WELCOME VISITORS!

This is a preview of the paper version of *A New Pattern Language for Growing Regions.* This is a project of Sustasis Foundation, in partnership with the Centre for the Future of Places, KTH Royal Institute of Technology, and UN-Habitat. This project is open-source, licensed as "CC BY 2.0". That means you are free to:

The 1977 book *A Pattern Language* was a landmark in the design world, introducing a methodology that has become influential across many fields. Among them are software and "design patterns," and important spinoff technologies like wiki (the basis of Wikipedia) and Agile Methodology. Yet curiously, the field where pattern methodology began – the built environment – has lagged conspicuously. As one remedy, a number of long-time collaborators with the original book's lead author have followed the explicit guidance of the book, and developed a new collection of 80 patterns offering tools and strategies for a new era of urban challenges. This new collection emerged in part from a five-year collaboration with UN-Habitat to address new urban challenges, including rapid urbanization, slum upgrading, sustainable urbanism, and new technologies. Together with the launch of an online companion pattern "repository" (available at npl.wiki) this volume aims to expand the capacity of pattern languages in support of a hopeful new era of open-source, human-centered, life-enriching technology.

We hope you will enjoy this low-resolution preview!

A New Pattern Language for Growing Regions

Places, Networks, Processes

A Collection of 80 Patterns for a New Generation of Urban Challenges

Michael W. Mehaffy

And

Yulia Kryazheva * Andrew Rudd * Nikos A. Salingaros

With Contributions By

Ana Gren * Steve Mouzon * Laura Petrella * Sergio Porta * Laurence Qamar * Yodan Rofè and other collaborators

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The 1977 book *A Pattern Language* was a landmark in the design world, introducing a methodology that has since become remarkably widespread and effective across many fields. Among them is software, where "design patterns" have since become an industry standard. Important spinoffs include peer-to-peer collaboration technologies like wiki — the basis of Wikipedia and related innovations — as well as Agile Methodology.

Yet curiously, the one field where pattern methodology has lagged most conspicuously is the one where it began, the built environment. In part, the popular appeal of the 1977 book served to "freeze" the initial set of patterns, greatly slowing further peer-to-peer development in environmental design — contrary to the original authors' stated aims. As one remedy, we present here — in one of many more hoped-for future companion volumes to the original classic book — a new collection of 80 patterns for a new era of urban challenges, including rapid urbanization, slum upgrading, sustainable urbanism, urban technologies, and new tools and strategies to meet these and other challenges.

This new collection comes as a contribution to a five-year collaboration with UN-Habitat on implementation of the "New Urban Agenda," a framework document adopted by consensus by all 193 countries of the United Nations. However, there remains an urgent need to implement its humane aspirations, using tools and strategies grounded in research evidence, but also subject to revision, addition and refinement with new findings from new collaborators.

This volume aims to meet that need — together with the launch of an online companion pattern "repository", available at **npl.wiki**. Both initiatives were developed in collaboration with Ward Cunningham, wiki inventor, and pioneer of pattern languages of programming as well as Agile Methodology. Both are meant to expand the capacity of pattern languages in support of a hopeful new era of open-source, human-centered, life-enriching technology.

> *"The technology of 'A Pattern Language' launched Wikipedia and the other programming methods we advanced. We are pleased to be a part of the cyber life of this work, returning again to have an impact on the built world."*
>
> — Ward Cunningham, inventor of wiki, and co-developer of pattern languages of programming

> *"The fact is, that we have written [the original] book as a first step in the society-wide process by which people will gradually become conscious of their own pattern languages, and work to improve them… we imagine this pattern language might be related to the countless thousands of other languages we hope that people will make for themselves, in the future..."*
>
> — Christopher Alexander and co-authors, *A Pattern Language* (1977)

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CENTRE FOR THE FUTURE OF PLACES
AT KTH ROYAL INSTITUTE OF TECHNOLOGY
STOCKHOLM, SWEDEN

UN-HABITAT
FOR A BETTER URBAN FUTURE

A New Pattern Language
for Growing Regions:

Places, Networks, Processes

A Collection of 80 New Patterns for
a New Generation of Urban Challenges

A further contribution guided by the book
A Pattern Language: Towns, Buildings, Construction

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And Other Collaborators and Reviewers

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Note on referencing patterns

In the text, two distinct means of referring to other patterns are used: new patterns introduced in this book are referred to by name and number, for example, 4.4. The 80 new patterns are numbered in groups of four, so they range from 1.1 to 20.4. Those original patterns from the book *A Pattern Language* are referred to according to that numbering system, for example APL 89. The 253 Alexandrian patterns range from APL 1 to APL 253.

