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APPROACHES AND METHODS

IN ARCHITECTURAL RESEARCH

Editors: Anne Elisabeth Toft, Magnus Rönn and Morgan Andersson

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FOREWORD

Anne Elisabeth Toft and Magnus Rönn

The Nordic Association of Architectural Research (NAF/NAAR) is an independent and not-for-profit association of architectural researchers from universities and schools of architecture in the Nordic countries.

The present book, published by NAF/NAAR, is the proceedings publication from the association's 2019 symposium which was titled *Approaches and Methods in Architectural Research.*

The symposium was organized by NAF/NAAR in collaboration with researchers from the Department of Architecture and Civil Engineering at Chalmers University of Technology in Sweden, which also hosted the event on 13–14 June 2019.

The Department of Architecture and Civil Engineering at Chalmers University enthusiastically engages in research that queries architecture as a so-called 'making discipline' and 'material practice'. It has developed a keen interest in and knowledge about architectural research that specifically applies design- and practice-based methods such as projective research, often combined in transdisciplinary modes with methods adapted from scientific disciplines, the social sciences, the humanities, and the fine arts.

Focusing its discussions on a research interest shared by NAF/NAAR and its Swedish peers, the 2019 NAF/NAAR symposium pursued the current development of approaches and methods in architectural research.

During the symposium, twenty-four international researchers presented papers. All eleven articles in this publication—except those by the invited keynote speakers Isabelle Doucet, Professor of Theory and History of Architecture at Chalmers University of Technology, and Karl Kropf, Senior Lecturer in Urban Design and Historic Conservation at Oxford Brookes University and Director of Built Form Resource, an urban design, landscape,

and heritage consultancy—were submitted to a double-blind peer-review process, based on a peer-review template developed by NAF/NAAR.

As President and Vice-President of NAF/NAAR, we extend our sincere thanks to our collaborators at Chalmers University of Technology: Marie Strid, Julia Fredriksson, Morgan Andersson, and Fredrik Nilsson, who were instrumental in conceptualizing the theme of the symposium and organizing the event. We would also like to express our gratitude to the invited keynote speakers Isabelle Doucet and Karl Kropf, to all of the individual authors who submitted articles to the publication, and to the many peer reviewers who have supported NAF/NAAR and its work by offering their time and professional expertise for reviewing the articles in this publication.

Finally, we would like to direct our thanks to our financial benefactors. The publication of the present book was made possible thanks to the generous support of Chalmers University of Technology and the foundation ARQ.

Anne Elisabeth Toft
President of NAF/NAAR

Magnus Rönn
Vice-President of NAF/NAAR

INTRODUCTION

Anne Elisabeth Toft, Magnus Rönn, and Morgan Andersson

This proceedings publication explores approaches and methods in architectural research. The architectural professions are currently undergoing profound changes in terms of education, design work, and research. This calls for specifically articulated research competence, methods, and processes. It also necessitates a re-examination of the notion of architectural research, how it is interpreted in different research contexts, and which role it plays in architecture. Changes in design-, practice-, and arts-based approaches have resulted in new disciplines and new academic research, such as, for example, research by design, curriculum research, and practice-based research. Novel concepts such as transdisciplinary and post-normal science are also embraced by the research communities at universities and schools of architecture, and among architecture professionals an increasing interest in research and knowledge production has resulted in fruitful collaborations between the contexts of practice and academia. Seeking to understand the driving forces behind the evolution of architecture as a professional discipline, an academic subject for teaching, and a distinct field of research, Chalmers University of Technology and the Nordic Association of Architectural Research (NAF/NAAR) joined forces in organizing the 2019 NAF/NAAR Symposium: *Approaches and Methods in Architectural Research*.

Arguing that there is a significant need for up-to-date architectural knowledge in the current transformation of built environments all around the world, the symposium particularly focused on the different procedures by which architectural knowledge is systematically initiated, tested, and discursively formulated in diverse research contexts. Against this background, it also sought to explore how teaching and research can inform each other.

The symposium posed the questions: How can we produce relevant knowledge that helps us to understand the complexities in contemporary architecture, landscape architecture, and urban planning? In what way can we strengthen

the relations between research and practice? How can we understand the connection between methods and the articulation of architectural knowledge?

The Nordic countries have a long tradition of architectural research and formalized doctoral education.[1] The Scandinavian model, with its strong environments for innovation, societal impact, and citizen participation, is currently gaining more and more interest internationally.[2] It is a model that NAF/NAAR thinks should be further investigated and reflected upon, thus it and its methods and approaches in architectural research, education, and practice were central to the discussions at the symposium in Gothenburg.

Against this background, NAF/NAAR and the Department of Architecture and Civil Engineering at Chalmers University invited both academic scholars and professional practitioners to participate in the symposium. Providing a qualified platform to address the future challenges of the architectural profession, the discussions at the symposium outlined how architectural means and tools can be used as instigators and models for knowledge production and dissemination. They also framed how academia and practice can interact in architectural research, showing how differences and similarities between research projects conducted at universities, art academies, and architectural offices play out.

This publication compiles eleven articles and essays based on presentations given at the symposium. The written contributions are loosely gathered and grouped within given categories, which also structured the symposium sessions and the related discussions: 'Material, Building Design, and Programming'; 'Urban, Rural, and Regional Landscapes'; 'Renegotiating Architectural Practice and Profession'; and 'Heritage, Conservation, and History'.

Beginning with the articles written by the symposium's keynote speakers—Isabelle Doucet, professor of the theory and history of architecture at Chalmers University of Technology, and Karl Kropf, senior lecturer in urban design and historic conservation at Oxford Brookes University—the publication unfolds its theme in diverse ways that reflect its complexity. It broadly maps and presents a number of different discursive positions and research foci, spanning from thoughts on architectural writing as a form of scholarship in its own right to descriptions of architectural practices and the use of quantitative and qualitative methods in architectural heritage management.

In her article 'Tales of Cities as (Resistant) Practices', the architectural theoretician Isabelle Doucet reflects on how to write about architecture and urbanism. In doing so, she asks herself what holds relevance, and if she can write about it in ways that respect the situated nature of spaces and buildings. In her writings, she aims to bridge the gap between architectural theory and practice by using so-called situated and relational approaches. Confessing that writing 'situated stories' is indeed challenging, Doucet believes that such writing and its performance can expand the discourse of architecture and lead to a new critical engagement with architecture and the city.

The contribution by Karl Kropf is called 'Multiple Depth Analysis and the Urban Design Consequences of Semi-Public Realms'. In his article, he elucidates semi-public realms—that is, shared circulation spaces—in the built environment and visualizes the concept using models in order to gain a better understanding of how these spaces operate. This approach to investigating semi-public realms is based on a combination of four key conceptions of so-called morphological depth: a) configurational depth, measured as steps between two spaces; b) territorial depth, measured as a sequence of public-private spaces; c) structural depth, measured as the complexity of built form; and d) legal regimes, measured as the relationship between occupation and controlling agents. The first three understandings of morphological depth are related to architecture and urban design as built form. Legal regimes, on the other hand, are associated with power, surveillance, and regulations through private or public entities. In the article, the four conceptions are mapped by Kropf and presented in diagrams of generic structures of building forms. The objective is to translate research findings into design practices supporting the benefits of semi-public realms and to minimize misuse. Kropf's interest lies in developing a better understanding and sharpening the analysis and critique of semi-public spaces and in improving their design.

Material, building design, and programming

This first section of the book includes two articles. They deal with multidisciplinary research and practice and the methods and means for mapping, orchestrating, analysing, and communicating complex design issues within architectural structures.

