

FROM ARCHAEOLOGICAL STATEMENTS TO SCIENTIFIC ILLUSTRATIONS

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Abstract: *Like many other cities, the city of Cologne is a former Roman garrison. Densely populated without interruption, Cologne was one of the largest cities in northern Europe in the Middle Ages. Its location on the Rhine as a Hanseatic city and its strategic position on the border of the two empires as a result of the division of Charlemagne's inheritance have shaped Cologne's importance to this day. Despite an eventful history and many destructions, the Cardo and Decumanus have been preserved to this day, even though their function and shape have been subject to constant change. Their appearance, especially during the Migration Period, is largely unknown. Sparse finds nevertheless allow archaeology to make a statement about the city structure that gives an approximate idea. This paper illustrates a method to translate such statements into scientific architectural visualisations. This makes it possible to compare states of varying degrees of certainty.*

Keywords: *Visualisation; Translation; Uncertainty; Knowledge; Scientificity.*

Resumo: *Assim como muitas outras cidades, a cidade de Colónia é um antigo território romano. Densamente povoada sem interrupções, Colónia foi uma das maiores cidades do Norte da Europa na Idade Média. A sua localização no Reno como cidade hanseática e a sua posição estratégica na fronteira dos dois impérios resultante da divisão da herança de Carlos Magno moldaram a importância de Colónia até aos dias de hoje. Apesar de uma história movimentada e muitas destruições, o Cardo e o Decumanus foram preservados até à atualidade, embora a sua função e forma tenham sido sujeitas a constantes mudanças. O seu aparecimento, especialmente durante o Período das Migrações, é em grande parte desconhecido. Achados escassos permitem, no entanto, que a arqueologia faça afirmações sobre a estrutura da cidade que fornecem uma ideia aproximada. Este artigo ilustra um método para traduzir tais afirmações em visualizações arquitetónicas científicas. Isso torna possível comparar estados de diferentes graus de certeza.*

Palavras-chave: *Visualização; Tradução; Incerteza; Conhecimento; Cientificidade.*

1. THE CITY OF COLOGNE FROM ROMAN TIMES UNTIL TODAY

The history of the city of Cologne dates back to Roman times. Its eventful history and its unbroken importance as a regional metropolis — in the Middle Ages Cologne was one of the largest cities north of the Alps — are responsible for an enormous stratigraphy with countless overlapping layers. Every measure that touches the subsoil is accompanied by archaeological investigations. The uncovering, however, is one thing;

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it becomes more difficult when the space is subsequently to be used, for example by underground car parks, which makes it imperative to carefully register and, if necessary, relocate the finds. Thus, for the uninitiated visitor, strange phenomena arise, such as a section of a man-sized Roman sewer that appears like a sculpture on the pavement. On the other hand, it is precisely such excavations carried out in the course of the underground car park around Cologne Cathedral that have made possible a great wealth of documented finds and thus a largely secured urban structure and the street in the city structure over the centuries.

Historical testimonies

Since the great city view by Anton Woensam from 1531 at the latest, a contemporary representation of the city has been available, which, even if this representation is only an elevation, already allows conclusions about the contextualisation of some existing buildings. Finally, Arnold Mercator's city plan from 1571 makes it possible to assign such an extensive number of medieval finds and also preserved buildings and building structures that the gap between the Roman and the medieval city seems bridgeable. The stability of the most important streets in the city structure seems particularly clear.

Visible testimonies

Buildings from the Middle Ages that have survived to the present day, some labelled with dates on the façade, with presumably even older cellar structures, allow a precise location and thus precise geometric adjustment of some of the buildings recorded by Arnold Mercator's drawing. This provides at least a sufficiently informative picture of the medieval city. The Roman finds left in situ, although some of them are far below today's walking level, through underground museums such as the *Praetorium*, multi-storey halls with a view from the public space such as the large *Dionysus* mosaic in the Roman-Germanic Museum, or the very well preserved gateway in today's entrance to the underground car park at Cologne Cathedral, make it possible to experience the spatial allocation of parts of the Roman city even today.