ACKNOWLEDGEMENTS

Thanks are due most importantly to KTH Royal Institute of Technology and its Centre for the Future of Places for sponsoring this research, and thanks in particular to its director, Tigran Haas. We are grateful also to the Ax:son Johnson Foundation and Peter Elmlund, who in turn have generously supported the Centre's work, and ours. We are also grateful to the many others who have contributed to development of this work and offered feedback and comments over a period of years. Thanks most especially to our colleagues at UN-Habitat, including Andrew Rudd, Laura Petrella, and Cecilia Andersson. Thanks also to Bernie Franceschi, board member of Sustasis Foundation, for support over many years, and to Ward Cunningham, board member of Sustasis Foundation and a major influence on pattern language and wiki methodology. Ward has made enormous contributions to this work, and to its digital companion repository. Thanks to Leslie Mehaffy for all her editing and support. Yulia Kryazheva, the book's designer, once again has delivered a beautiful result beyond expectations, and contributed substantially to content as well as design (including the delightful drawings at the end of each pattern). Thanks also to Maggie Alexander of the Center for Environmental Structure, wife of ailing Christopher Alexander, for her early encouragement and strong support expressed for this project, and for her continued advice.

Finally, we are grateful to all those who worked on and contributed to pattern language methodology, including the original authors of the 1977 book: Sara Ishikawa, Murray Silverstein, Ingrid Fiksdahl-King, Max Jacobson, Shlomo Angel, and especially, Christopher Alexander. May the work they started continue, as they expressed and intended.

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To Christopher, and to all those others who continue his fascinating and hopeful work.

INTRODUCTION:

Who is this book for?

One of the most pressing needs today is to improve the quality of urban development for growing regions around the world — to maximize the benefits that urbanization can bring, while minimizing the potential problems and negative impacts for the future. To that end, this volume presents a so-called "pattern language" of a number of urban development best practices that have been identified through research at Sustasis Press, and with partners at KTH University, the University of Strathclyde, and a number of other universities, research centers, and individual collaborators.

This book also represents a contribution to a five-year collaboration with UN-Habitat on implementation of the "New Urban Agenda," a framework document that seeks to maximize the human benefits of urban development at all scales over the period 2016-2036. The New Urban Agenda was adopted by consensus by all 193 countries of the United Nations in 2016, in an act of remarkable international unity. However, there remains an urgent need to implement its aspirations with effective, evidence-based tools and strategies. This volume is one contribution aimed at addressing that need.

This volume (and its on-line counterpart, npl.wiki) is also intended as only the start of a much wider international effort — not only applying the information herein, but seeking additions to it, and encouraging parallel efforts. Ultimately this and other projects may form a many-stranded network for sharing of the best available knowledge, tools and strategies for better-quality urbanization. In that spirit, this work is by no means a "final word" — but it is our best curated formulation of the current state of evidence-based urban design and architecture today, expressed as a representative and (we very much hope) useful collection, for active builders, designers, planners, businesses, governments, and NGOs.

Why pattern languages?

In many fields today, pattern languages have been used successfully to develop and share best practice design tools and strategies. Perhaps the widest usage is in computer science, where pattern languages of programming (also called design patterns) are used to develop many operating systems, most games, and many other kinds of programs. In a remarkable spinoff, pattern languages also led to the development of wiki, which was created as a tool to share patterns of design, and later used (more famously) to create Wikipedia, as well as many other widely-used websites. Additional software spinoffs included Agile development, Extreme Programming, and Scrum methodology.*

Pattern languages have also been applied usefully in a surprisingly diverse number of other fields, including human-computer interaction, sociology, molecular biology, business management, manufacturing, and production engineering, to name a few. In fact, many thousands of patterns have been written, not only for software and computer architecture, but also for structural principles of organizations, education, social interaction, communication and information technology, even music, chess and poetry. Researchers in these disciplines have adopted the convenient pattern format to present their results, and were also encouraged to try and find links among their patterns. The pattern format is now embraced as a convenient standard in which to write new results in a variety of disciplines.

This diversity is all the more remarkable, considering that pattern languages had their origin in the built environment, and yet remarkably, the built environment remains one of the least well-developed fields for pattern languages. Therein lies a paradox — and an underdeveloped resource.

Pattern languages were introduced most famously in the 1977 book by the architect Christopher Alexander and his colleagues, *A Pattern Language: Towns, Buildings, Construction.* The book offered three remarkable achievements all at once. First, it gave the pattern format for expressing a discovered design result in compact and logical form for future reference and distribution as an evolving best practice. The presentation occurred normally in seven parts: *iconic name; representative (contextual) photo; links to previous patterns; problem-statement; discussion; conclusion ("therefore statement");* and *links to subsequent patterns.* Second was the idea of a pattern language in which the individual patterns link up using grammar-like rules. Importantly, this emphasized that design patterns are not isolated entities, but are embedded in an essential web-network. Third, the book presented the specific collection of 253 numbered patterns developed by Christopher Alexander and his associates at that time.

What accounts for the usefulness of pattern languages across such a diversity of fields? They are in essence a way of capturing useful knowledge

* See for example Cunningham, W. and Mehaffy, M.W. 2014. "Wiki as Pattern Language." In *Proceedings of the 20th Conference on Pattern Languages of Programs* (PLoP'13), Monticello, Illinois, USA (October 2013). 15 pages.

about the nature of a design problem, and expressing it in a way that can be easily shared and adapted to new contexts. However, the form of the knowledge is not rigid, but context-dependent and relational. This feature is especially useful for design problems that require very local and context-specific responses. Of course, this is very often the case for problems of urban design, architecture and building too.