Kiran Maini Gerhardsson opens the discussion in this section with a contribution called 'Benefits and Challenges of Adding Participant Photography to Qualitative Residential Research'. Addressing methods and approaches in

architectural research, her article reflects on the benefits and challenges of adding participant-produced photographs to qualitative interviewing. Based on two qualitative studies carried out in Lund and Malmö, Sweden, focusing on how residents use their electric luminaires and on the daylight coming through window openings in their home environments, the author pursues a discussion of the methods used in both studies. Her article supports findings in recent literature on qualitative research, namely that adding participant-produced photographs to qualitative interviews has multiple benefits in terms of knowledge production, from the perspective of both the researchers and the participants. Gerhardsson argues that the identified benefits, in terms of data quality, outweigh the disadvantages, such as the longer time needed for data collection, although some reflecting comments in her article also point out a number of issues that need to be addressed. One such issue is the necessity of identifying the relationship between a researcher-driven approach versus a more respondent-controlled one, which will affect the outcome. Another issue, as a result of the delegated work, is that significant factors may be missed in the research.

The second article in this section is called 'Biased Building Regulations for Windows?' by Thomas H. Kampmann. This article investigates how windows are constructed, regulated, and how they perform. The objective is to develop a tool enabling professionals to better understand the pitfalls of energy consumption for windows. There are two approaches in Kampmann's article. First, he undertakes a detailed examination of selected paragraphs in building regulations and analyses how windows and energy are expressed in the Danish building regulations 2015 and 2018. Secondly, he compares his finding to similar regulations in Finland, Norway, and Sweden. The comparative analyses reveal similarities and differences in window design and energy consumption in the Nordic countries. According to Kampmann, up to 1995 all windows in Denmark were treated equally with the simple rule that the U-value (thermal transmittance) should be lower than 1.8 kWh/m^2. Since then, the regulations have become more complex, and the new parameters make it almost impossible for architects and building engineers to select the most energy-efficient windows in Denmark. Kampmann's solution to this problem is a website providing reliable data on windows in terms of sustainability, maintenance, noise reduction, energy performance, and economy. On a general level, the article points out the need for information that is independent of manufacturers.

Urban, rural, and regional landscapes

The second section in this publication embraces four articles. They discuss contemporary approaches and methods in urban design, planning research, and practice, shedding light on how the architectural discipline can understand and tackle complexities within urban processes and produce knowledge for the future design of cities and metropolitan regions.

Ann Legeby starts the discussion in this section with a contribution titled 'Developing Station Communities: Alternative Approaches and Perspectives on Access'. The predominant paradigm of 'concentric centrality' as a model for urban development near stations, whereby high densities are encouraged within one kilometre, is here challenged in the context of smaller stations. Her article focuses on urban form and its configurative properties in connection with the possibility of opening new train stations in the Västra Götaland region in Sweden. The regional authorities aim to strengthen local labour markets, sustainable commuting possibilities, and development outside of metropolitan areas. Legeby advocates a shift from 'node thinking' to 'network thinking', where landscape conditions, barrier effects, visibility, and access in relation to key functions are taken into account, opening up the field for design strategies that are relevant for small communities and avoiding a narrow focus on transportation aspects. Nodes or points in the city landscape foster 'to-and-from' movement and risk being counterproductive from a social and cultural perspective. In smaller communities, the co-location of different facilities generates synergies and is essential for supporting local life and social processes.

Tony Svensson continues the examination of station communities and regional planning processes in the Gothenburg region. His contribution is called 'A CAS Perspective on Planning for Energy-Efficient Station Communities'. CAS, which stands for complex adaptive systems, is a broad concept for cities, communities, and regions characterized by a diversity of niches, regimes, landscapes, built structures, and planning actors. Svensson connects CAS to a paradigm shift in planning, changing focus from mobility, flows, and nodes to accessibility to places, qualities, and functions. Svensson's study on station communities takes place in the Gothenburg region and includes eleven municipalities along railways expanding in three directions from the city centre. The vision for the region promotes this development. CAS can, from a perspective of context, be useful in identifying problems, needs, and opportunities and in formulating strategies for planning an energy-efficient, clima-

te-smart, and sustainable society. Key concepts from a transport perspective, include the question of the station community's accessibility (distance), the social functions (diversity), and the functions for those who live and work in the station community (density), along with the station communities themselves (size and context). These concepts can be seen as a roadmap for further investigation of station communities in the metropolitan area.

'Potentials of Light in Urban Spaces Defined through Scenographic Principles', authored by Mette Hvass and Ellen Kathrine Hansen, presents methods and approaches used in studies of light for urban spaces. The two authors investigate how so-called scenographic principles for the use of electric lighting in theatres can provide inspiration for lighting design that supports everyday activities in the city. According to Hvass and Hansen there is a general need for better outdoor lighting in most cities since it is often designed merely to meet the requirements of brightness levels, for accessibility and safety. The perceived qualities of electric light, its aesthetic and affective values, however, are mostly neglected and not satisfactorily explored. Drawing on theories within scenography, urban design, social science, and lighting design, the two researchers argue that it is possible to use scenographic principles to create lighting in the city at night that enhances the connection between space, people, and light for a richer visual and social experience of the illuminated urban space. Pointing out the important architectural and social potential of electric light in the city, the article promotes scenographic principles as a qualitative tool in lighting design.

The last article in this section is 'Urban Design: Science, Art, or a Scientifically Informed Creative Practice?' by Jarre Parkatti, who wants to contribute to recent debates about the disciplinary autonomy of urban design. In his article, he examines the theoretical and methodological foundation of the discipline of urban design based on a critical review of the writings of Alexander Cuthbert and his questioning of the existence of scientific urban design knowledge. In the article, Cuthbert's discursive positioning, and his understanding of the role of social science and of urban design as a discipline, are discussed up against those of other scholars such as Mike Biddulph, Matthew Carmona, Stephen Marshall, Kim Dovey, and Elek Pafka, among others. In the article, Parkatti pursues the discursive debate, reflecting on the many different kinds of knowledge seemingly central to urban design theory and exploring to what extent this theory is 'scientific or normative' and what its possible scientificity means.

Heritage, conservation, and history

This third and last section in the book contains three articles focusing on architectural history and cultural heritage as significant avenues of recourse for future architectural design. More specifically, they deal with the methods and approaches that define and value architectural heritage as well as the discourses that govern them.

The article 'Swedish Prefabricated Houses in the Saudi Arabian Oil Fields', authored by Abdulaziz Alshabib and Sam Ridgway, discusses methods and approaches that have sustained the introduction of modern Western architectural design and industrialized construction techniques in Saudi Arabia during the twentieth century. From the 1940s, Swedish prefabricated timber houses have been imported to the Saudi Arabian oil fields. According to Alshabib and Ridgway, the buildings were originally ordered by the Arabian American Oil Company (Aramco) to accommodate its rapidly expanding workforce of both locals and expatriates, and many Swedish, Scottish, and English architects and builders accompanied the prefabricated houses to the building sites. By reflecting on the Swedish prefabricated houses and the architectural changes they helped to establish in Saudi Arabia, the authors aim to theorize and historically contextualize the Saudi government's current initiative to build one million affordable homes by 2030, using industrialized construction methods. The article concludes that the Swedish prefab houses, although both successful and popular in the Saudi oil camps, did not translate more widely into the modern Saudi Arabian urban environment, like examples in many other countries, such as Britain and Australia. The reason for this is due to the choice of material—timber—being regarded as temporary, non-traditional, and second class, and it is also scarce in the region.

Mari Oline Giske Stendebakken and Nils Olsson, both specializing in cultural heritage, have researched why a number of institutions in Norway are moving from protected buildings into new structures, while the historical buildings are derelict. In the article 'Typical Fallacies regarding Potentially Vacating Protected Buildings', they claim that this unfortunate trend, which most often has negative consequences for the protected buildings and their maintenance, is largely based on incorrect information about the buildings and their potentials. According to the authors, a significant factor for the abandonment of such structures is a prejudice towards older buildings in the documents that support politicians' decisions. This delicate issue, not only restricted to Norway, leads to the authors' critical discussion of how

protected buildings are valued, and the methods and tools which are used to define their quality assurance.

