London suburb in the nineteenth century', *Journal of Historical Geography* 1, 211–24.
Whitehand, J.W.R. (1981) 'Conzenian ideas: extension and development', in Whitehand, J.W.R. (ed.) *The urban landscape: historical development and management. Papers by M. R. G. Conzen*, Institute of British Geographers Special Publication 13 (Academic Press, London) 127–52.
Whitehand, J.W.R. (1988) 'Urban fringe belts: development of an idea', *Planning Perspectives* 3, 47–58.
Whitehand, J.W.R. (2009) 'The structure of urban landscape: strengthening research and practice', *Urban Morphology* 13, 5–27.
Whitehand, J.W.R. (2018) 'Taking a long view: two centuries of urban morphology', keynote paper, Twenty-Fifth ISUF Annual Conference, Krasnoyarsk, 5–9 July.
Whitehand, J.W.R. (2019) 'Green space in urban morphology: a historico-geographical approach', *Urban Morphology* 23, 5–17.
Whitehand, J.W.R. (2020) 'Green space, fringe belts and the historico-geographical structure of cities', *Urban Morphology* 24, 105–6.
Whitehand, J.W.R. (2021) 'Diffusion of morphological ideas', *Urban Morphology* 25, 194–6.
Whitehand, J.W.R. and Morton, N.J. (2003) 'Fringe belts and recycling of urban land: an academic concept and planning practice', *Environment and Planning B: Planning and Design* 30, 819–39.
Whitehand, J.W.R. and Morton, N. J. (2004) 'Urban morphology and planning: the case of fringe belts', *Cities* 21, 275–89.
Whitehand, J.W.R. and Morton, N.J. (2006) 'The fringe-belt phenomenon and socioeconomic change', *Urban Studies* 43, 2047–66.
Zhang, Y. (2019) 'A spatio-temporal study of fringe belts and urban green spaces in Birmingham, UK', *Urban Morphology* 23, 18–26.

The problem of teaching urban morphology and the ISSUM experiment

Giuseppe Strappa, Dipartimento di Architettura e Progetto, Sapienza, University of Rome. E-mail: gstrappa@yahoo.com ORCID: 0000-0002-1054-4189
DOI:

From 20 to 28 June 2022 an experiment took place in Rome on the problems of teaching urban morphology in relation to architectural design at the scales of the building and the urban fabric. This International Summer School in Urban Morphology (ISSUM) was organized by ISUF (which also provided an economic contribution to the initiative) within the European project KAEBUP (Knowledge Alliance for Evidence Based Design), whose main purpose is investigate the impact of research on urban form in the field of design. The reasons behind the project were discussed and approved at the meeting of the ISUF Regional Network on 21 September 2021.

First, why was a school in Urban Morphology devoted specifically to urban and architectural design felt to be necessary? The relationship between research, teaching and design in urban morphology has always been problematic, and is still far from being resolved. This difficulty is evident every time a work of contemporary architecture as an example of the relationship between the built landscape morphological reading and the design is to be presented to students. Even in the work of Saverio Muratori, as noted by Gianfranco Caniggia (1984), many contradictions can be found. Some of his works, notably the case of the large residential building in the Tuscolano district in Rome, are, one could say, anti-Muratorian. The same could be said for other scholars of urban form such as Aldo Rossi, Carlo Aymonino and Guido Canella. The argument also applies, more generally, to the relationship between theories of modern design and design practice. The masters of the Modern Movement – such as Le Corbusier, Gropius and Mies van der Rohe – did not develop a true design method derived from the reading of built reality.

Of course, by its nature, architecture is a complex discipline, with many components, including those of aesthetic synthesis which is necessarily individual. But never, in the history of architecture, has there been a period of division between theory, method and design such as that we see today. This is the problem that every design teacher should query. On the one hand, academics write brilliant

Figure 1. Plan of the Ghetto area with the overlap of the current cadastre, in red, on the Gregorian cadastre, in black. (Source: Benocci and Guidoni, 1993.)

texts of theoretical reflections which, however, have the non-negligible defect of being far from reality. On the other hand, designers work in a pragmatic way, responding to the requests of a global market that 'consumes' images, regardless of their meaning.

Teaching – in the broad sense of transmitting knowledge, not only in schools of architecture, but in general – is both the cause and the consequence of this situation. The core of the problem is that students are no longer trained in 'demonstration'. Current societies no longer seem to need proof, verification, explanation of why and how objects are produced. Societies are organized in 'swarms' aggregated by the seduction of objects, not by their functional and social role (Bauman, 2007). The most evident confirmation lies in the crisis of Euclidean geometry which, until the 1970s, had formed the basis for scientific education. Training then took place through demonstration, by means of theorems which trained the student in the use of abstraction. Gradually, in different ways but in all European countries, it seems that this type of study was too distant from the concreteness of the real problems that arise in contemporary life. Thus, more direct methods of knowledge have been introduced, based on evidence, on the observation that does not need proof, such as set theory.

This is a very serious problem as Western culture has been based, for centuries, on the use of abstraction. Lucio Russo, a mathematics professor, wrote: ". . . I shuddered hearing, from a student of Sapienza University of Rome, the argument that geometry is false – since there are no real segments, as everything has a thickness. The subject is not new to me: I had already read it in the works of Sextus Empiricus; since then, scientific rationality was about to be abandoned for the next fifteen centuries" (Russo, 1998; and see Empirico, 1972).

Figure 2. ISSUM exercise 1. Reconstruction of the Ghetto fabric before the demolitions of the late-nineteenth century (by student Fedor Torgashev).

Plato himself said, moreover, that mathematics is not so much useful for practical purposes, but for the great power of elevating the mind forcing it to reason abstractly. On the other hand, what is Conzen's suggestion to look for the general in the particular, if not a call to abstraction (Strappa, 2020)?

In fact, the assumption of urban morphological schools is that demonstration is not useful to the new generations, foreseeing that for them above all notions would have been useful for doing practical accounts, paying taxes, checking budgets. Producer elites would be trained outside school. This crisis in the abstraction and demonstration tradition has inexorably passed to the university level, where students are now demanding practical teaching aimed directly at the profession.