What accounts for the comparatively limited development of pattern languages in the built environment — the very field for which they were originally developed? One explanation is that some architects and urban designers do not like what they see as the book's formulaic design guidance, which they believe constrains their creativity. That may be true for some, but by no means all. Another perhaps more relevant explanation is that, paradoxically, the very success of the 1977 book served to "freeze" the work in a seemingly immutable set of 253 patterns. The book became a best-seller, and an iconic work that some said must not be "tampered with."

But that is not what the book itself said. On the contrary, the introduction made its aim very clear (emphases added):

> *Let us finally explain the status of this language, why we have called it "A Pattern Language," with the emphasis on the word, "A," and how we imagine this pattern language might be related to the* ***countless thousands of other languages we hope that people will make for themselves, in the future****… The fact is, that* ***we have written this book as a first step*** *in the society-wide process by which people will gradually become conscious of their own pattern languages, and work to improve them…*
>
> *We hope, of course, that many of the people who read, and use this language,* ***will try to improve these patterns*** *— will put their energy to work, in this task of finding more true, more profound invariants — and we hope that gradually* ***these more true patterns,*** *which are slowly discovered, as time goes on, will enter a common language, which all of us can share...*
>
> *You see then that the patterns are very much* ***alive and evolving.*** *In fact, if you like, each pattern may be looked upon as a hypothesis like one of the hypotheses of science. In this sense,* ***each pattern represents our current best guess as to what arrangement of the physical environment will work...*** *But of course, no matter what the asterisks say,* ***the patterns are still hypotheses, all 253 of them — and are therefore all tentative, all***

> ***free to evolve*** *under the impact of new experience and observation. (Alexander et al., 1977, pages xv-xvii)*

Unfortunately, with the exception of a few pockets of practice, this continued evolution has been woefully absent in built environment fields. Instead, the very success of the book has served to freeze its contents, protected even by copyright as well as by the practical difficulty of modifying or adding to printed pages. Yet the text above makes clear the intention to launch a much larger and more ambitious open-source project to develop many more patterns, and to edit, adapt, share, and apply them all.

The proliferation of design patterns

This is precisely what has happened in computer science and other fields, with prodigious results. The comparatively weak results in environmental design fields are humbling — and instructive, for those who recognize the unmet potential of pattern languages to help to address new challenges for settlements.

For many years the kind of open-source exchange called for in the book was difficult to accomplish at any significant scale, since it required the cumbersome use of copier machines and the like. A few authors published compendia of new patterns, but without the ability to interact with and incorporate the original 253, they did not have a very large impact.

Of course, with the advent of the Internet, it became much more practical to share patterns, and even to turn the references that each pattern featured into "live" links that could be used to "click through" to other patterns. This is precisely what was done in 1987, not by environmental designers but by software engineers. In that year, Ward Cunningham created the "Portland Pattern Repository," advancing both pattern languages of programming and their more famous outgrowth, wikis.

Both design patterns and wikis were developed to address a fundamental problem in software: simply specifying new solutions to new problems in sequence leads to a cluttering of code, and an increased likelihood of malfunctions from unforeseeable and unintended interactions. In 1987, Cunningham and his colleague Kent Beck, working at Tektronix Corporation near Portland, Oregon, were seeking new forms of software that would display what mathematicians sometimes refer to as "elegance": the ability to do more with less. Cunningham embodied this principle in the question, "what is the simplest thing that could possibly work?" We enter a process of exploration and adaptation, without assuming the need for detailed specifications in advance.

Cunningham was intrigued by the capacity of language, in its very ambiguity, versatility and economy, to serve more ably as a useful working model for problem-solving. A problem is, by definition, not pre-decomposed into simple functional units, but as Alexander noted, has many overlapping and ambiguous connections. Language mirrors this capacity, and therein lies its usefulness. Therefore, the goal is, in a sense, to achieve the same robustness of language, by endowing the model with its own set of powerful (but limited in number) generative components, much as language does.

Thus, the goal is not simply a matter of economy, but one of greater context-adaptive problem-solving power. In fact it goes back to the heart of Alexander's concept of language-like networking: a simple grammatical system, functioning generatively, can be far more powerful than a complex set of specification-based processes. As Cunningham put it, when asked by programmer Tom Munnecke to explain how "the generativity of a pattern is a way of expressing complexity:"

> *That was an idea that excited me, and that seemed more powerful than most... And that is, language is generative. And that idea that I can have a set of rules that generates something that I could value is really important. So the question was, why don't we do everything that way? And the answer was, well we pretty much did, until we let professionals get involved. ...And they made it complex by trying to make it simpler, because they didn't understand how some system of rules could* ***generate*** *behaviors instead of* ***specifying*** *behaviors.*

This generation refers to the capacity to reproduce the essence of a functioning structure, without having to specify all of its characteristics. A simple example is the distinction between the way a genetic process generates the blue eyes, say, of a child, which recapitulates the blue eyes of the parent without having to specify them in minute detail — their intricate retinal flecking pattern, precise round shape, and so on. Instead, the genetic process is able to generate, and regenerate, an intricately complex structure from a relatively simple set of language-like (or recipe-like) instructions.