2. ABSTRACTION FOR SCIENTIFIC VISUALISATIONS

But how can such an eventful history with such variously comprehensible conditions be presented in a chronological series? Above all, how can the scientific content of the hypotheses be visualised without giving the impression that we know what the church, the city and the streets looked like? One of the central problems in the visualisation of architectural hypotheses lies in their suggestiveness. If visualised too speculatively, they could appear as if all the interrelationships were assured, and a re-construction was possible without any problems. But what the city actually looked like will remain uncertain forever. The buildings themselves are largely destroyed. What

is recognisable, however, is the type of building, such as the peristyle house. From this, a visualisation can be created that does not represent the individual building, but only and exclusively its type. This is achieved primarily through the degree of abstraction of the three-dimensional model, and this in turn depends on the degree of uncertainty. This ranges from findings to such completions that are assumed solely by comparison with better-preserved buildings of the same type, whose design, however, can turn out completely different and even contradictory depending on the selection of those comparative buildings. The challenge is to do justice to both archaeological scientificity and vividness in the sense of architecture. At the highest level of abstraction, for example, the statement that it is a simple house can be rendered by a simple box with a shed or saddle roof. In the linguistic description, such uncertainty is not noticeable. It is entirely common to name building typologies without specifying them further. Sketches in the form of line drawings are likewise fairly common. A three-dimensional reconstruction, on the other hand, requires a solid body, since the spatial presence determines its appearance. The completely different method of visualising unknown historical conditions as if they were contemporary photographs or even film footage from antiquity does not do justice neither to the communication of the state of science nor to the scientific nature of the disciplines of archaeology. The challenge of visualisation lies in the combination of both demands, i.e. not only to adequately translate the hypotheses of archaeology as science, but also to convey an image of architecture that in itself allows an architectural interpretation, i.e. also an emotional evaluation of the spatial composition, without being pure speculation.

The present method of visualisation¹ aims to convey this dialectic associated with the uncertainty in the knowledge of archaeology and building research² visually, but certainly also architecturally. This also means, that the communication cannot take place in the form of diagrams overloaded with all kinds of information, i.e. graphic coding that visualise every fact, no matter how complex, from dating to find context and fragmentation to every conceivable metadata in a way that completely reproduces the linguistic description. For in such a case of graphic overload, diagrams can no longer convey an architecturally effective spatial impression. Graphic diagrams are not to be confused of course with diagrammatic architecture, i.e. the sculptural design of abstract geometry taking into account the principles of semiotics³.

On the other side of the abstraction are the findings, which as undisputed witnesses of the ancient building form the basis for the scientific work. This is not possible through the faithful reproduction of the findings, even if they are preserved in their original state, free from the effects of weathering. For the fragment itself,

¹ LENGYEL, TOULOUSE, 2019: 218-230.

² LENGYEL, TOULOUSE, 2011: 163-175.

³ LENGYEL, TOULOUSE, 2013a: 327-352.

with all its historical randomness, has no significance for the communication of the architectural vision. The architectural design intention does not contain the decay; rather, it stands for the idea behind the building.

Abstract modelling

For this reason, two traditional methods of representation from the creative discipline of architecture are combined, namely the abstract design model — as a three-dimensional visualisation of an architectural idea - and documentary architectural photography — as a projection of the architectural idea that guides the viewer and allows the viewer to visually perceive this idea as if it had been built. For this reason, it is not possible in most cases to create a multicoloured visualisation based on only a few preserved colour fragments without again proceeding largely speculatively. The uncertainty in the polychromy would obscure the relatively high degree of certainty in the geometry. In other cases, where the majority of the objects are still preserved or their colourfulness attested by equally preserved design drawings, it is perfectly possible to create polychrome visualisations under the same principles of representing uncertainty⁴.