The same happens for the design disciplines. Students (and then designers) are not asked to demonstrate the project they are developing. They are not asked for the working method, the proof, only functionality. And students ask for images to use in design practice which, in the absence of a generative process, are uncritical variants of what the market offers. Certainly, images themselves have their own cultural value, but they must be understandable. The image has value when it conveys meaning. And significant images cannot be produced in architecture if one is not aware of the process within which that image is inserted, just as one does not know the profound meaning of a word without knowing its formative process, its etymology (a similar crisis occurred in the teaching of Latin and history).

Even the student of architecture is by now a consumer, rather than a producer: a consumer of images. Instead, it is the teacher's task to form a culture of producers. 'Producing' is a derivative term – *pro-ducere* – which means to bring about, to give shape, which is the ultimate goal of architecture. It is, therefore, essential to teach how what is produced today fits into the great flow of the transformation of built reality.

For these reasons, urban morphology can be a powerful tool for renewing teaching in the field of architectural design. Morphology seeks common characters of the built reality in the multiplicity of forms, the rational and transmissible law through which we are not only allowed to critically read buildings and urban fabrics, but to inform, give

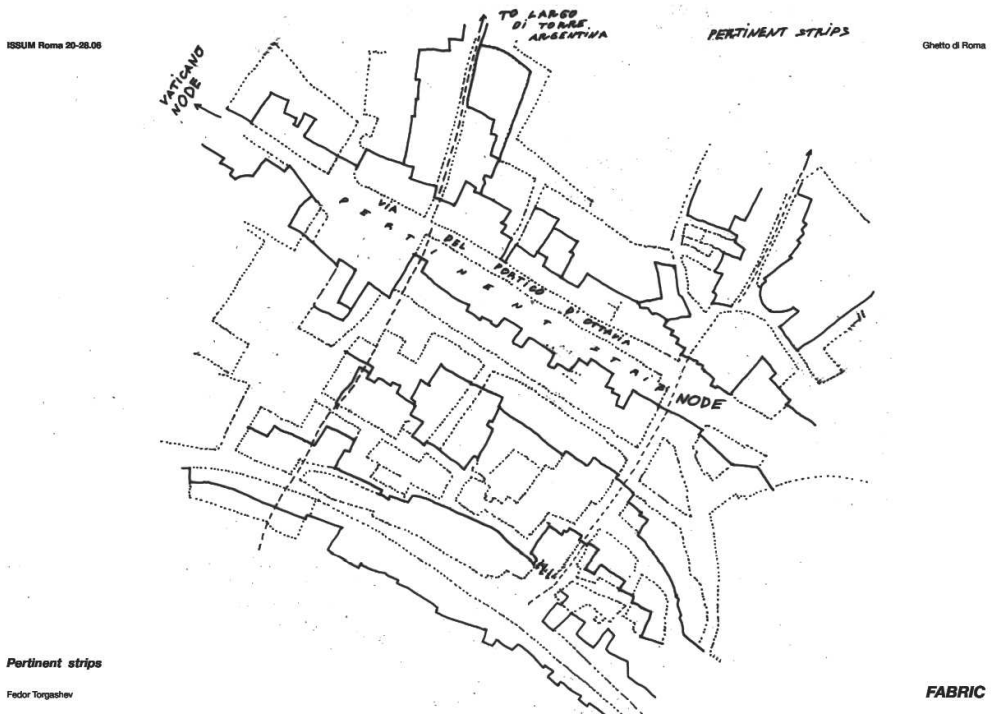

Figure 3. ISSUM exercise 2. Study of the pertinent strips (the set of all the built lots referred to the same street front) in the Ghetto fabric (by student Fedor Torgashev).

shape to the concrete design. Morphology is a 'formative' discipline in the sense in which this term was intended by Luigi Pareyson, for whom "form is nothing but the very process of its formation" (Pareyson, 1960).

Design consists of a circular process in which urban morphology plays a central role. This process starts from reality, within which reading operates an abstraction, to then move on to the critical choice of the architect which is the design, and again to reality through the executive project that precedes the construction. In this circular process, design arises from the knowledge of reality, but the design itself is also a tool for knowing reality. Architects understand the built reality through design.

Finally, in teaching it is necessary to demonstrate how urban morphology, against persistent prejudices, is a design tool in which the architect's critical choice and his personal expression as an aesthetic synthesis are fundamental. As in other fields of knowledge, the rules that are recognized in the built environment have in fact to be understood in a generative sense, recognizing how a limited number of identified types (at the building and fabric scale) are able to generate an infinite number of results (Chomsky, 2006).

The aim of the ISSUM is to contribute to posing these problems in contemporary terms, fully aware that it is not possible to give an answer in a short time to very complex questions, but wishing to facilitate a reflection on possible solutions. The short duration of a summer school should contribute to a synthetic learning of some reading methods of urban morphology on the part of students, but also to foster a dialogue between teachers on the topics of innovation in teaching. The goal of ISSUM is (and will be in the future) to provide a centre of excellence in urban form knowledge through multiple exchange and involvement of students, academics, professionals, in learning, research and design. For this reason, teachers who follow different methods have been invited to ISSUM, to give an idea of the vastness of the field of investigation.

The organizational premise is that there is not just one urban morphology, but there are many (and there are also, moreover, many other methods of rational and methodological approaches to design other than morphology). The purpose of ISSUM's first iteration was to hold a short but intensive course on the method used by the Roman school; thinking that, in the future, other schools will present their own methods.

About 50 applications from Masters and PhD architecture and planning students interested in urban morphology research, from a range of countries, responded to the call. Fifteen of these were selected (including a student from the University of Blida, in Algeria, who benefited from an ISUF grant for an African student).

Through lectures and studio work, discussions, and research activities, participants explored the role of urban morphological studies in reading historical urban fabrics. Field surveys were organized by teachers to guide the students in the practical urban analysis, and studio activities have been carried out, intended as reading exercises and also involving some hints on the architectural design related to the fabric studied (Figures 1 and 2). Lectures and study work took place at the Palazzo Cenci Bolognetti, a Renaissance building in Piazza delle Cinque Scole in Rome. The site is located in the Ghetto area, in an especially remarkable historical area where the Medieval and Renaissance fabrics blend with the ancient substratum. The area around the school had been the subject of the morphological readings. The demolitions and brutal reconstruction interventions of the late-nineteenth century also made it possible to clearly introduce the participants to the Muratorian theme of 're-designing'.