So it is with pattern languages and their patterns. The goal is to pick out the most salient features that are needed for regeneration *within a specific context*, and to establish a generative process that uses those patterns. This process is very much like the way older cities and buildings were traditionally generated using linguistic concepts, often without the need to state them explicitly. In the case of pattern languages, the process is only formalized, so that designers can be more articulate about the needed design aspects, and so that the result can be more successful, more durable, and more sustainable, responding to the best available evidence, and representing a best adaptation to human need.

The continuing need for pattern languages in many fields — including the built environment

Just now, by contrast, the human species is drowning in overly complicated and malfunctioning designs, from a human point of view. They may be exciting, they may be stimulating, they may be entertaining — indeed, they may not be malfunctioning in the short term, but instead, offer great power and allure. But we are like the fabled Sorcerer's Apprentice, unleashing a power we cannot control. Especially in comparison with the durable structures of nature, and of our own history, the results lack long-term resilience and sustainability. We can enjoy them, we can marvel at them, we can admire them — but we must also commit ourselves to deep reforms.

An apparent paradox is that today we are able to produce more *volume* of building than ever before in human history. Indeed, we are in an era of unprecedented urbanization, on course to build more sheer area of urbanization in the next fifty years than in all of human history. It is therefore a matter of highest urgency to address the nature of this urbanization, and its long-term impacts on economy, technology and quality of life — and to determine the levels at which reforms are needed in policy and practice.

It is a thesis of this book that those levels are very deep indeed. At the heart of the pattern language methodology is a recognition of changes needed in the very nature of technological methodologies, and the inadequate feedback capacities of our current linear systems — particularly as they impact the use and depletion of resources, the systems we use for developing and applying adaptive knowledge, and related challenges.

This is also the reform-minded insight behind the related movements of Agile, Scrum, wiki, and other innovative reforms in methodology of design, and technology more broadly. Pattern languages, as we have discussed, played a role in shaping these other movements. The stunning, if partial, success to date hints at more to come, and suggests that the full potential of pattern languages — especially in the built environment — has not been reached.

One of the great advantages of pattern languages is that they do contain within them the capacity to establish reciprocal feedback channels through their web-networks of hyperlinks. The implications of this capacity are broad, although a full discussion is beyond the scope of this book.

Why these patterns in particular?

This volume is not meant to provide an exhaustive library of patterns, but rather, to provide a representative curated compendium of relevant new patterns, suggesting the potential for many more. The book is divided into three sections representing places, networks and processes ("patterns of scale," "patterns of multiple scale," and "patterns of process") with a series of pattern groups under each, and four representative patterns in each group. The selection of four is not significant, except as a means of including a small but illustrative sample of each kind of pattern.

There is also an on-line companion "repository" that includes these patterns as, in effect "seed patterns," which can be edited, deleted, added to, and used in any other way desired. It can be found at npl.wiki. We hope very much that this on-line version will lead to the evolution and use of many more patterns.

The patterns curated herein are not the only ones that are possible, certainly — and indeed, many regions are using very different patterns today (for better or worse). But a key purpose of this book is to show with the patterns herein examples of a more reliable, evidence-based approach to sustainable, resource-efficient urban development, promoting a higher quality of life, and at the same time, a healthier and more sustainable form of economic development. We document this claim with numerous research citations within the patterns, and we further demonstrate this claim by showing some concluding examples of several contemporary cities that do incorporate these patterns very successfully, with measurable economic, social and ecological benefits.

Other users may assert other patterns, or dispute the patterns we propose — and that is fine. All that is required is that the preponderance of evidence over time shows which patterns succeed best on local human terms, including social, economic and environmental dimensions. We want to know not only which patterns seem to be universally more beneficial, but also locally more beneficial in many different contexts, and expressing many different adaptations and variations — and in some cases, wholly new patterns, that may prove useful elsewhere. In this way, the entire collection of patterns can grow more useful, and at the same time, more diverse and extensive. This is, after all, how science works, and how knowledge works.

Ultimately, we may have many different collections of patterns, some sharing common patterns, some slightly different, and some altogether different, based on context. This is the core idea behind "federation," the concept that motivates the new "federated" generation of wiki, of which the new wiki is an example. This would deliver on the promise of the original book, to see "countless thousands of other languages we hope that people will make for themselves, in the future."

Why this particular format?