However, modelling and projection do not merely follow one another, but rather intertwine. The modelling already takes into account the later projections. Thus, it can contain different versions of the same object for different views, which come into play in different ways depending on the visual context. At the same time, the model limits the possibilities of the virtual photographs by allowing certain viewpoints and excluding others. Often, it is neither intended nor subsequently possible to change the viewing direction, as the then visible environment was not part of the scientific hypothesis. The design of the abstract spatial model pursues the goal of developing such forms that are intuitively recognised as idealization⁵.

Virtual Photography

The design method complementary to modelling, which we call Virtual Photography, pursues the goal of photographing the three-dimensional model as if it were built architecture, so that a spatial model is created in the viewer's imagination that comes as close as possible to the architectural statement. The two decisive components here are the dimension and orientation of the building structures. The difficulties arise above all from the abstraction of the three-dimensional model, which often offers too few points of reference to ensure a reliable perception and assessment of the architecture, as is usually possible with photographs of built architecture, be it through functional elements such as door handles, furniture, fittings, and everyday objects or even people, animals and plants.

⁴ LENGYEL, TOULOUSE, 2013b: 150-154.

⁵ LENGYEL, TOULOUSE, 2017: 127-129.

It is precisely the immobility of the still image that makes these clues important, because the still image is the real challenge. The perception of built architecture usually takes place in a long sequence of different visual projections. The movement of the body as it approaches and passes through, that of the head as it looks around and, last but not least, the movement of the eyes as they scan the space create a multitude of projections on the retina, which is then also ellipsoidal, so that subsequently perception and imagination permanently and successively construct and constantly refine a mental spatial model. A still single image must be able to compensate for this entire process if it is to claim to enable the perception of architecture. And the fact that, similar to axonometry, a perspective projection also becomes surreal as soon as the viewer's eye no longer fixes on the main point — often the centre of the perspective — makes interpretation even more difficult. The aim of virtual photography is therefore to make as clear a statement as possible.

3. THE STREET IN THE CITY STRUCTURE OF COLOGNE OVER THE CENTURIES

The grid of streets in today's Cologne city centre, which covers the Roman city, can be traced back to the Roman street grid; the two main axes *Cardo* and *Decumanus* are still used as important axes today, even if they are no longer completely straight and in their full width. Until well beyond the Middle Ages, the entrances to the city, the city gates, remained responsible for maintaining the function of the ancient main streets. The city views⁶ created in the course of the visualisation of the Building Phases of Cologne Cathedral and its Predecessors show the respective state of science with its changing uncertainty, which was particularly pronounced in the period between the Roman city and the first contemporary representation from the 16th century.

1st to 4th century AD

Roman Cologne was already a densely built-up city. The section shown here is of the north-east corner, where there was, among other things, a garden with a water basin that would later be the baptismal font of the predecessor churches of Cologne Cathedral. On the left is the north gate of the city's main axis running north-south. The street parallel to it runs towards the next tower of the city wall further east. In the area between these two streets stood an almost ideal insula. The bounding streets form a rectangle, and the building structures within it align their ground plan completely with this right angle. Only the slight inclination of the street to the east towards the Rhine represents a deviation from the ideal. The certainty regarding the compositional principle of this insula is based on the extensive excavations in the

⁶ LENGYEL, SCHOCK-WERNER, TOULOUSE, 2011.

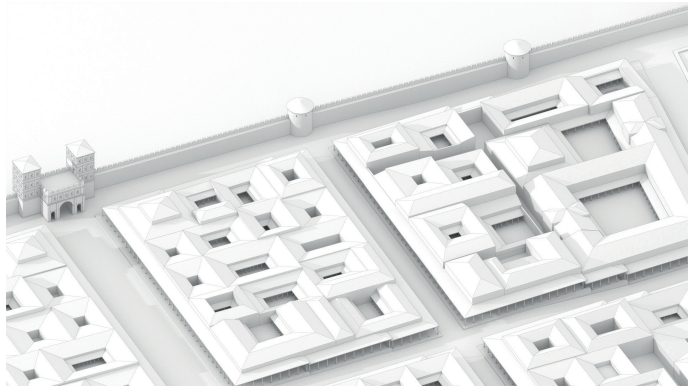


Fig. 1
Cologne around 1st to 4th
century AD. Source: © Lengyel
Toulouse Architects Berlin