The 2022 International Summer School in Urban Morphology was organized by G. Strappa (director), A.D. Amato, F. De Rosa, A. Pusceddu and N. Scardigno. Many members of ISUF and the ISUF Italy association, KAEBUP researchers, teachers of the Sapienza and Roma3 universities and other teachers and professionals from different backgrounds gave lectures during the school. The pandemic prevented the hoped-for greater integration with the Regional Networks of urban morphology. All students participated with encouraging enthusiasm, and the idea of continuing the experiment over the next few years was discussed at the ISUF conference in Łódź and Krakow.

References

Bauman, Z. (2007) *Homo consumens, Lo sciame inquieto dei consumatori e la miseria degli esclusi* (Erikson, Trento).

Benocci, C. and Guidoni, E. (1993) *Il Ghetto*, *Atlante storico delle città italiane, Roma, 2* (Bonsignori, Roma).

Caniggia, G. (1984) 'Saverio Muratori e il progetto di tessuto', *Storia Architettura* VII(1/2), 31–50.

Chomsky, N. (2006) *Language and mind* 3rd edn (Cambridge University Press, Cambridge).

Empirico, S. (1972) *Contro i matematici*, libri I-VI, Italian translation of Πρὸς ἀριθμητικούς edited by A. Russo (Laterza, Bari).

Pareyson, L. (1960) *Estetica. Teoria della formatività* (Zanichelli, Bologna).

Russo, L. (1998) *Segmenti e bastoncini. Dove sta andando la scuola?* (Feltrinelli, Milano).

Strappa, G. (2020) 'Four questions to Jeremy W. R. Whitehand on urban morphology and historical cities', *U+D* 13, 10–13.

Time as a significant dimension in urban form research

Jintang Chen, College of Architecture and Urban Planning, Guangzhou University, Guangzhou510006,P.R.China.E-mail:jtchen@gzhu.edu.cnOrcid:0000-0003-1717-3111
DOI

Without time, the formative and evolutionary processes – the core research objects of urban form study – would not exist. Various morphological and typological methodologies follow a chronological structure in order to map those processes in town plan development or to identify changes to buildings. M.R.G. Conzen (1962), representing the approach of the English historico-geographical school, surveyed a series of historical maps to identify the plan units or morphological regions, whereas Caniggia and Maffei (2001), of the Italian typomorphological school, identify synchronic and diachronic variations of building types across time and space. In several fundamental concepts of the two schools, such as morphological periods (M.R.G. Conzen, 2004), burgage cycles (M.R.G. Conzen, 1962), and typological processes (Caniggia and Maffei, 2001), time is an obvious factor and cannot be ignored.

Time acts as an essential clue in urban morphological research. However, when reviewing

the literature regarding the philosophical foundation (Gerosa,1999; Mugavin,1999), methodology (Oliveira, 2013), and epistemology (Scheer, 2016) of the subject, issues about the effects of time on urban morphology are not fully appreciated. Thus it is necessary to break the mould of our current thinking about time and treat it as a separate parameter, even an element complex (M.R.G. Conzen, 1962), in the research about urban form, as it may elicit new interpretations on the cognitive aspect (Gauthier and Gilliland, 2006) about the interrelation between morphological study and understanding.

According to Marshall and Çalişkan (2011), morphological understanding is description about the urban fabric from the past to the present, while design is the thread that leads to the future. Their argument has broadened our perspective with respect to time. Utilizing time as a continuous variable can reveal the interrelationship about urban form research and consequently application. In other aspects, the characteristics of landform can be either dependent or independent variables as the limits of time and space change (Schumm and Lichty, 1965). Fitting different elements of morphological study in an appropriate framework together, implications for the urban landscape from the cyclical pattern of growth of fringe belt, residential area, fluctuations in transport innovations and changing of building types over century can all be modelled (Whitehand, 1994). Piecemeal alterations of individual buildings and gardens can be continuous but small-scale and individually quick. However, these micro-scale activities will change the urban landscape after a period of continuous accumulation (Whitehand, 2001). In consideration of these statements, time can be considered as a discrete variable as measurement element for morphological study. Different time spans should first be identified, then used as measurements for exploring the human activities and their influencing factors, and morphological understandings of the products made by those activities in different spatial scales.

An integrated framework following time

Human activities naturally occupy different spatial scales. They produce dissimilar components in the urban landscape during the time spans in which these activities take place. Daily activities usually take place in rooms inside buildings, and the open spaces between them. These repeat daily, weekly, or monthly, and their range is determined by individual physiological need. Buildings are designed initially in response to the needs of the space users, after which their construction is completed over a period of years (although the 'gestation period' between initial idea and building completion can be lengthy). The public's demand for spaces and their accompanying fashion trends do change over time. Subsequently, the function or façade of a building may be converted as the space needs and trends change, which can happen decades after a building's initial construction. The final product of these conversions is often dominated by technological innovation and the utilization of new materials. The economic and social demand for areas and buildings contributes to the urban fabric through the formation and transformation processes. These processes may originate in the desire to develop a new plan or initiate adaptive redevelopment in an existing street block (M.R.G. Conzen, 1962).

After a period of time, accretionary growth and functional agglomeration accelerate regional homogeneity in density, patterns, land use, appearance, and so on (M.R.G. Conzen, 1962). The urban districts created from this growth can usually be easily distinguished. For example, the central business district reflects the centralizing forces that concentrate businesses with a high-density tight texture, while residential areas possess unity of history, form, and function (M.P. Conzen, 2009). Conversely, the fringe belt is recognizable by its open pattern of land cover and larger plots (M.P. Conzen, 2009). As an addition to the urban and rural space, new towns have been intended as alternative solutions for unlimited expansion and intensity increasing of urban built-up areas to accommodate rapidly-growing populations. The process of selecting new locations for these new town developments requires a great deal of social and cultural consideration, and has been relatively rare in the last century or so (Freestone, 2021).

The brief review of human activities above effectively integrates time span variables (left sector in Fig. 1), which can be located by comparing fluctuations in short time spans to longer periods of human activities. Each activity or process requires a different scale of space and yields differing morphological understanding about urban form (right sector in Fig. 1).