For the printed version, we have chosen to stay relatively close to the structure and appearance of the original pattern format introduced in 1977, for three related reasons. First, other versions of pattern language structure and appearance have been developed for the built environment, in part following the invitation of the book — yet no format has proven as user-friendly, as appealing, or as effective, as the original. This project is nothing if not evidence-based, and reliant on what has been shown to work — unless and until other, better practices are demonstrated to be more successful. Second, a consistent form of pattern is necessary so that the original goal of shared languages may be possible, and so that the patterns may be re-used in various customized project languages, working together. Third, the original book itself provides explicit direction (emphasis added):

> *…we have written this book* ***as a first step****… We have spent years trying to formulate this language, in the hope that when a person uses it, he will be so impressed by its power, and so joyful in its use, that he will understand again, what it means to* ***have a living language of this kind****. (A Pattern Language, pp. xvi-xvii)*

Echoing our second point, the book also makes clear that the format presented is intended as an essential characteristic of the project:

> *There are two essential purposes behind this format. First, to present each pattern connected to other patterns, so that you grasp the collection…as a whole, as a language, within which you can create an infinite variety of combinations. Second, to present the problem and solution of each pattern in such a way that you can judge it for yourself, and modify it, without losing the essence that is central to it. (A Pattern Language, p. xi)*

The success of the format is clear, and the invitation to use and modify is clear. This book is therefore one step in response, and an invitation to all those who are serious about further open-source development of pattern languages and related advances. Let us join with many others in a larger collaboration, now for the built environment as well — precisely as called for in the original book.

Patterns for a New Urban Agenda

Many of the patterns collected here are also suggested by the New Urban Agenda, the aforementioned 2016 international framework agreement on urbanization adopted by acclamation by all 193 countries of the United Nations. The document places heavy emphasis on the role of public spaces, including streets and sidewalks, as essential elements for healthy urbanization. It articulates this new priority for public spaces in no fewer than ten paragraphs.

For example, Article 37 promotes

> *... safe, inclusive, accessible, green and quality public spaces, including streets, sidewalks and cycling lanes, squares, waterfront areas, gardens and parks, that are multifunctional areas for social interaction and inclusion, human health and well-being, economic exchange and cultural expression and dialogue among a wide diversity of people and cultures…*

The New Urban Agenda also emphasizes the economic importance of public spaces, as in Article 53:

> *We commit ourselves to promoting safe, inclusive, accessible, green and quality public spaces as drivers of social and economic development, in order to sustainably leverage their potential to generate increased social and economic value, including property value, and to facilitate business and public and private investments and livelihood opportunities for all.*

The New Urban Agenda also emphasizes the interconnected "network" character of public spaces, with special emphasis on streets as public spaces, and the ways they and other public spaces connect to private edges. For example, Article 100 supports

> *...the provision of well-designed networks of safe, accessible, green and quality streets and other public spaces that are accessible to all and free from crime and violence, including sexual harassment and gender-based violence, considering the human scale, and measures that allow for the*

best possible commercial use of street-level floors, fostering both formal and informal local markets and commerce, as well as not-for-profit community initiatives, bringing people into public spaces and promoting walkability and cycling with the goal of improving health and well-being.

Finally, a number of other articles in the New Urban Agenda emphasize the integration of public spaces with other key characteristics of urban form, including "polycentrism" (many regional centers with a full mix of housing, employment and recreation). For example, Article 51 supports

...the development of urban spatial frameworks, including urban planning and design instruments that support... appropriate compactness and density, polycentrism and mixed uses, through infill or planned urban extension strategies, as applicable, to trigger economies of scale and agglomeration, strengthen food system planning and enhance resource efficiency, urban resilience and environmental sustainability.

An evolving theory of urban form, based on an evolving science of cities

This emphasis on public space frameworks organized around streets and their active edges, and around mixed use, polycentrism and compactness, reflects a notable shift from the dominant 20th century (mostly European and American) urban theories. These older theories, rooted in an earlier industrial model of cities, have given way to a more dynamic, more complex view of cities — one that also reflects new scientific insights from the biological sciences, and from other advancements in mathematics and other fields.*

The form of many cities around the world today is still dominated by these older models. It must be recognized that these models have proven effective in supporting rapid urbanization and economic growth, and in removing millions from poverty. That achievement should not be minimized. At the same time, the older models rely on unsustainably high rates of resource consumption and depletion, and related long-term consequences like pollution, greenhouse gas emissions, climate change and other potentially disastrous long-term impacts. We can also see that, for all its gains, the 20th century paradigm has also been socioeconomically costly, by segregating and essentially trapping many of the poor. The

* These topics are discussed in much greater detail in Mehaffy, M.W. and Salingaros, N.A. (2014), *Design for a Living Planet,* Portland: Sustasis Press.

evidence increasingly points to the need for a major transition to more resource-efficient forms of urbanization, and of technology — and to urbanization that also more efficiently delivers better long-term quality of life for human beings, without the many negative impacts of the older models.

Accordingly, the patterns herein reflect this new view of cities, and indeed the new understanding of the inter-connected, web-like patterns within cities — a view on which the technology of patterns itself is based. Therefore, in accordance with the New Urban Agenda, the patterns here describe compact, polycentric urban development, public space frameworks, a mix of uses, multi-modal forms of transportation over well-connected, walkable street systems, active street-level building edges, human-scale design, ample greenery and natural characteristics, and other related specifications. Again, these patterns are not the final word, but they do reflect our best current formulation of the state of the urban science, and the lessons for urban best practice.