course of the construction of the present underground car park around Cologne Cathedral and leaves no doubt as to the structure, even though not every single house could be completely documented. In addition, some storey-high wall segments allowed conclusions to be drawn regarding the high quality of the building. Taken together, one assumes a rather affluent quarter within the city.

6th to 7th century AD

After Cologne was occupied by the Franks and reconquered by the Romans, not all of the destroyed buildings were rebuilt, but from the 6th century onwards the city was in Frankish hands and Roman architecture was mixed with local styles. Nevertheless, some of the smaller half-timbered houses were still to some extent subordinate to the recognisable streets. The Roman streets are still partly recognisable, especially the main street is still perceived by the surrounding houses at least as orientation and is probably still used. It is assumed that the timber-framed houses were surrounded by cultivated gardens. In this phase, the street is less a built structure than a recognisable spatial structure, formed by the row of loosely flanking but discrete individual buildings.

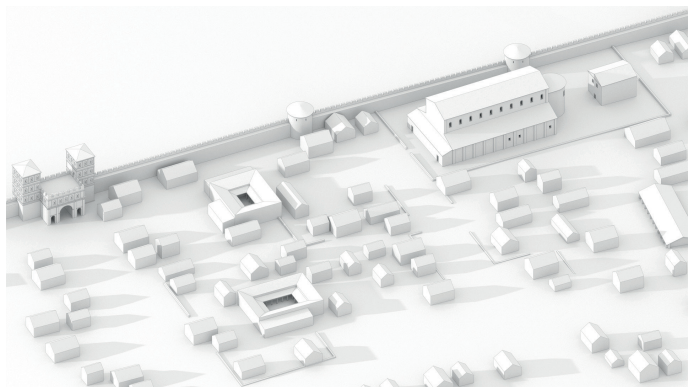


Fig. 2
Cologne around 6th to 7th
century AD. Source: © Lengyel
Toulouse Architects Berlin

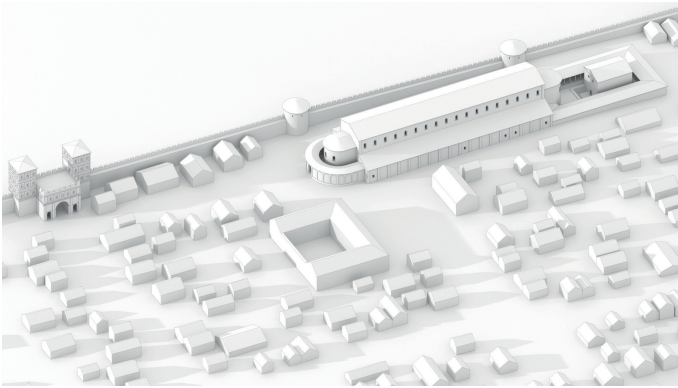


Fig. 3
Cologne around 7th to 8th
century AD. Source: © Lengyel
Toulouse Architects Berlin

7th to 8th century AD

Also in the 7th century, the building forms change, the half-timbered houses are now closer together, the first stone houses are built. The densification also increased the contrast between the built-up area and the open space, the street became clearer, although still not as a constructed structure, but as a space structure, and the subsequent medieval density can already be guessed at. Presumably, one or the other Roman house was still standing even now, but no longer dominating the townscape and also no longer as the backbone of the streets. Rather, it is still the loose juxtaposition here, which, however, now makes the streets somewhat clearer as a deliberately kept open space in between.