Transformation of the functionality of a building is not necessarily restricted by its original form. For example, it is common for old factory buildings to be reused as office space in urban

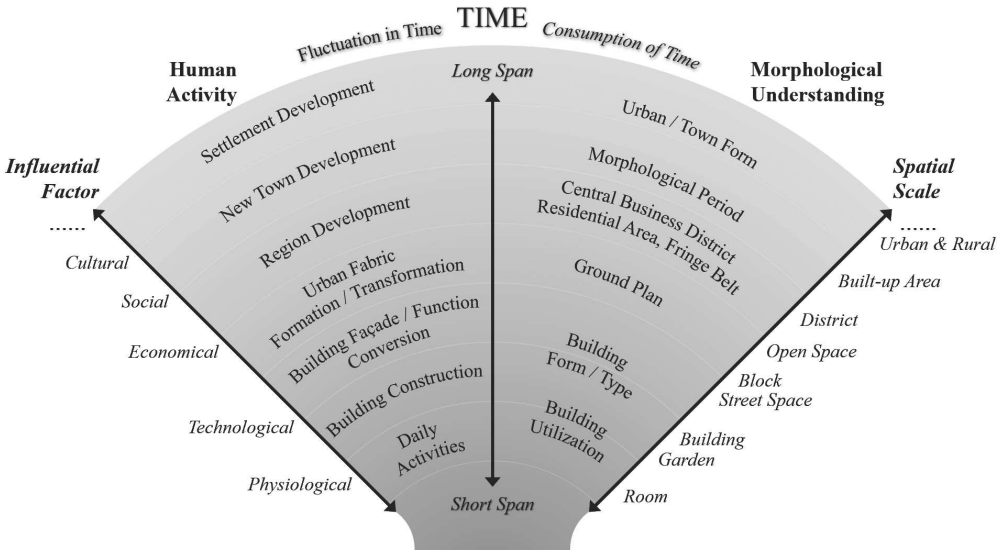

Figure 1. Conceptional framework of time, human activity, morphological understanding, influential factor, and spatial scale.

regeneration programs. However, the formative progress for transforming a building type lasts a long time, as it is necessary to examine whether a new type can adapt to various site conditions; otherwise, it is just specific practice (Caniggia and Maffei, 2001). The ground plans accommodate different kinds of morphological elements, including buildings, plots, streets, blocks, and squares. Every element takes times to modify before it can fit others together as a coherent whole. As mentioned above, central business district, residential area and fringe belt all have their own pattern of ground plans. Any cultural period that exerts different morphological influence upon the whole or any part of a town. The resulting forms will represent the socio-economic needs of that period (M.R.G. Conzen, 2004). Thus the whole urban form is a product of cumulative historical morphological periods, unless it is formed quickly for example as a new town development. According to this model, then, spatiotemporal attributes should be noted as part of morphological understanding.

Discussion

By using time spans as markers we can survey interaction between human activities, their products and the morphological understanding together. The relationship between various morphological element complexes (M.R.G. Conzen, 1962), such as their hierarchal structure, can be understood not only in their spatial scale and in how they are accommodated within this hierarchical structure, but also the time needed for its formation. Ground plans, as the highest-level element, are more stable, while building form and the utilization of land and building can be more changeable (M.R.G. Conzen, 2004). Combined with the framework, the stability of the element in the hierarchical structure is related to the time consumed in its formative processes. In other words, morphological elements formed over long periods of time cannot normally be transformed easily in short periods of time. This perspective can thus be utilized by examining the consumption of time in each element; in this way, it is easy to describe things such as the sub-orders in the layout of units, and the bound forms of morphological frames, because the factors determining the character of urban forms can be considered either dependent or independent variables as time expands or contracts.

This framework remains conceptual, as the variety of human activities and urban form research fields are greater than those mentioned above. When considering more cultural and social concepts and disciplines related to urban form research, the framework will be more complicated and composed of more elements and morphological understanding. Obviously, contributions from other researchers and academic schools regarding interaction between the urban spatial characteristics and their change over time and how this is affected by cultural values (for example M.P.

Conzen, 2001) or different social backgrounds (for example Stojanovski, 2019) should be considered widely, not just through the issues discussed above, which are principally derived from the Conzenian approach (M.R.G. Conzen, 1962, 2004). However, it is not the intention of this discussion to complete a final framework based on all contributions from urban morphology and architectural typology, instead the aim is to motivate researchers to rethink taking time as a parameter in improving our understanding of urban form.

References

Caniggia, G. and Maffei, G.L. (2001) *Architectural composition and building typology: interpreting basic building* (Alinea, Firenze).

Conzen, M.R.G. (1962) 'The plan analysis of an English city centre', in Norborg, K. (ed.) 'Proceedings of the IGU symposium on urban geography, Lund, 1960', *Lund Studies in Geography* series B 24, 383–414.

Conzen, M.R.G. (2004) 'Morphogenesis, morphological regions and secular human agency in the historic townscape, as exemplified by Ludlow', in Conzen, M.P. (ed.) *Thinking about urban form: papers on urban morphology, 1932–1998* (Lang, Oxford) 116–44.

Conzen, M. P. (2001) 'The study of urban form in the United States', *Urban Morphology* 5, 3–14.

Conzen, M.P. (2009) 'How cities internalize their former urban fringes: a cross-cultural comparison', *Urban Morphology* 13, 29–54.

Freestone, R. (2021) 'A brief history of new towns', in Peiser, R. and Forsyth, A. (eds) *New towns for the twenty-first century: a guide to planned communities worldwide* (University of Pennsylvania Press, Philadelphia) 14–31.

Gauthier, P. and Gilliland, J. (2006) 'Mapping urban morphology: a classification scheme for interpreting contributions to the study of urban form', *Urban Morphology* 10, 41–50.

Gerosa, P.G. (1999) 'The philosophical foundations of urban morphology', *Urban Morphology* 3, 44–5.

Marshall, S. and Çalişkan, O. (2011) 'A joint framework for urban morphology and design', *Built Environment* 37, 409–26.

Mugavin, D. (1999) 'A philosophical base for urban morphology', *Urban Morphology* 3, 95–9.

Oliveira, V. (2013) '*Morpho*: a methodology for assessing urban form', *Urban Morphology* 17, 21–33.

Scheer, B.C. (2016) 'The epistemology of urban morphology', *Urban Morphology* 20, 5–17.

Schumm, S.A. and Lichty, R.W. (1965). 'Time, space, and causality in geomorphology', *American Journal of Science* 263, 110–19.

Stojanovski, T. (2019). 'Swedish typo-morphology – morphological conceptualizations and implication for urban design', *ICONARP International Journal of Architecture and Planning* 7, 135–57.

Whitehand, J.W.R. (1994) 'Development cycles and urban landscapes', *Geography* 79, 3–17.