In their article 'Heritage Beyond a Subcategory of Cultural Ecosystem Services in Swedish Landscape Management', Susanne Fredholm and Freja Frölander discuss the so-called ecosystem services (ES) approach. Widely used in Swedish planning, it aims to identify and valorize the multiple benefits that ecosystems provide to human well-being. According to the authors, the concept of ecosystem services, however, has no legal definition and is currently not included in any legislation. While keeping a focus on the role of heritage management in ecosystem conservation, the article sets out to investigate the ecosystem services approach and what defines it. The authors' research is based on a review and analysis of Swedish national, regional, and local ecosystem services guidelines and a number of semi-structured interviews with ecosystem services practitioners and experts in Sweden.

Addressing what methods and approaches architects, landscape architects, and urban designers use in their work, why and how, this publication initiates critical reflection on their relevance, qualities, pitfalls, representations, and discursive positionings. It also suggests that new approaches and methods are worth considering. Not just because research and architectural knowledge are evolving practices, and different institutions, infrastructures, and frameworks produce different kinds of knowledge and in different ways, but because of the many future global perspectives and challenges that society at large is facing. Well aware that a selection of articles will give a mere glimpse of the larger discursive picture, it is, nevertheless, our hope that this proceedings publication will lend momentum to further discussions on architecture and architectural research, with a focus on the connection between approaches and methods and the articulation of architectural knowledge.

NOTES

[1] Further information on this subject can be found in *The Production of Knowledge in Architecture by PhD Research in the Nordic Countries*, Proceedings Series 2018-1.

[2] Fredrik Nilsson and Halina Dunin-Woyseth, 'Building (Trans)Disciplinary Architectural Research: Introducing Mode 1 and Mode 2 to Design Practitioners', in *Transdisciplinary Knowledge Production in Architecture and Urbanism: Towards Hybrid Modes of Inquiry*, edited by Isabelle Doucet and Nel Janssens (Dordrecht: Springer, 2011), pp. 79–96.

MULTIPLE DEPTH ANALYSIS AND THE URBAN DESIGN CONSEQUENCES OF SEMI-PUBLIC REALMS

Karl Kropf

ABSTRACT

In the context of the need to accommodate growing urban populations and densities, many emerging building types incorporate increasingly large and complex shared circulation spaces. These 'semi-public realms', found in both perimeter blocks and 'megastructure' types, present potential benefits but also potential problematic consequences for the combined private, semi-public, and public realms. Key issues include: ambiguity of form, boundaries, use, control, and imageability. Some of the factors at the root of these issues include lack of connectivity, excessive connectivity, excessive spatial depth, lack of hierarchy, and spatial differentiation in relation to depth. As the latter points suggest, a key concept that can help in understanding these issues—and contribute towards designs that avoid them—is depth. Within the field of built form studies and urban morphology, the idea of depth encompasses a number of different specific conceptions. Three of the most relevant are: configurational depth,[1] territorial depth,[2] and structural depth.[3] The aim of this article is to show that these three forms of depth are not mutually exclusive but have specific complementary relationships that can be used together to undertake a coherent, 'multiple depth' analysis of built form. Using examples of contemporary buildings types with extensive semi-public realms, the article goes on to show how such an analysis can aid in both urban design practice and urban design education.

KEYWORDS

Generic structure, public realm, density, urban design qualities

INTRODUCTION

Contemporary urban development in many parts of the world is increasingly taking the form of large, mixed-use, multi-occupancy buildings. There are a number of potential factors that might explain this trend. The large building types can be seen as a response to increasing global population in general and growing urban populations in particular, based on the evidence that higher densities are more sustainable. The large buildings can also be seen as a response to a crisis in global capital, with increasingly large amounts of private capital looking for decent returns in the face of historically low interest rates and volatile but restrictive public equity markets.[4] The (historically) steady capital growth of property in global cities such as London, Hong Kong, Singapore, San Francisco, and New York remain attractive investments. The building types might further be seen as a symptom of the state of the *res publica*, public sphere, and the attendant relationships between sovereign states, individuals, and a wide range of corporate bodies and institutions.

In some cases, the large, complex buildings are part of extensive, privately financed developments in which ostensibly public spaces remain private property. Such developments are, in some ways, the confluence of several interrelated historical phenomena that have been the subject of ongoing critique and debates over the years: the megastructure and the privatization of public space. If the profile and prominence of the megastructure as an architectural preoccupation has waned,[5] it is to a large extent due to its transformation and assimilation into the common repertoire of leading types. It has slipped from critical consciousness and become a cultural-financial habit: to a very large extent an expression and symptom of global capital.

As a very broad initial definition, the megastructure can be described as an extensive area of urban development under the control of a single entity with a unified, integrated design. The beginnings of its evolution were documented—and to a large degree promoted—by Sigfried Giedion in his *Space, Time and Architecture: The Growth of a New Tradition*.[6] Giedion pointed to Rockefeller Center in New York as a precursor to the idea of 'group form' and the work of Fumihiko Maki who coined the term 'megastructure'. In its original formulation, the megastructure was conceived as an extensive (infra)structural framework with replaceable modules. As epitomized by Cumbernauld New Town Centre, however, the difficulty of actually realizing the modular flexibility of megastructures at the urban scale, along with the generally unpopular 'Brutalist' architectural expression of their

designs, meant the ideal architectural version of the concept had a short life.[7] The underlying principle as recognized by Giedion did, however, have a more lasting appeal. Central to that appeal is 'urban development under the control of a single entity', a feature not really emphasized in the ideal version but key to the success of Rockefeller Center. With this definition, we can see the mixed-use/retail environments such as the Mall of America in Bloomington, Minnesota, the Jerde Partnership's Namba Parks in Osaka or OMA's Euralille as successors to the megastructure. From the wider urban perspective, the fortress-like character of some of these developments and the more general issue of the privatization of public space have been the focus of intense criticism.[8] To generalize, the focus of the critiques of these places is that they create an ambiguous realm that is neither fully public nor fully private. They can be overly complex with limited visibility, poor connectivity, and convoluted lines of movement embedded deep within the structure. There is often a lack of clear boundaries between areas for different uses and occupants but rather than offering opportunities for diversity, the overly determined design tends to prevent it.

More recently, critical 'selection pressures', including the major challenges to the retail sector presented by online giants, mean the shopping-based megastructures are undergoing further mutation. Like the precursor of Rockefeller Center, the contemporary megastructure is mimicking—and integrated with—public streets, yet many of the 'public spaces' remain privately owned. Examples include Hudson Yards in New York and developments at Kings Cross and Paddington Stations in London. The pretence of the streets creates a semi-public realm.

It is fair to point out, however, that the principle of a semi-public realm is also central to, figuratively and literally, the 'Berlin type' perimeter block as realized at the end of the nineteenth and beginning of the twentieth centuries in much of northern Europe. The type is usefully exemplified by Berlage's plan for South Amsterdam in which residential units are arranged to form a continuous line around the edges of the block, enclosing a central space for the exclusive use of the residents. This type has its successor in the many examples of 'podium' blocks in which the central space is raised up one or more floors of structured parking. In these cases, the semi-public space within the block is seen as an asset, making a positive contribution to people's living environments. More generally, Manuel de Solà-Morales takes the view that semi-public realms or 'collective spaces' are ubiquitous in urban

environments and form a continuum that needs to be understood in its own terms.[9] To agree with this view does not remove the potentially detrimental aspects of scale and control. The danger is that the semi-public realms proliferate and create another version of the megastructure, presenting relatively blank walls to public streets. The consequence is that the benefits of the semi-public realm to a few are realized at the expense of the fully public realm, reducing it to a utilitarian rump of transport links only suitable for vehicles and the people living on the margins.

This brief preamble suggests the semi-public realm is both ubiquitous and ambiguous in its status as well as in terms of its physical nature, its role in urban form, and the ways in which it is viewed and interpreted.