New *kinds* of patterns

The sections of this book offer patterns at a number of different scales — as did the 1977 book — but addressed to new challenges, including rapid urbanization, new urban technologies (like autonomous vehicles), and the particular challenge of developing urban public spaces. (This is a key focus of the New Urban Agenda, and a particular focus of our own research work as well.)

Several sections also include new kinds of patterns as well — at least new by the standards of the 1977 book — including patterns devoted to retrofit processes (such as slum upgrading, and so-called "sprawl repair"), more detailed geometric patterns, and also implementation tool patterns (including community design and building processes, and financial tools). This focus on patterns of *process* represents an expansion of the earlier focus on patterns of configuration within human environments.

For this reason, the book is organized into three major sections: patterns of scale, patterns of multiple scale, and patterns of process. These correspond to the subtitle of the book: places, networks, processes. This structure reflects an awareness that we need new models of urbanism, and also new tool for successful implementation of urbanism, to confront new challenges.

In all these innovations, this volume represents one open-source project to expand the capacity of pattern languages — and it is far from the final word. Like the first set of patterns, it amounts to a set of hypotheses based on our best assessment of available evidence. Like the hypotheses of science, these patterns are able to be challenged and revised, if and when truly better evidence for broader human benefit — as opposed to *ex cathedra* doctrines, or ideologically motivated rationalizations for narrow self-interests — becomes available.

Accordingly, the text herein is licensed under Creative Commons' "Attribution-ShareAlike"*. Those who would like to revise, extend, modify, or otherwise re-publish the text with their own (one hopes) proper evidence-based alterations, are welcome to do so, in whatever media they choose, with the only stipulation of attribution to this original source, and continued openness to peer review and challenge on evidence. In that spirit, as Christopher Alexander and his co-authors said in the original book, may we finally see "countless thousands of other languages… that people will make for themselves, in the future."

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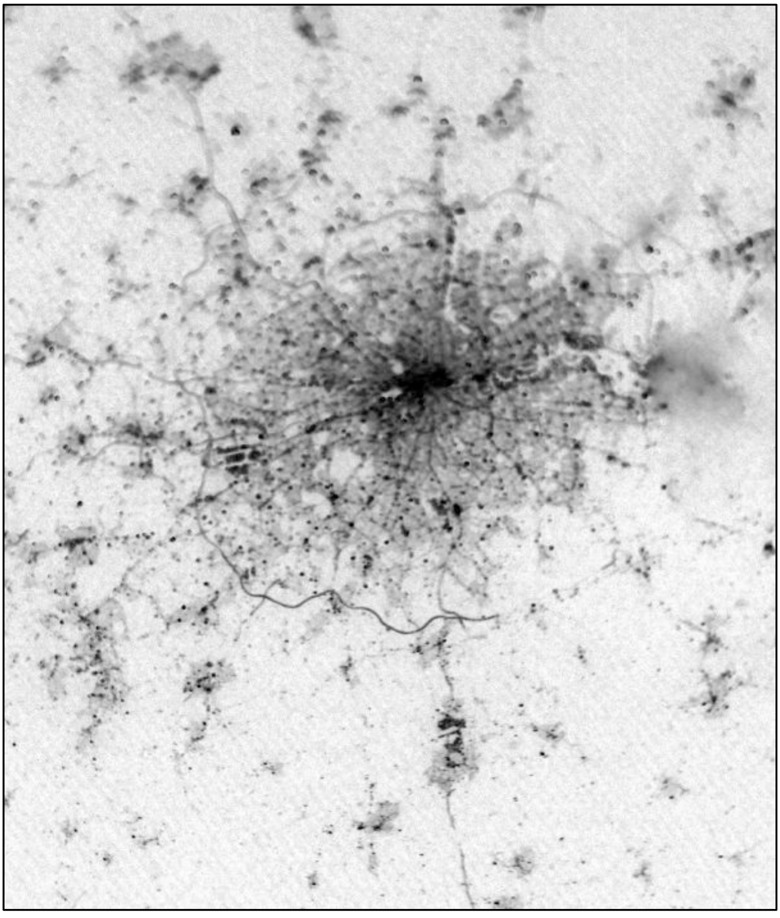
SECTION I:
PATTERNS OF SCALE

1. REGIONAL PATTERNS

Define the large-scale spatial organization…

1.1. Polycentric Region
1.2. Blue-Green Network
1.3. Mobility Corridor
1.4. 400m Through Street Network

1.1. POLYCENTRIC REGION

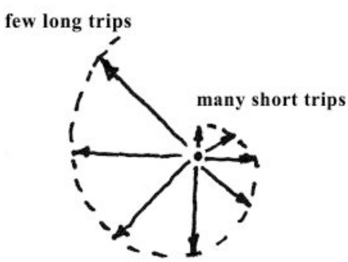


…We need to establish a settlement area as it relates to a wider regional structure. This pattern governs the relation of urban centers to their peripheries.

❖ ❖ ❖

Problem-statement: Cities that are too centralized too often require excessive commuting from their edges, and their cores can become unhealthy monocultures.