Whitehand, J. W. R. (2001) 'Changing suburban landscapes at the microscale', *Tijdschrift voor Economische en Sociale Geografie* 92, 164–84.

From types to regions: a quantitative approach to the characterization of urban form

Mariana Pizzo Diniz, CITTA – Research Centre for Territory, Transports and Environment Department of Civil Engineering, University of Porto, Rua Dr. Roberto Frias s/n, 4200-465 Porto, Portugal. E-mail: mpdarquitetura@gmail.com ORCID: 0000-0002-0340-9616, **Meta Berghauser Pont**, Department of Architecture and Civil Engineering, Chalmers University of Technology, Sven Hultins gata 6, SE-412 96 Gothenburg, Sweden, E-mail: meta.berghauserpont@chalmers.se ORCID: 0000-0002-4000-9064 and **Miguel Serra**, CITTA – Research Centre for Territory, Transports and Environment, Department of Civil Engineering, University of Porto, Rua Dr. Roberto Frias s/n, 4200-465 Porto, Portugal. E-mail: mserra@fe.up.pt ORCID: 0000-0001-9000-0706
DOI

As a natural phenomenon that underpins the spatial distribution of objects, Tobler's (1970) 'First Law of Geography' might sound modest in its formulation: "Everything is related to everything else, but near things are more related than distant things". Yet it resonates deeply with how physical

elements are arranged in space. Without such a foundation, one could not begin to describe an area (or a region) of roughly homogeneous objects, or even understand the sequence and linkage within spatially organized systems. From a biological perspective, similar body cells are grouped contiguously to form tissues; in a similar way, topographic surfaces vary linearly, which prevents an erratic arrangement of flat areas and slopes. The context and scale might be different; but the same principle underpins both examples. In fact, the whole concept of spatial analysis relies on this groundwork (Grekousis, 2020).

This has obvious connections to the urban landscape and its spatial arrangements. Specifically, in the field of urban morphology, where the historical and geographical backgrounds converge to illuminate the city's formative processes, there are several concepts that also, directly or indirectly, reflect the disposition of similar things within a consonant neighbourhood. The classic morphological literature identifies, for example, plan units, urban tissues, fringe belts or morphological regions (Conzen, 1960, 1988; Whitehand, 1977; Caniggia and Maffei, 1979; Kropf, 1998).

The method of morphological regionalization, as defined by Conzen (1960, 1988), stands out as a very important contribution to the study of the historico-geographical structure of the urban landscape. Central to that method is the understanding of the way in which urban landscapes are structured: the existence of unitary areas which comprise individualized combinations of the town plan, building fabric and land and building utilization – delimited by their degree of internal morphological similarity (Barrett, 1966; Whitehand, 2009; Whitehand *et al.*, 2011; Gu, 2020; Oliveira and Yaygin, 2020).

Once these inner relations are identified, the underlying structural pattern becomes explicit: a patchwork of regions with unique combinations of urban form elements and their types, distinct from their surroundings, which may be delimited based on their degree of internal similarity. Although some recent studies (Chen, 2018; Allahmoradi and Comert, 2021; AlSadaty, 2021; Li and Zhang, 2021) draw on computational methods to identify typomorphologies (topological analysis), the basic analytical method to identify those homogeneous regions remains based on visual analysis and on the personal expertise of the analyst (Larkham and Morton, 2011). These studies are also largely restricted to historical urban centres, and do not explore contemporary urban tissues.

This constrains the application of the method in a scalable and reproducible way, something that is needed if we want to compare regions across the globe, in order to discuss global morphological similarities and differences, focusing on the general instead of the particular in each case study, as is argued by Oliveira and Yaygin (2020). One way to make the method scalable and reproducible is to translate the conventional analytical procedures into quantitative methods that allow automation.

Such translation into quantitative methods requires objective definition of the procedural decisions, which leads to precision in terminology and rigour in method. This is not only useful for automation *per se*, but it should also prove beneficial for the field of urban morphology itself, because then studies can be made reproducible, whether or not automated procedures are employed, resonating with one of the other gaps identified by Oliveira and Yaygin (2020).

As has been mentioned, the traditional framework of morphological regions is centred in the combination of typomorphologies, which yield the delimitation of homogeneous areas. We perceive this underlying premise as a link with other quantitative approaches in urban morphology, developing typological descriptions of the urban environment using computational methods (such as spatial analysis and statistical modelling), to characterize individual urban form elements into typomorphologies (Berghauser Pont and Haupt, 2005; Gil *et al*., 2012; Serra *et al*., 2017; Berghauser Pont *et al*., 2019; Bobkova, 2019).

This now significant body of literature on multivariate descriptions of urban form elements and their clustering in order to define types provides a solid basis for the next step. We propose to move from the identification and classification of types of individual elements to their combination into homogeneous areas within the city; that is, of typomorphological regions. The challenge to define this combination of patterns within the four morphological elements (the street network, street-blocks, plot system and buildings) is twofold: first, the use of a spatial unit of analysis, and secondly, the aggregation (combination) of the individual elements. Obviously, these two challenges are interconnected.

The possible paths to address these tasks are still being investigated. However, we can already offer some considerations. We believe that the regions aggregating the built form components should emerge from the characteristics of the elements themselves, rather from the delimitation

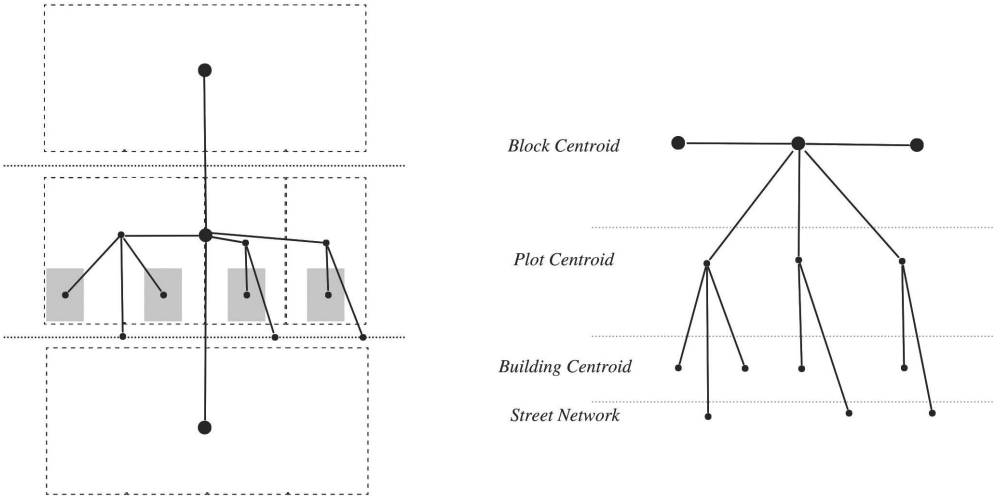

Figure 1. Representation of the spatial relations of built form arrays in different systems.

of an artificial tessellation of polygons (Voronoi diagrams, Delaunay triangulations) which combine the variables (Araldi and Fusco, 2019; Fleischmann *et al*., 2021). Therefore, the resulting regions should reflect the optimal distance at which the morphological variability of the elements is minimized (homogeneity maximized), making their limits expectedly variable.