The aim of this article is to clarify and refine the definition of the semi-public realm, to situate it morphologically, and to put it into deeper historical perspective. In so doing the aim is to allow for and take into proper account the diversity and ambiguities found in specific cases. The underlying purpose of the investigation is to develop a better understanding and sharpen the analysis and critique of semi-public spaces as well as to improve their design. Clearer understanding should help us to find out how best to achieve and enhance the benefits of semi-public realms and minimize their potentially corrosive effects on the fully public realm. Central to that last concern is the conception of the civic and political and the social relations that underpin them.

The method adopted to investigate the phenomenon of semi-public realms is a kind of 'triangulation' that combines four different conceptions of morphological depth. The approach brings together the work of a number of different authors and for convenience might be termed multiple depth analysis.

Three of the main conceptions of depth relate directly to physical built form and the fourth involves the associated aspect of control. Of the three relating to physical built form, one is the idea of *configurational* or 'step' depth based on the principles of architectural morphology set out by Lionel March and Philip Steadman in 1971, by Steadman in 1983, and developed by Bill Hillier and Julienne Hanson, particularly in their concept of gamma analysis as used in *The Social Logic of Space* of 1984.[10] The second notion of depth is the principle of *territorial depth* developed by John Habraken and elaborated most fully in his treatise on control, *The Structure of the Ordinary*.[11] Kris W. B. Scheerlinck usefully brings these two together in the concept of 'depth

configurations'.[12] The third notion is rooted in the work of Saverio Muratori, Gianfranco Caniggia and Gian Luigi Maffei, and M. R. G. Conzen, relating to levels of aggregation and the compositional hierarchy of built form.[13] This notion has also been generalized by Brian Arthur as 'structural depth' in *The Nature of Technology*.[14] The evolutionary approach taken by Arthur, which parallels that of Conzen and the Italian architects—and urban morphology more generally—is taken as a further methodological foundation of this article. The fourth idea of depth picks up again on the work of Habraken and involves the customary or legal regimes of control held over spaces by particular agents or entities. This aspect brings out most directly the social structures and interrelations at the core of the notion of public space.

To summarize the different types of depth in simple terms, configurational depth is a measure of the number of spaces or 'steps' between two given spaces in a configuration of multiple, interconnected spaces. Habraken's territorial depth can be seen as the configurational depth of a specific string or sequence of spaces from the most public to the most private. Structural depth is a measure of the complexity of built form as indicated by the number of levels of aggregation of generic elements that compose the form. Depth of control is similar to structural depth but refers to the specific relationships of occupational, customary, or legal control over spaces and the controlling agent. As Habraken notes, there is an intimate relationship between the spatial units of physical built form and units of control, the latter tending to follow the former. That relationship is not, however, fixed and the variability of the relationship is crucial to understanding the position and role of semi-public realms within the wider built environment.

The four different types of depth can be combined and visualized by mapping them onto the diagram of generic structure of built form as introduced by Kropf.[15] In brief, the vertical axis of the diagram represents structural depth and the horizontal axis, taken through the three generic spaces or voids, represents generic territorial depth (see fig. 1). As will be explored in more detail below, configurational depth can also be represented by the horizontal axis through the voids but takes into account the full range of boundaries and spaces of specific examples. As will also be seen, depth of control has both structural and territorial depth and so maps onto both the vertical and horizontal axes of the diagram.

GENERIC STRUCTURE AND STRUCTURAL DEPTH

One of the important results published in Kropf's article 'Ambiguity in the Definition of Built Form' in *Urban Morphology* is the principle that different urban tissues can have different generic configurations.[16] In general terms, different urban tissues can be more or less complex because they contain a different number and range of generic elements and the complexity can be located in different parts of the tissue. It might be said that the diversity and variability of urban tissue that arise in response to different contexts and cultures is due to a fluidity in the structure of built form that is both discrete and continuous. That is, there can be differences in the number, type, and position of elements (discrete) and in their shape and size (continuous). While the continuous, specific variability can be measured by quantities such as length, the discrete, generic fluidity is measured by a combination of 1) the number of levels of aggregation constituting the tissue (structural depth) and 2) the position of the levels relative to an individual 'room' or simple sheltered space (territorial depth). Thus, differences in the generic configuration of urban tissue are characterized by the two attributes or 'dimensions' of structural depth and territorial depth (see Figure 1). As will be explored below, the two are interrelated.

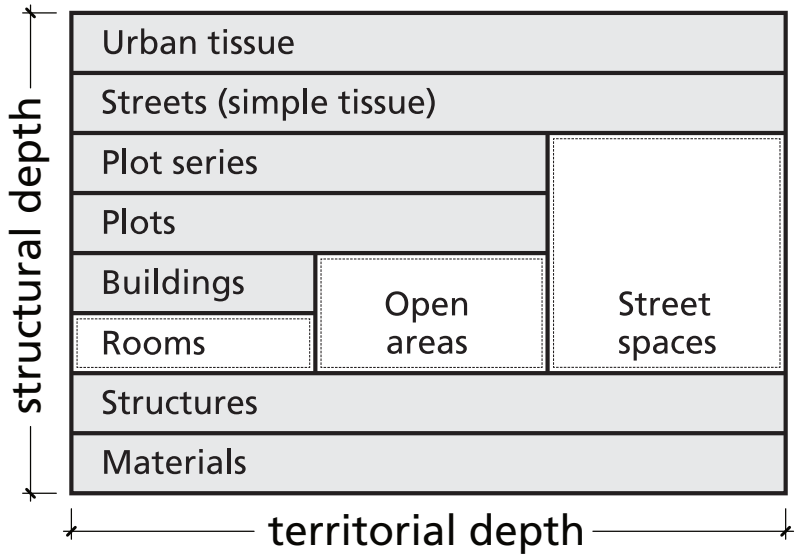

Figure 1. A multi-level diagram representing the reference generic structure of built form with axes identifying structural and territorial depth. Source: © Karl Kropf.

These principles and the potential for using them to articulate the definition, position, and role of semi-public realms can perhaps best be explained in more detail by looking at examples from a developmental-evolutionary perspective. Drawing on the process-based typology of Muratori, Caniggia and Maffei, and, in particular, Arthur's concept of 'structural deepening,'[17] the approach involves examining the evolution of human settlements in terms of primitive forms and their associated regimes of control. The term primitive is used here to deliberately evoke both the sense of the early stages of development and an intuitive concept used as a precursor to build more extended logical formalizations as used in mathematics. The result is more a thought experiment that gives an abstract, generalized view of the evolution of human settlements rather than a specific 'natural history' or genealogy.

The starting point for the purposes of the article is the range of archaeological evidence for human settlements from the Neolithic period.[18] Typical examples are constituted by three main elements: tracks, enclosures, and shelters. The tracks, some likely pre-existing, would have formed a network of routes extending into the wider area for access to food and other resources. A typical enclosure would have been defined by a more or less circular boundary wall of wooden palisade or stone with usually a single opening for controlled access. The shelters were located within the enclosure and typically circular in plan, constructed of timber or stone with a timber roof to form a single, fully enclosed space with a single opening. Each of the three elements can be defined in terms of a surface, boundary, and openings as a 'structured space'[19] and together form the core, root types out of which human settlements are composed.

As represented in the diagram in Figure 2, the structural depth of the Neolithic settlement is four, taking into account materials, structures, the three types of space, and the settlement as a whole.[20] The territorial depth is three, assuming for the moment the space within the enclosure that is not occupied by shelters is undifferentiated.

The three types of space also correspond to units of control. Tracks, as a shared resource for a group, are generally kept free of occupation or other impediments to movement. Control is therefore exercised to permit use by many. The walled enclosures are controlled to restrict entry to the resident group or those expressly invited in. Similarly, shelters are restricted to subgroups, generally an extended family. It could be said then, that there is a gradient

from 'public' tracks to 'semi-public' enclosure to private shelters. The context of the Neolithic period does, however, beg the question of what we might mean by the terms public and semi-public. A feature of the Neolithic period was frequent raiding and hostilities between groups, the response to which was to enclose a space shared by the group for mutual safety. The track would not provide that safety, less so as it extended out of the territory of the group. All are free to use the track but at the risk of attack and robbery. Is there a difference between 'no-man's-land' and public space?

