observing the existing buildings is, however, partially different from how the city must have looked in the Middle Ages. In fact, the written sources preserved in the archives suggest that, in the 12th–13th century AD, the city made of stone and bricks was also accompanied by a city made of timber.

Current research has identified 46 documents that mention “timber houses” (*domus lignaminis*), houses with wooden walls, columns or shelves, and 5 houses that, despite not being clearly described as made of timber, can be considered to be similar to the other “timber houses”. The timespan of these documents is mostly between 1156 and 1347 AD,

with three cases dating back to the 16th and 17th centuries AD. Most of the quotes found in the documents (33) relate to existing buildings, whereas the other cases refer to new constructions. Most of the timber buildings are situated in the city centre, although some are located on its outskirts or in other parts of its territory. Overall, research has highlighted a small but significant number of cases that refer to a lost world, the outlines of which are still not very well defined.

This “wooden city” has gradually disappeared, due both to recurring, devastating fires (as reported in the Annals of the city) and to its inhabitants and administrators’ desire to modernise the city. Changes in construction materials and techniques not only relate to the houses but also to the city’s urban infrastructures supporting its rich commercial activity (such as the large public colonnade of the Ripa), and the port that was the source of its wealth and power. There, the presence of wooden piers is still documented in the 13th and 14th centuries AD, before the last timber structures were replaced with sturdy piers made of stone masonry in the 15th century AD.

This paper seeks to reconstruct the process of petrification of the city and to discuss the combination of factors and causes that led to the unavoidable replacement and eradication of the wooden constructions.

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