Spatial autocorrelation, which essentially reflects a periodicity in the spatial distribution of values, can be an indicator of the disposition of regions with a high intensity of spatial clustering among their elements. By following this bottom-up approach, the method becomes transferrable: as the observed characteristics of the urban form components vary significantly within different geographical contexts, these differences can be equally represented in the size of the spatial unit. It is important to clarify that the spatial unit of analysis is not a region. Instead, the spatial units are the elements being aggregated into regions, based on the merging of morphologically similar adjoining units. Once there is an indication of the size of the spatial unit, one needs to decide how measures will be aggregated. Buildings, parcels, or blocks could be used as aggregating units, from which all the adjacent elements within the given distance of the unit could be combined.

Although urban form elements are independent entities, they are also spatially linked and can thus be represented as a connected set, or graph (Krüger, 1979, 1981): buildings are connected to plots, which are grouped into street-blocks and linked to the street network (Figure 1). Furthermore, the urban form components may be organized hierarchically, following their discriminant potential in the specification of the several regions. Following Krüger (1979, 1981), we aim to establish this network in order to represent the spatial relations of the elements as well as their discriminant weights, and use it as the underlying structure on which regions will be identified, before being mapped in geographic space.

Nevertheless, with such challenging proposition in mind, an important remark is necessary: the processes of characterization and of valuing of the urban landscape are two different practices. Although often regarded as one, it is important to distinguish them as separated processes, especially when aiming to automate the delimitation of typomorphological regions. One is the description of the physical character of the urban form components within a region, while the second is the assessment and interpretation of the cultural-heritage value or other valued practices linked to its components. The process of valuing is essentially a human activity because it relates to the social, historical, and cultural meaning of the object and the aims which society collectively agrees upon. The automated procedures we propose are targeting the descriptive part, developing a reproduceable and scalable method and, through that, allowing further comparative studies. Eventually, but not primarily, it may also support the urban heritage

valuing and conservation processes (Zancheti and Jokilehto, 1977; Bandarin and van Oers, 2012).

References

Allahmoradi, M. and Comert, N.Z. (2021) 'A new complementary model for integrating historico-geographical and configurational approaches: the case of Famagusta', *Urban Morphology* 25, 115–36.

AlSadaty, A. (2021) 'Applications of morphological regionalization in urban conservation: the case of Bulaq Abulela, Cairo', *Urban Morphology* 25, 13–49.

Araldi, A. and Fusco, G. (2019) 'From the street to the metropolitan region: pedestrian perspective in urban fabric analysis', *Environment and Planning B: Urban Analytics and City Science* 46, 1243–63. https://doi.org/10.1177/2399808319832612

Bandarin, F. and van Oers, R. (2012) *The historic urban landscape* (Wiley, Chichester).

Barrett, H.J. (1996) 'Townscape change and local planning management in city centre conservation areas: the example of Birmingham and Bristol', unpublished PhD thesis, University of Birmingham, UK.

Berghauser Pont, M. and Haupt, P. (2005) 'The spacemate: density and the typomorphology of the urban fabric', *Nordisk Architekturforskning* 4, 55–68.

Berghauser Pont, M., Stavroulaki, G., Bobkova, E., Gil, J., Marcus, L., Olsson, J., Sun, K., Serra, M., Hausleitner, B., Dhanani, A. and Legeby, A. (2019) 'The spatial distribution and frequency of street, plot and building types across five European cities', *Environment and Planning B: Urban Analytics and City Science* 46, 1226–42. https://doi.org/10.1177/2399808319857450

Bobkova, E. (2019) 'Towards a theory of natural occupation: developing theoretical, methodological and empirical support for the relation between plot systems and urban processes'. Unpublished PhD thesis, Chalmers University of Technology, Gothenburg, Sweden.

Caniggia, G. and Maffei, G.L. (1979) *Lettura dell'edilizia di base* (Marsilio Editori, Venezia).

Chen, C.-H. (2018) 'A military-related townscape: the case of Zuoying, Taiwan', *Urban Morphology*, 22, 53–68.

Conzen, M.R.G. (1960) *Alnwick, Northumberland: a study in town-plan analysis*, Institute of British Geographers Publication 27 (George Philip, London).

Conzen, M.R.G. (1988) 'Morphogenesis, morphological regions and secular human agency in the historic townscape, as exemplified by Ludlow', in Denecke, D. and Shaw, G. (eds), *Urban historical geography* (Cambridge University Press, Cambridge) 253–72.

Fleischmann, M., Feliciotti, A., Romice, O. and Porta, S. (2021) 'Methodological foundation of a numerical taxonomy of urban form, *Environment and Planning B: Urban Analytics and City Science* 49, 1283–99. https://doi.org/10.1177/23998083211059835

Gil, J., Beirão, J.N., Montenegro, N. and Duarte, J.P. (2012) 'On the discovery of urban typologies: data mining the many dimensions of urban form', *Urban Morphology* 16, 27–40.

Grekousis, G. (2020) 'Spatial autocorrelation', in Grekousis, G. (ed.) *Spatial analysis methods and practice: describe – explore – explain through GIS* (Cambridge University Press, Cambridge) 207–74.

Gu, K. (2020) 'The teaching of urban design: a morphological approach', *Journal of Planning Education and Research* 14, 472–81. https://doi.org/10.1177/0739456X18775480

Kropf, K.S. (1998) 'Typological zoning', in Pretuccioli, A. (ed.) *Typological process and design theory* (Aga Khan Program for Islamic Architecture, Cambridge, MA) 127–40.