9th to 10th century AD

At the beginning of the 11th century, the streets returned as an organising structure, and the buildings made better use of the space available to them by clearly demarcating the street space from the cultivated garden, resulting in the familiar dense alignment of buildings in the medieval city. Verifiable remains of this structure can be reconciled with contemporary representations from the 16th century. And here, too, the building

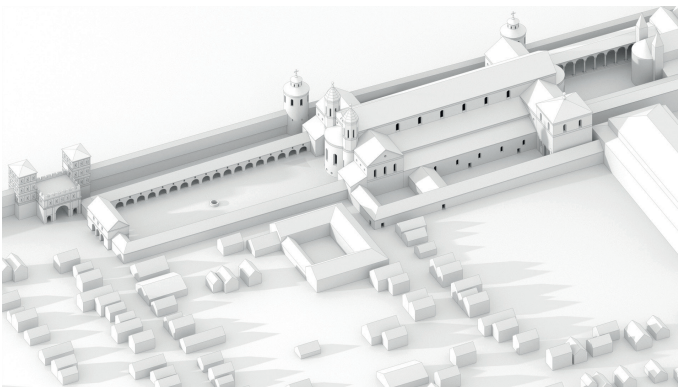


Fig. 4
Cologne around 9th to 10th
century AD. Source: © Lengyel
Toulouse Architects Berlin

forms change once again, but above all they are more varied. The streets form the face of the city. And even if these representations are primarily about the visualisation of the current state of scientific knowledge about the building phases of the predecessor churches of Cologne Cathedral, it becomes clear how significant the urban context is for the architectural interpretation of the church. The fact that a morphology of the street has emerged quite incidentally is a fortunate circumstance, which is mainly due to the relatively dense findings.

1520 until 1842

For the design and thus also emotional evaluation of the architecture, it is not the analytical reproduction of the structure in the form of axonometric aerial photographs, but the perspective projection from natural eye level that has a much greater expressiveness. In this perspective, the street recedes into the background, because the viewpoint from which the church is seen is outside the city wall. What becomes clear in this representation instead is the effect of different levels of abstraction in one and the same picture. The juxtaposition of differently finely resolved geometry with an overall lack of materiality and colour conveys both a clearly perceptible composition of volumes and a staggering of scientific uncertainty. On the one hand, the Gothic choir, which has practically been preserved to this day, is in the centre of the depiction, and on the other hand, following the east choir, a church of which the successor building is already only incompletely documented. Little more is known of this church, shown here on the left, than what can be seen here. And yet the visual conveyance of the idea of a Romanesque church works. The same applies to the other buildings in the context of the church, and so a vision emerges from the natural eye level which, although it does not correspond to the actual appearance of the church and its context of the time, does correspond to the idea of it, or, as one would like to put it, its idea, its design intention. At its centre, it shows Cologne Cathedral in the state



Fig. 5
Cologne around 1520
Source: © Lengyel Toulouse
Architects Berlin



Fig. 6
Cologne Cathedral around
1520. Source: © Lengyel
Toulouse Architects Berlin

it was in around 1520, before the construction site with its emblematic building crane came to a standstill until 1842. This view is the idealised counterpart, corresponding to the current state of science, to a multitude of contemporary illustrations from the 16th to the 19th century, which in turn provided insightful support in the development and weighing of the various hypotheses by the archaeologists and scientists involved in the project about the appearance of that time.

CONCLUSION

By reverting to the two traditional methods of representation, the visualisations make use of our traditional visual habits and thus allow us to visually experience archaeological findings and architectural qualities at the same time. In this way, they not only provide the general audience with insights into archaeology and architecture, but also provide architecture with inspiration for current design processes and archaeology with starting points for further research. The entire visualisation process takes place in close cooperation in a cycle of hypothesis, modelling, visualisation, questions developed from this and thus to new hypotheses. The visualisation of hypotheses about streets in a city structure is thus a process of knowledge for both disciplines and the visualisation acts as a catalyst.

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