Given the derivation of the term 'public' and its historical meanings, the 'public' space in the case of a Neolithic settlement is in some ways not the track but the shared enclosure, because it is more clearly bound up in the relationship or agreement between the individuals that constitutes the group. The *res publica* is both the group (also referred to as the *civitas*, the citizen community) and the common 'property' of the group, the ground that it shares and within which its social customs are observed. This is, of course, to apply the terms *res publica* and *civitas* anachronistically. In the context of the Neolithic period, the gradient from track to shelter is less one of public to private then one of protection. The concepts of *res publica* and *civitas* only emerged or co-evolved towards the Bronze Age with the city state and, as specific terms, are tied culturally and linguistically to Ancient Rome. It is still useful to apply the concepts to more primitive forms because it highlights the extent to which the notion of the 'public realm' is interdependent with a range of other cultural habits, activities, and institutions. That insight in turn points to the co-evolution of sociopolitical, socioeconomic, and physical structures in the emergence of the city state.

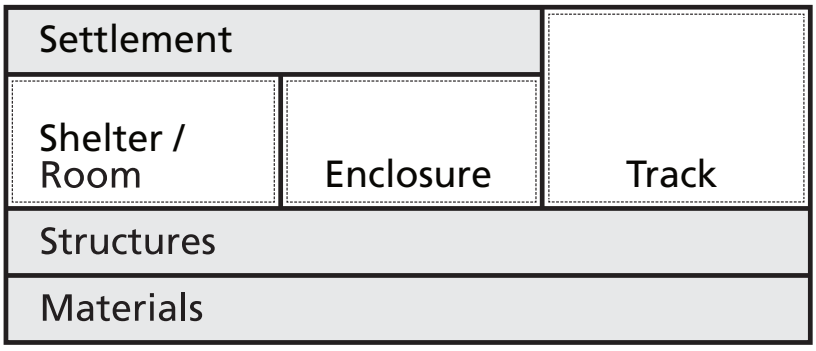

Figure 2 A multi-level diagram representing the generic structure of a typical Neolithic settlement. Source: © Karl Kropf.

In terms of physical form, the co-evolution involved a number of instances of structural deepening as defined by Arthur. Deepening occurs when elements are added to an existing structure so that it is transformed from a simple entity to an aggregate and when aggregated entities are combined together to make more complex objects.

In the case of the transformation of settlements from the Neolithic to the Bronze Age and beyond, the deepening involved, among others, the following:

- The creation of multiroom structures by subdivision, addition, or deliberate design
- The addition to shelters of a connected external enclosure such as a courtyard
- The packing of shelters together into aggregates with shared or abutting walls
- The coordinated connection, for access, of an aggregate of buildings to an abutting track
- The retention or creation of widened tracks within an enclosure for specific common activities and the creation of special buildings for specific activities resulting in the differentiation of areas, namely tracks and associated aggregates, within the settlement.

Each of these transformations increases the structural depth of the settlement as a whole by increasing the level or degree of aggregation as illustrated with the diagram of generic structure in Figure 3.

A further deepening occurred with the emergence of multi-storey, multiple occupancy buildings such as the Roman *insula*.[21] The deepening occurs with the creation of repeating configurations of rooms to form apartments on multiple floors. These require both shared vertical circulation and shared horizontal circulation. The combination of these generic elements has persisted as the 'apartment house' type, with many specific variants (see fig. 4).

Not all transformations in the evolution of urban form have resulted in structural deepening. There can be a 'shallowing' of generic structure by the removal of levels of aggregation. The phenomenon is highlighted by Philippe Panerai, Jean Castex, and Jean-Charles Depaule in their seminal work *Formes urbaines: de l'îlot à la barre*,[22] which recounts the effective disappearance of the 'plot' and 'street' from European cities as transformed under the urban

principles of the Congrès Internationaux d'Architecture Moderne (CIAM) beginning in the first half of the twentieth century.

Many of those principles remain current as an active type of urban tissue and in particular in the form of the contemporary megastructure, though often alongside other types. An example is the redevelopment of the former canal basin next to Paddington Station in west London (fig. 5).

The drawing shows three distinct tissues: one, Praed Street, is a more traditional type with individual plots and terraced houses with the generic configuration shown in Figure 3; the second is an 'insula type' with the generic configuration shown in Figure 4. The third tissue, Paddington Basin, is more ambiguous. Rather than a repeating pattern of building and enclosure (garden) aggregated into series, Paddington Basin includes a number of large buildings within what is essentially one large plot occupying most of a large convoluted block, due in part to the presence of the canal and station. At the same time, the buildings within Paddington Basin are of the apartment house or office building type. Both the apartment and office buildings are of

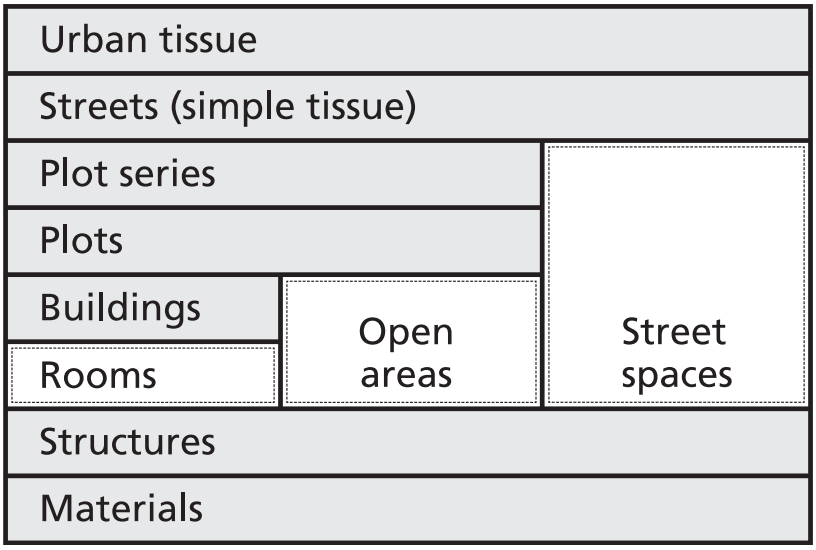

Figure 3. The process of structural deepening of built form that occurred in city-states by the Bronze Age resulted in an increased number of levels of aggregation relative to the simpler structure of a Neolithic settlement. Source: © Karl Kropf.

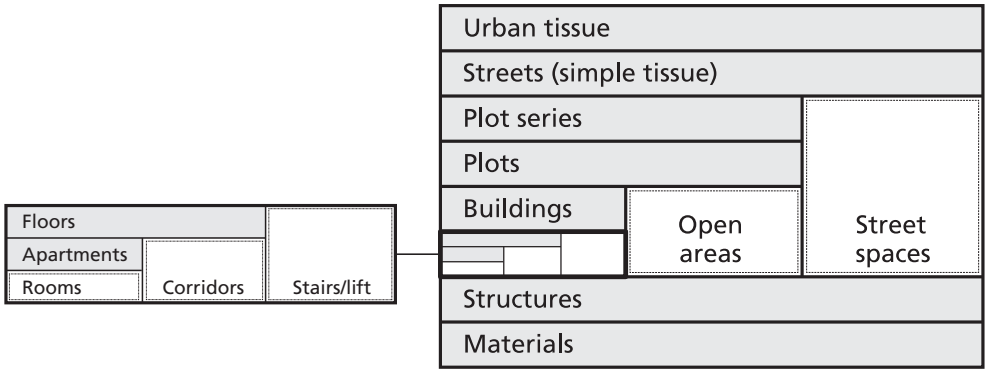

Figure 4. A multi-level diagram representing the generic structure of a typical Insula block. Source: © Karl Kropf.