<u>Discussion:</u> We can see that where cities and towns have developed in a more natural pattern — especially prior to the automobile — there has been a remarkably regular distribution of city sizes, with a few large urban centers, many smaller satellite towns, and a medium range of mid-size settlements, often suburban town centers. Similarly, most residents in these areas make a great many short trips — for example, daily trips to a nearby grocery store or to school — as well as a few long trips, perhaps to a major cultural event in another town. In between these extremes, they make a medium number of medium-size trips — for example, trips to work. This range of trip lengths could be illustrated this way:



But when a city is too centralized, even routine trips can become long commutes — for example, when the center is a monoculture of offices and workplaces, and the edges are primarily residential. By the same token, a city can also become too decentralized, with too many resources scattered across a large region, and requiring too much energy and cost for most people to access equitably.

A healthier pattern will include a more optimum distribution of activities and uses across settlements and scales, forming a "polycentric" region — a region with a range of diverse, mixed centers at a range of scales, each of which offers most of the routine destinations, activities and amenities of urban life.[1]

This pattern can be seen clearly in the example of the London region (the photograph for this pattern). There a series of "urban villages" offers most of the needs for most residents to live, work and play within their own area, while they can also take longer trips less frequently. Some may make long frequent trips, but many do not.

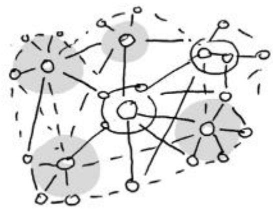
This pattern also extends to the smaller cities and towns of a larger region. Their residents also need to be connected to the same regional economy, with similar life opportunities and exchanges, but focused more on the activities that are best suited for their regional location — for example, industries needing regular access to rail, water-intensive industries, or other location-specific economic activities.

What we describe goes to the heart of stable sustainable systems, which as evidence suggests, obey "fractal" scaling properties.[2] That means there are a few big elements, many small elements, and a medium number of medium-sized elements. In the case of path lengths, the same is true: there must be many more short trips, and many fewer long trips, made possible by the geometry of the urban fabric and its distribution of uses. Unfortunately in the 20th century, we created urban forms that forced too many longer trips, largely by separating functions with zoning. That was not a stable or sustainable condition.

All of these nodes in the local, regional and even global network, need to be well-connected and well-developed to provide balanced life opportunities for all residents. Evidence shows that when some populations are cut off from genuine opportunity for growth and human development, there are political, economic and environmental impacts for all populations that are likely to become unsustainable over time.

Therefore:

Develop cities as nodes within polycentric regions, consisting of a range of sizes of mixed, diverse, well-connected "urban villages" that offer a full complement of daily and weekly needs, and good access to other parts of the region for less frequent trips.



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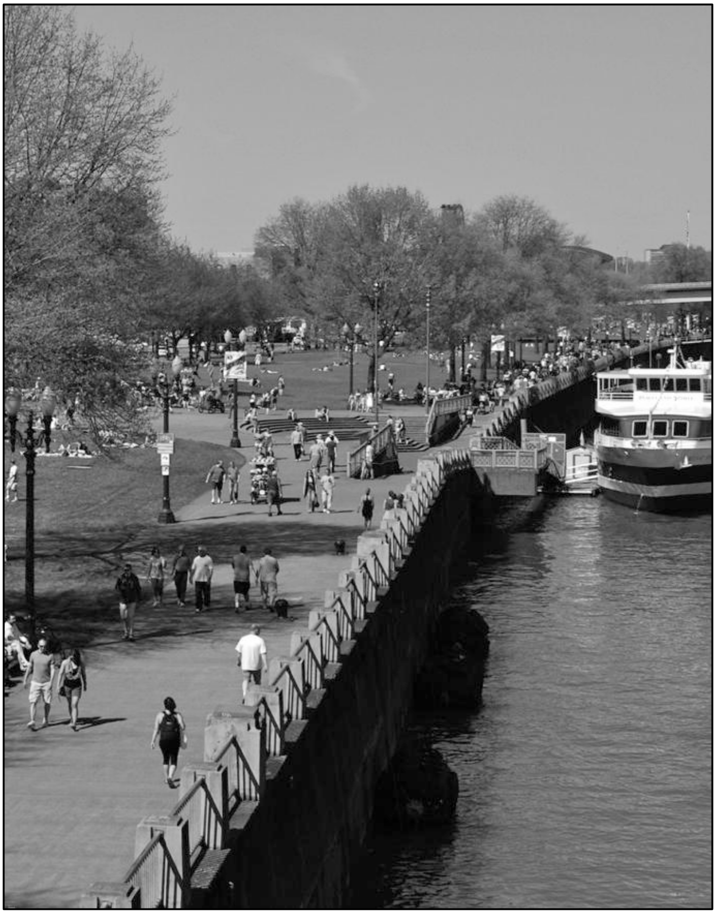
Establish a rough structure of a 400M THROUGH STREET NETWORK (1.4), creating continuous walkable and multi-modal urban areas. Where interruptions occur, such as natural geographic obstructions, connect the centers as much as possible with a continuous network, organized around the MOBILITY CORRIDOR (1.3) and MULTI-WAY BOULEVARD (3.2) patterns…