Krüger, M.J.T. (1979) 'An approach to built-form connectivity at an urban scale: system description and its representation', *Environment and Planning B: Planning and Design* 6, 67–88. https://doi.org/10.1068/b060067

Krüger, M.J.T. (1981) 'An approach to built-form connectivity at an urban scale: modelling the disaggregation of built forms by types', *Environment and Planning B: Planning and Design* 8, 57–72. https://doi.org/10.1068/b080057

Larkham, P.J. and Morton, N. (2011) 'Drawing lines on maps: morphological regions and planning practices', *Urban Morphology* 15, 133–62.

Li, X. and Zhang, Y. (2021) 'Combining the historico-geographical and configurational approaches to urban morphology: the historical transformations of Ludlow, UK and Chinatown, Singapore', *Urban Morphology* 25, 23–41.

Oliveira, V. and Yaygin, M.A. (2020) 'The concept of the morphological region: developments and prospects', *Urban Morphology* 24, 35–52.

Serra, M., Gil, J. and Pinho, P. (2017) 'Towards an understanding of morphogenesis in metropolitan street-networks', *Environment and Planning B: Urban Analytics and City Science* 44, 272–93. https://doi.org/10.1177/0265813516684136

Tobler, W.R. (1970) 'A computer movie simulating urban growth in the Detroit region', *Economic Geography* 46, 234–40. https://doi.org/10.1126/science.ns-15.362.18

Whitehand, J.W.R. (1977) 'The basis for an historico-geographical theory of urban form', *Transactions of the Institute of British Geographers* NS2, 400–16. https://doi.org/10.2307/621839

Whitehand, J.W.R. (2009) 'The structure of urban landscapes: strengthening research and practice', *Urban Morphology* 13, 5–27.

Whitehand, J.W.R., Gu, K., Whitehand, S.M. and Zhang, J. (2011) 'Urban morphology and conservation in China', *Cities* 28, 171–85. https://doi.org/10.1016/j.cities.2010.12.001

Zancheti, S.M. and Jokilehto, J. (1997) 'Values and urban conservation planning: some reflections on principles and definitions', *Journal of Architectural Conservation* 3, 37–51. https://doi.org/10.1080/13556207.1997.10785179

A new map of Alnwick

Terry R. Slater, School of Geography, Earth and Environmental Sciences, University of Birmingham, Birmingham, B15 2TT, United Kingdom. E-Mail: t.r.slater@bham.ac.uk. ORCID: 0000-0001-6494-5829
DOI

The urban morphological community may be interested to learn that The British Historic Towns Atlas, since its revival in the last ten years, has been publishing the 1:2500 map, which is the basis of each town atlas, as a convenient folded map in card covers for a very reasonable price of £9.99 GBP. In most instances, these maps have preceded the publication of the atlas volume proper and have thereby served to publicize each atlas project. There are thus maps of Windsor and Eton (2013), York (2015), Winchester (2016), and Oxford (2016), all of which are also now published as full atlas volumes. The Historic Towns Trust (which oversees the British atlas series) has also published these maps for Hull (2017) and Coventry (2021) as part of these cities' 'City of Culture' celebrations in 2017–18 and 2021–12 respectively, and there are maps of Medieval London (2021), Tudor London (2018), and of Bristol in 1480 (2020) which revisit cities previously published in the Historic Towns Atlas series. The most recent of these historical map publications are for Canterbury (2021), Beverley (2022), and Alnwick and Alnmouth (2021), where work is ongoing for publication of full atlases at a later date. Future publication plans include Swansea, Bath and Lincoln.

These folded maps are titled in a variety of ways and cover a variety of time periods depending upon the local organization which helped to prepare and fund the necessary research (see Appendix). The Alnwick map is titled 'Historical maps of Alnwick and Alnmouth from earliest times to 1918'. The maps are created using the British Ordnance Survey 1:2500 map series, published between 1912 and 1925, redrawn and geo-referenced, as a base by Giles Darkes, the Trust's cartographer. They are in full colour using the conventions devised for the atlas maps (Figure 1) and, as well as the map, have a substantive gazetteer on the back of the sheet, together with historical photographs. Neither are as complete as in the final atlases, but there is a considerable amount of historical information which is summarized in an introductory text on each map. Though their price suggests that they are unashamedly aimed at a more popular market than the full atlases, they retain the scholarly basis of the latter, though without the substantive texts and gazetteers, and the large number of map and picture reproductions, that distinguish the atlas volumes.

On the Alnwick and Alnmouth map sheet, no less than 14 different building types are recognized by subtly differentiated colours, seven of which are also characterized by period of origin (three medieval and four post-medieval); for example, 'post medieval buildings built 1603–1830 still standing in 1918'. The dates are determined by surviving historical maps of the two towns. There are also six land use categories for the fields, gardens and woodlands surrounding the town. This is therefore a composite map showing everything from long-demolished medieval institutional buildings to a First World War army camp set up in the grounds of Alnwick Castle.

Alnmouth is the medieval out-port of Alnwick, some four miles down-river, and was a one-street town in its own right. Its map occupies about a quarter of the back of the Alnwick sheet, at the same scale. Also on the back are reproductions of historical maps, of Alnmouth in 1624, and of Alnwick in 1760 (part of Isaac Thompson's *A Plan of the Town & Castle of Alnwick*), providing some of the evidence for the main reconstruction map, and there are 12 small reproductions of engravings