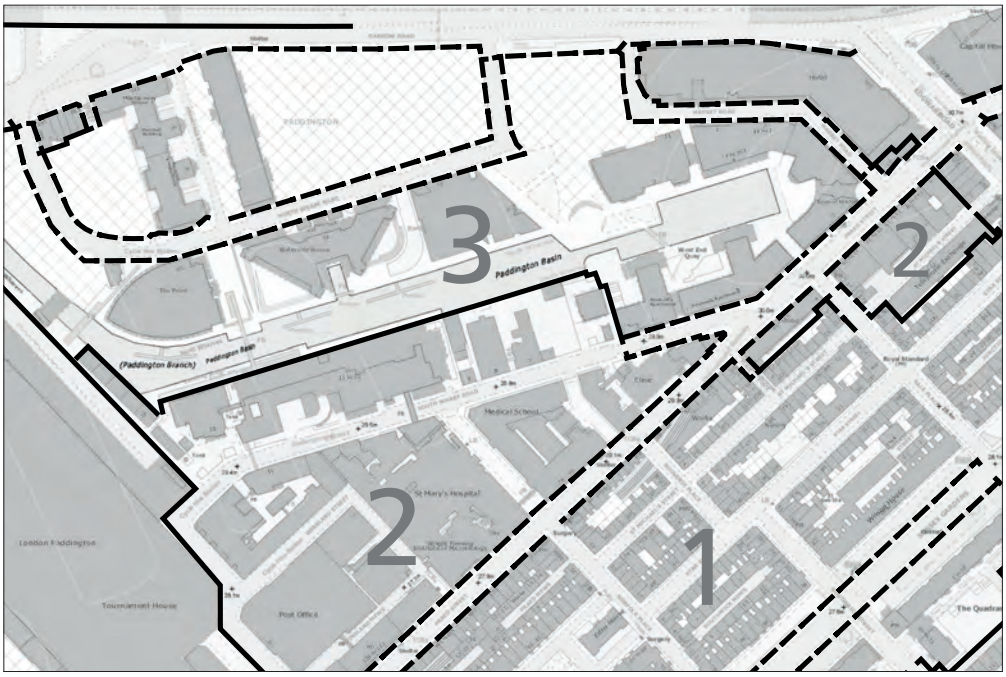

Figure 5. A plan illustrating the Paddington Basin area of London, identifying the distinct urban tissues, each with a distinct generic structure. Source: Mapping © Crown copyright and database rights 2021 Ordnance Survey 100025252.

multiple occupancy and include some kind of shared vertical circulation core and floors with horizontal circulation.

The resulting generic configuration of the Paddington Basin type is shown in Figure 6. In all three cases, the number of levels in the diagram is the structural depth of the tissue. Interestingly, comparing the Praed Street type (fig. 3) and Paddington Basin, it can be seen that both have the same number of levels but the depth is situated in different places within the structure. In the case of Paddington Basin, it is contained mainly within the building while in Pread Street it is within the subdivisions of the block.

TERRITORIAL DEPTH

Comparing the different examples of tissue as mapped onto the diagram of generic structure shows that there is a clear relationship between structural depth and territorial depth. In simple terms, at the generic level, increasing the structural depth *of spaces* increases territorial depth. In the diagram, the territorial depth is represented by the 'horizontal section' running through the voids or spaces. The depth is the number of generic spaces from one side to the other. In the case of the Neolithic settlement (fig. 2), there are just the three primitive types of structured space. The same is also the case with a simple settlement or tissue such as Praed Street (fig. 3) containing buildings, plots, and plot series, although there is an increase in structural depth higher in the diagram. With the introduction of multiple occupancy, multi-storey buildings in the example of the insula tissue (fig. 4), the structural and gene-

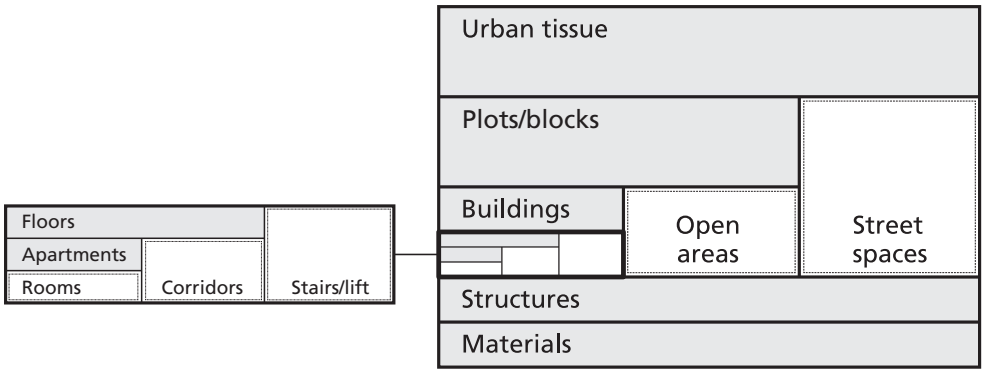

Figure 6. A multi-level diagram representing the generic structure of tissue 3 in the Paddington Basin area from Figure 5. Source: © Karl Kropf.

ric territorial depth are both increased relative to the Neolithic settlement and simple settlement. In the Paddington Basin type, the structural depth is the same as found in the simple settlement (or Praed Street, as noted above) while the territorial depth is greater but, again, located within the building.

CONFIGURATIONAL DEPTH AND THE NOLLI STRING

Before going on to interpret the differences between the mappings above, it is important to note that they illustrate the *generic* territorial depth of the different settlements or tissues. As used by Habraken and developed by Scheerlinck,[23] an analysis of territorial depth entails distinguishing all the specific spaces and subspaces through which one passes when moving from a public space into a plot and building to a private space. So, for example, if there are stairs and a porch or a stoop leading to the front door of a building, these increase the territorial depth. For convenience, the sequence of spaces can be referred to as a Nolli string, in honour of Giambattista Nolli and his renowned map of Rome depicting streets, enclosures, and buildings but also the interiors of public buildings. To formalize the definition, a Nolli string for a given building in its plot is the most direct sequence of spaces leading from the public street that gives access to the plot to any occupiable space in the building.

In order to better visualize and quantify territorial depth, it is helpful to follow the conventions as used by Steadman rooted in graph theory while also drawing on those of Hillier and Hanson and Scheerlinck. This involves representing the sequence of spaces as a graph with each distinct space and subspace being assigned a vertex and the opening from one to the next represented as an edge. The most public space that gives immediate access to the plot is identified as the root space and a Nolli string is the shortest simple path from the root space to any end node. The total number of vertices in a simple path to a given end space is the specific territorial depth and the longest string is the maximum territorial depth of the plot/building.

Within the terms of space syntax, a Nolli string can be seen as a subset of a J-graph of the plot/building with the root space taken as the public street that gives immediate access to the plot/building. A further representational step is to map the string onto the horizontal section through the voids of the diagram of generic structure, which can be termed the Nolli section. The mapping involves inscribing the vertices and edges of the string onto the diagram so that all of the specific spaces and subspaces within a generic type are placed in linear/depth sequence within the appropriate polygon of the diagram (fig. 7).

Broadly speaking the axis of the string represents a gradient from public to private. But as the discussion of the Neolithic settlement exposed ambiguities in the definition of 'public', the definition of 'private' cannot usefully be limited to the end node of a string. Privacy has many dimensions,[24] in part highlighted by the case of the balcony. While a balcony is an end point on a string, it can be eminently public because any occupants will be visible and audible from public spaces. The combination of visibility, audibility, and protection provided by the balcony has been exploited by religious and political leaders and activists throughout history, from the Popes at the Vatican to Mussolini in Palazzo Venezia, Eva Perón at Casa Rosada, and Julian Assange from the Ecuadorian Embassy in London. More recently, the combination has also provided a means of maintaining both social contact and distance within the context of the coronavirus pandemic. 'Private space' might therefore be considered to entail, as a kind of structural minimum, a combination of the position along a Nolli string (depth within the configuration) and the type of space in terms of number of openings, the centrality of the space, and its orientation toward and visibility/audibility from the public realm. While access, depth, and centrality are captured—visually and computationally—within a graph representation, visibility is not. A complementary representation is therefore to map the string onto the Nolli section of the generic

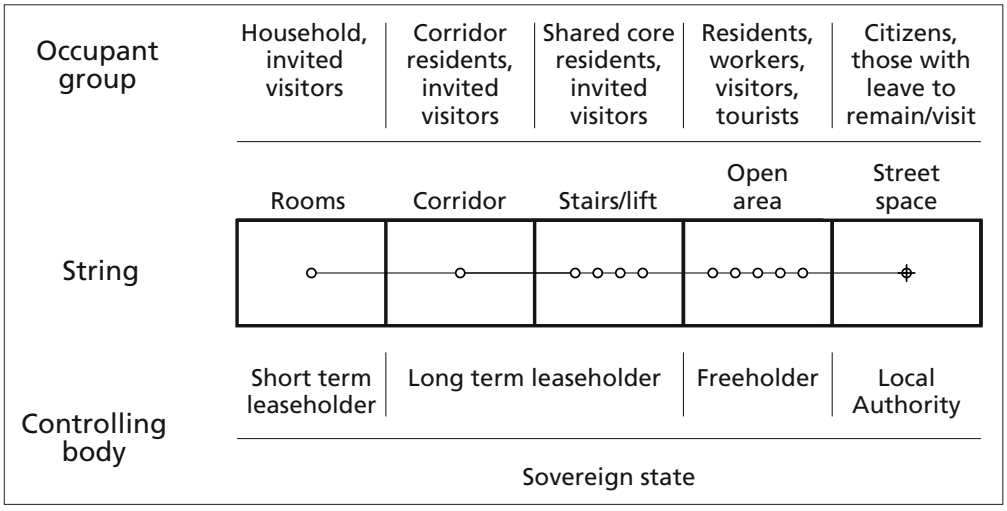

Figure 7. A diagrammatic representation of a Nolli string for a residential tower showing boundaries of control and occupant groups. Source: © Karl Kropf.

structure diagram and allow for folding of the string. In the case of the balcony, this results in the vertex of the balcony being placed in the polygon for 'enclosures' and the edge folded back onto the main string.

DEPTH OF CONTROL

The final indicator of depth to consider is the depth of control. As a preface, control is here interpreted as a general aspect of urban form encompassing a wide range of relationships between humans and physical built form, as well as the land on which it sits, including occupation, ownership, administrative and regulatory regimes, legal jurisdiction, and sovereignty. The brief discussion above in examining early settlements questioned whether the notion of 'public space' made sense outside the context of such a range of relationships as embodied in the tacit or explicit customary structures and institutions of a distinct social group. Public space has a physical manifestation but it is constituted and maintained as such by agreed rules of social interaction and behaviour. From this perspective, the tracks leading to and from Neolithic settlements, if set within a wider territory without any overall control by a tribe, would not be public in the sense that a street in London is public. As suggested in the discussion, what might be considered a 'proto-public realm' lies within the enclosure, which is the shared, common good of the group based on the customary understanding of the individuals in the group about their mutual relationships with each other and the group as a whole. It is out of that proto-public realm that a more truly public realm emerges with the city state and the structural deepening of its physical form. Similarly, the tracks or roads between settlements only really become 'public' with the emergence of supra-settlement control exercised by a federation, league or accord of groups, or as imposed by royal or imperial powers.

What emerges from seeking to clarify what is properly public is a hierarchy of control, of and by social groups. The hierarchy provides the framework of social structures and institutions that gives the notion of 'public' its being and meaning. Today, in the global north, such hierarchies generally include:

- Sovereign states (country or nation)
- Regional or federated state authority
- Department/Province/County/District authority
- Municipality or city authority

The scope of this article does not allow a fuller exploration of the many variants of such hierarchies but it is sufficient to note that each entity within it generally exercises control over an area with distinct boundaries. In general, the hierarchies are nested, with the spatial extent of entities lower down contained with those higher up and with no overlapping boundaries between entities of the same level. The hierarchies also tend to work on the basis that the structures and institutions embodied in the higher-level entity, such as the legal system and national laws, apply equally to the lower level bodies, though this is not invariably the case.

Of course, the exercise of control is not just limited to public bodies but extends to private entities that exercise control over others, depending on the structure of the legal system in operation. This extends the overall hierarchy of control. In the case of the UK, for example, property law allows for:

- Freehold (ownership in perpetuity)
- Long-term leasehold tenancy
- Short-term leasehold tenancy
- Sublet tenancy
- Owner/tenant occupation.

Even a quick reflection on the common English term for a person or company that leases property—landlord—points to the historical fact that the control over private land in the United Kingdom has its roots in the feudal system in which private landowners were empowered and obliged to undertake local public administration and justice. Private landowners were an extension of the state apparatus of control.

So, in the same way that we speak of the structural depth of physical form, there is an analogous structural depth of control. The more levels in the hierarchy, the greater the structural depth of the system. It is then also possible to inscribe the levels of control onto the Nolli section and correlate them with physical form as shown in Figure 7. In this case, the nature of the occupant group and the controlling body has been correlated to the generic types of space.

MULTIPLE DEPTH ANALYSIS: QUALITIES, RELATIONSHIPS, AND THE CIVIC

The example shown is a Nolli string into an apartment house within the Paddington Basin development with access from Praed Street. A notable feature of the example is that there is a compression of territorial depth in the open area (plot) while there is less depth within the building, despite there being more structural and generic territorial depth than is characteristic of Praed Street (fig. 3). The greater specific territorial depth and complexity within the plot is a manifestation of the attempt to create a quasi-street-like environment on what is a very large plot under the control of a private body.

Setting aside the issue of control by a single private body for the moment, the questions that should be raised from a design perspective are: Does the more complex, quasi-street-like environment have other positive qualities of streets? Conversely, do the semi-public spaces within the buildings have positive qualities appropriate to their position within the string? What is the experience along the whole string? As importantly, what are the knock-on consequences for other lines of movement and for experience of the whole tissue? As a comparison of the three tissues in the Paddington area shows, there can be significant differences in the generic configuration of the tissues, as indicated by the combined measures of depth, and corresponding differences in the richness of experience.

The combined indicators of depth as summarized in Figure 7 and the differences in the generic structure of tissues also point to another realm of engagement for design. That is, while the generic structure of physical form and the hierarchy of control are similar in principle, the relationship between the two is fundamentally variable, both spatially and over time and, as importantly, in how the boundaries are interpreted and observed by people using the spaces. A legitimate area for design exploration and innovation is the different potential relationships between the occupant group, the physical structure, and the controlling body. To a large extent this is to say, the three always go together in some form, but there is a choice in the consideration of which go together and in what ways. A large plot with complex buildings might be owned by a cooperative or it might be subdivided into smaller holdings for subgroups. If urban design is always an expression of the powers exercised in that combination - occupant groups, physical form, and controlling body - designers at least should have an awareness of those relationships.

Looking at the variability between physical form and control more broadly from the perspective of the developmental evolutionary thought experiment provides a further insight. In general, the transition from Neolithic settlement to city state, nation state, and empire has involved a progressive spatial expansion of the area within which the customary legal social pact establishing the *res publica* applies. The boundaries of that area—the enclosing palisade, the city wall, and national and imperial borders—are in many ways fundamental to the meaning of what is public. The public is both the place and the group taken together and one of the key roles of the social group or state is the maintenance and control of the borders, including who to allow in and monitor what they do.[25] From a global, transnational perspective then, it might be said that any given *res publica* is only semi-public. The freedom to walk and use any given public realm is limited to citizens and admitted guests. Put another way, is there a transnational *res publica*, a place where any person of whatever origin is 'free' to walk the streets as a 'citizen' as opposed to an alien?