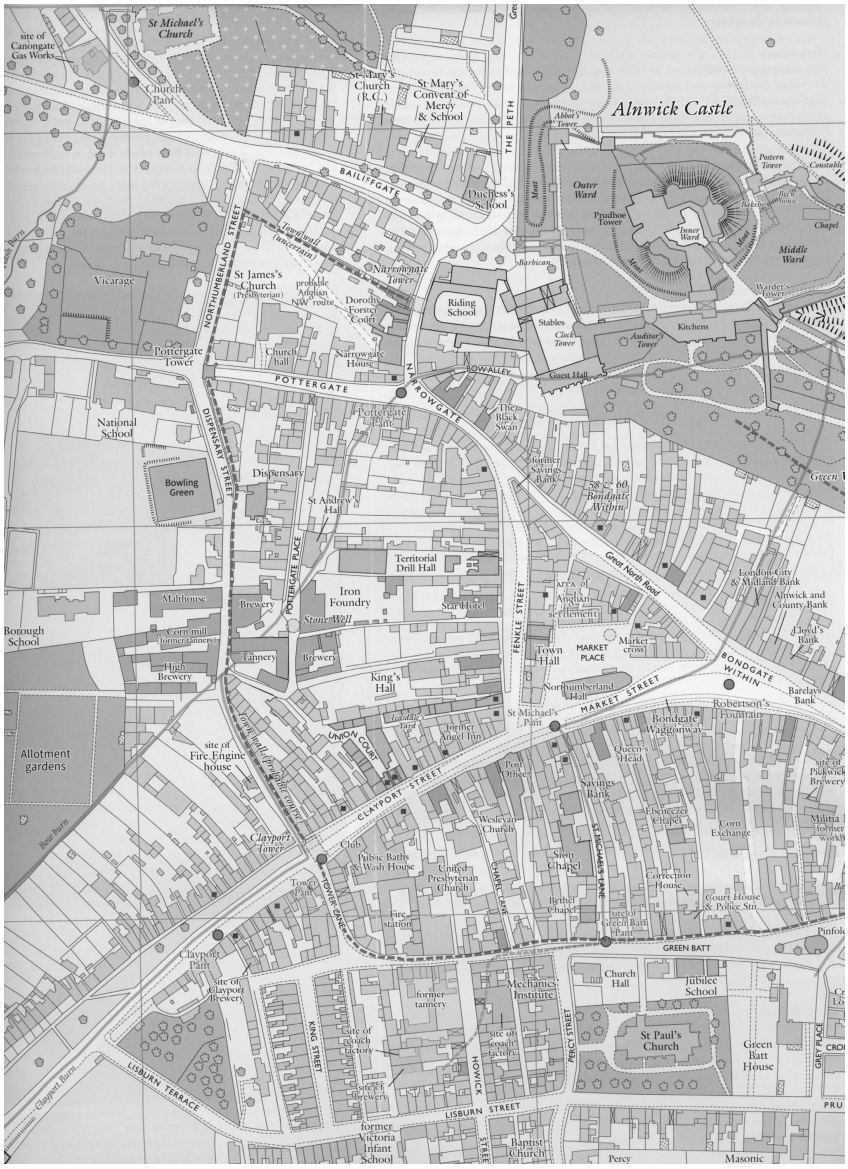

Figure 1. Part of the Alnwick map showing the historical town centre and castle (reproduced with permission of the Historic Towns Trust).

and photographs of the two towns. The texts of the gazetteer entries are referenced back to the grid squares on the map and provide brief vignettes on the development of spaces (the Market Place and Bailiffgate for example) and streets, as well as of institutional buildings such as schools, churches and the like. The historical introduction fills the interior of the card cover and has been provided by the Alnwick Civic Society.

If we ask whether the map is helpful to researchers, the answer must be a qualified yes. The gazetteer provides a quick reference to the dates of principal buildings; the map is attractive aesthetically in its colour and design, and it is clear and easy to read. It could be used to reconstruct any of M.R.G. Conzen's analytical maps (Conzen, 1960) whilst additional historical maps of both Alnwick and Alnmouth are available on the Northumberland Archives website (https:communities.northumberland.gov.uk/Alnwick_C16.htm). There is also information that cannot be found on other cartographic sources such as the location of public houses selling alcohol before 1918 and, especially, the plan and location of medieval buildings long demolished. However, the map must be used with caution especially if interested in the building

category ‘post-medieval buildings built after 1830 still standing in 1918’. In fact, only major institutional buildings are so categorized, together with some nineteenth-century housing outside the walls such as the ‘Tyneside terraces’ of King Street and development around the railway station (presumably because they are referenced in the gazetteer), but other ‘post 1830–pre 1918’ housing development is categorized as ‘all other buildings’. This seems to make little sense to me. Either all ‘post 1830–pre 1918’ buildings outside the walls should be coloured appropriately, or none should have been. The possibility of confusion is substantial with the decisions taken in this instance. Critiques of the multi-period maps previously published in both the British and other national Historic Towns Atlases are numerous (Slater, 1996; M.P. Conzen, 2008; Simms, 2015) and attempts are now under way to mitigate these by publishing interactive electronic maps where GIS systems can be used to add historical data sets to the maps, but this is both expensive and labour-intensive work requiring multi-disciplinary teams of people and a secure institutional base. In the meantime we should appreciate these historical reconstruction maps, but with a constant critical eye.

References

Conzen, M.P. (2008) ‘Retrieving the pre-industrial built environments of Europe: the Historic Towns Atlas programme and comparative morphological study’, *Urban Morphology* 12, 143–56.

Conzen, M.R.G. (1960) *Alnwick, Northumberland: a study in town-plan analysis*. Institute of British Geographers Publication 27 (George Philip, London).

Simms, A. (2015) ‘The European Historic Towns Atlas project: origins and potential’, in Simms, A. and Clarke, H.B. (eds) *Lords and towns in medieval Europe. The European Historic Towns Atlas project* (Ashgate, Farnham) 13–32.

Slater, T.R. (1996) ‘The European Historic Towns Atlas’, *Journal of Urban History* 22, 739–49.

Appendix: The Town and City Historical Maps Series

No authors are given because texts on the maps are by a variety of scholars.

(2021) ‘A map of medieval London. The City, Westminster & Southwark 1270 to 1300’ (The Historic Towns Trust).

(2018) ‘A map of Tudor London. England’s greatest city in 1520’ (The Historic Towns Trust).

(2022) ‘An historical map of Beverley. Medieval, Georgian & Victorian town’ (The Historic Towns Trust).

(2022) ‘An historical map of Canterbury from Roman times to 1907’ (The Historic Towns Trust).

(2021) ‘An historical map of Coventry. From medieval to industrial city’ (The Historic Towns Trust).

(2017) ‘An historical map of Kingston upon Hull. From medieval town to industrial city’ (The Historic Towns Trust).

(2016) ‘An historical map of Oxford from medieval to Victorian times’ (The Historic Towns Trust).

(2016) ‘An historical map of Winchester from medieval times to 1800’ (The Historic Towns Trust and The Winchester Excavations Committee).

(2020) ‘Bristol in 1480. A medieval merchant city’ (The Historic Towns Trust).

(2021) ‘Historical maps of Alnwick & Alnmouth from earliest times to 1918’ (The Historic Towns Trust).

(2013) ‘Historical map of Windsor & Eton about 1860’ (The Historic Towns Trust).

(2015) ‘Historical map of York from medieval times to about 1850’ (The Historic Towns Trust and the York Archaeological Trust).