The aim of this digression is to highlight and reinforce the idea articulated by Solà-Morales that the semi-public realm is not an exception but ubiquitous, that there are kinds and degrees of 'publicness'. For the purposes of analysis, critique, and design, a starting point should therefore be to acknowledge, and where necessary, delimit the boundaries of the different realms, to investigate the nature of the social entities that control them, and to understand the relationships and social pacts that constitute those social entities, whether public authority or private organization. As designers, we should also seek to reconcile the different semi-public realms so they work together as a whole and to understand the qualities and spatial relationships that make places feel more or less public.

We cannot assume that what may seem to be the 'normal' freedoms as granted to us as citizens apply to all people, in particular to the marginalized, dispossessed, and oppressed. We should not take for granted the freedoms that have been won from the extended negotiations within and between states to allow mutual access to the public realms in different parts of the world. Nor can we take for granted that nations that have historically practised and condoned a commitment to openness and liberty will continue to do so or continue to define that liberty in the same way. The civic is constantly being renegotiated.

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Susanne Fredholm is a senior lecturer in the Conservation of Built Environments programme at the University of Gothenburg. The areas of her scientific research, publishing, and teaching span the integrated conservation of built environments, with an emphasis on landscape studies, urban planning, and critical perspectives on heritage. In her current research project 'Ecosystem Services: An Integrative Instrument for Sustainable Living Environments in Practice?', she explores how the ecosystem services agenda influences the implementation of immaterial heritage in planning practice and conservation professionals' work on social inclusion. She furthermore explores collaborative governance in urban and infrastructure planning, with a focus on factors for the success and failure of negotiations. Fredholm is also a senior advisor and provides heritage assessment and consultancy services to the infrastructure and urban planning sectors.

Freja Frölander is a master's degree student in the Department of Conservation, University of Gothenburg. The primary focus of her master's thesis is biological cultural heritage management and traces of historical land usage in old-growth forests. She is currently working as a film creator in two ongoing projects at the Department of Conservation. Both projects focus on traditional knowledge systems and crafts connected to historical landscape management. The main objective is to find suitable ways of documenting disappearing knowledge and to facilitate a transfer of knowledge where the generational knowledge chain has been broken. Her research interests are traditional crafts, historical landscape management, and their contemporary relevance for biodiversity and the sustainable development of rural areas.

Kiran Maini Gerhardsson, PhD in environmental psychology, is an architect, illustrator, and a postdoc researcher at Lund University in the Department of Health Sciences. She is also a teacher and researcher in the Department of Architecture and Built Environment. Her general research interest is the interaction between people and their environment, for example, people's experiences and reasons for their actions. The main research topic is light and health, and she is currently involved in experimental research targeting older adults living in ordinary housing. Her thesis project aimed to increase

understanding of how residents use their lighting from natural and fabricated light sources, what they want from it, and when they do not want it. Another aim was to evaluate a personalized home lighting system in terms of comfort and intention to use the system.

Ellen Kathrine Hansen holds a Master in Architecture from the Royal Academy of Fine Arts in Copenhagen and a PhD in design experiments from the Department of Architecture, Design, and Media Technology at Aalborg University, Copenhagen, where she is now an associate professor, co-founder and coordinator of the MSc Programme and research group in lighting design. Ellen is a leading person in the field of transdisciplinary design research and teaching within light and sustainable architecture. She has more than twenty years of experience driving projects within the field of developing new sustainable and architectural potentials through the integration of daylight and lighting technology.

Mette Hvass holds a MSc in Architecture from the Royal Academy of Fine Arts in Copenhagen and has studied lighting design at the KTH Royal Institute of Technology in Stockholm. She joined the lighting design programme at Aalborg University, Copenhagen, as an external lecturer in 2017. In 2019, she started a co-financed PhD project about the architectural and social potential of lighting in urban space at the Department of Architecture, Design, and Media Technology. In her research, the focus is on the role of lighting in urban space, how lighting forms the visual space in the dark hours and sets the scene for the co-presence of people around everyday activities—combining knowledge from fifteen years in practice as an architect and lighting designer with the research practice at Aalborg University, Copenhagen.

Thomas Kampmann, Architect m.a.a., MSE: cand. Polyt., associate professor at the Royal Danish Academy, Copenhagen, at TRANSFORMATION, Master's Programme in Cultural Heritage, Transformation and Restoration. Thomas is responsible for teaching building surveying, building archeology, and sustainability. The teaching in building surveying is done using total stations, laser scanners, and traditional surveying methods. The thorough measurements form the basis for the building-archeological investigations. The teaching of sustainability is based on these studies in order to calculate life-cycle analyses on a credible basis. Previously, Thomas has worked with windows at the Centre for the Restoration of the Built Heritage, Raadvad, Copenhagen, through practical renovations, and as a consultant for The

Agency for Culture and Palaces. He has published articles on heat loss, sound insulation, total economy, and life cycle assessment (LCA).

Ann Legeby, PhD, is a professor of applied urban design in the School of Architecture at the KTH Royal Institute of Technology, Stockholm. Her research concerns society-space relations. Central to her research is the aim to increase understanding of the role of architecture in relation to social segregation and unequal living conditions, including the conditions for everyday life. Several of the research projects are conducted in close collaboration with municipalities and other public actors. Urban analysis is central and methodologies are developed on how to analyse, model, and visualize spatial form, defined by architecture and urban design, and how it relates to urban processes. Ann is engaged in both teaching and practice and works with urban design and planning in several cities in Sweden.

Nils O. E. Olsson, Department of Mechanical and Industrial Engineering, Norwegian University of Science and Technology (NTNU). With a PhD from NTNU in Norway and an MSc from Chalmers University of Technology in Sweden, Nils is a full professor in project management at NTNU in Trondheim. He has served as coordinator of large research projects and has held professorships at faculties of engineering and architecture. He has extensive experience as a consultant, research scientist, and manager. His consulting experience includes Ernst & Young and DNV (Det Norske Veritas). Current research is focused on emerging aspects of project management, including governance, digitalization, and the use of artificial intelligence.

Jarre Parkatti is a social scientist (having majored in practical philosophy, University of Helsinki, minored in social science, University of Copenhagen) and a PhD student at the School of Arts, Design and Architecture at Aalto University, where he also has worked as a researcher on the research project 'Power/Knowledge in Urban Development'. His present research focus is on the societal preconditions, practices, and results of urban design/town planning in the new inner-city districts of Helsinki, especially as concerns the urbanity, ecological sustainability, and social functionality of the built environment.

Sam Ridgway is an architect and adjunct associate professor in the School of Architecture and Built Environment at the University of Adelaide. He has a Master of Architecture from the University of Adelaide and a PhD from

the University of Sydney. His research and publications have focused on a theorization of factory-made buildings, construction theory, architectural representation, and the texts and buildings of the remarkable architect and academic Marco Frascari. His recent work explores the theatre, architecture, and imagination.

Mari Oline Giske Stendebakken, PhD, Architect MNAL, Department of Architecture and Planning, Faculty of Architecture and Design, Norwegian University of Science and Technology (NTNU). Stendebakken is an architect from NTNU and L'Ecole nationale supérieure d'architecture de Paris-La Villette (ENSAPLV). She has a PhD from NTNU in cultural heritage, architecture, and analysis. Stendebakken works as city antiquarian and lectures in architectural heritage at the Oslo School of Architecture and Design. She has extensive teaching experience from NTNU and has worked as an architect and consultant in Norway and abroad.

Tony Svensson is a trained planning architect and has a doctoral degree in planning and decision analysis from the KTH Royal Institute of Technology in Stockholm. He holds positions as a researcher at KTH in the School of Architecture and the Built Environment, Department of Urban and Regional Studies, and as senior lecturer at Dalarna University, Department of Energy and Built Environment. Tony has been leading the research project 'Co-creative Spatial Planning for Energy-efficient and Sustainable Station Communities' (2017–20), financed by the Swedish Energy Agency and the Region of Västra Götaland.

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