[1] See for example the special issue of *Urban Studies,* Vol. 38, No. 4, and in particular the introductory essay, Kloosterman, R. C., & Musterd, S. (2001). The polycentric urban region: towards a research agenda. *Urban Studies, 38*(4), 623-633. Available on the Web at https://journals.sagepub.com/doi/pdf/10.1080/00420980120035259?casa_token=UN34U0vU-JnMAAAAA:pIlcW55gb7HLO_J7IX8iPbyC3ASwQYp9oiBTjJtpcW1Hvyk7qu1s3r-jBJj8q6aTUrfof-OuStj-a

[2] See for example Salingaros, N. (2005) "Connecting the Fractal City," in *Principles of Urban Structure.* Amsterdam: Techne Press. Available online at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.431.6038&rep=rep1&type=pdf

1.2. BLUE-GREEN NETWORK



…Settlements that follow the pattern of a POLYCENTRIC REGION (1.1) will also adapt to the terrain of the land, its watershed and vegetation patterns

❖ ❖ ❖

Problem-statement: A region that does not adapt its form to its watershed patterns cannot be sustainable.

Discussion: Every settlement area, no matter how arid, has a hydrology at some scale. In recent decades, it has been common to pipe over the natural system of hydrology, but this is doubly destructive. First, it fails to allow the natural systems to function as they can to clean the water, recharge the groundwater, and support vegetation with natural irrigation. Second, it deprives the human community of an important quality of life asset, and sense of connection to their own regional ecosystems.[1]

In order to work with a region's hydrology, it is vital to recognize its network connectivity through mapping, and then to lay out settlement patterns such as streets and infrastructure in response to its "blue-green network" — that is, its network of creeks, watersheds and vegetation corridors. These usually offer segments that can become important blue-green corridors for walking, cycling, recreation and vehicular transportation (with proper mitigation of danger, noise, emissions and other impacts) — see URBAN GREENWAY (3.1).

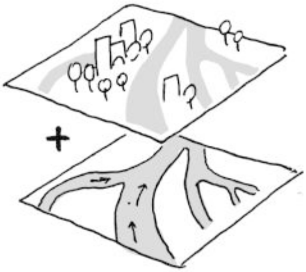
In the 20th century, we failed to understand the importance of these blue-green networks, and their potential role as a "cooperating network" with human movement networks. We failed also to understand the importance of blue-green networks in providing "ecosystem services," notably the improvement of water quality.[2] Rather than negotiate a co-existence between these two systems, we allowed human movement systems like streets to dominate and even replace blue-green networks with pipes and concrete ditches. Now we are paying the price for this short-sightedness. We have begun to change our policies and practices to create nested, interacting urban networks incorporating blue-green networks within them.

At the same time we must recognize that, while the blue-green network of an urbanized area must be ecologically functional with regard to its ecosystem services and its role in urban wildlife habitats, the primary function of urban regions is to be urban — that is, to establish a pattern that is sufficiently compact to avoid sprawl and to protect surrounding ecologies. As the British Town Planner Thomas Sharp put it, "the true way to save the countryside is to build true sheerly urban towns."

The blue-green network of Portland, Oregon USA, located at the intersection of two major rivers and a number of creeks and watersheds. These have been fashioned into major corridors for infrastructure, movement, recreation and ecosystems services. Photo: Google Maps.

Therefore:

Lay out the settlement with the pattern of blue (water courses) and green (vegetation corridors and watersheds) networks.



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Identify key corridors of the Blue Green Network as potential locations for an URBAN GREENWAY (3.1) or MULTI-WAY BOULEVARD (3.2)…

[1] See for example De Vleeschauwer, K., Weustenraad, J., Nolf, C., Wolfs, V., De Meulder, B., Shannon, K., & Willems, P. (2014). Green–blue water in the city: Quantification of impact of source control versus end-of-pipe solutions on sewer and river floods. *Water Science and Technology, 70*(11), 1825-1837. Available on the Web at https://tinyurl.com/yxfb444j

[2] This pattern is closely related to Goal 6 of the Sustainable Development Goals on safe water and sanitation (adopted by all members of the UN General Assembly in 2015). There are a number of resources that can be consulted for additional information. See for example the World Bank report on water quality and the role of cities, *Quality Unknown*, available free for download at https://openknowledge.worldbank.org/bitstream/handle/10986/32245/9781464814594.pdf?sequence=8&isAllowed=y. As the report concludes, "The world faces an invisible crisis of water quality. Its impacts are wider, deeper, and more uncertain than previously thought and require urgent attention. While much attention has focused on water quantity — too much water, in the case of floods; too little water, in the case of droughts — water quality has attracted significantly less consideration… Water quality challenges are not unique to developing countries but universal across rich and poor countries alike. High-income status does not confer immunity - challenges with pollutants grow alongside GDP. And as countries develop, the cocktail of chemicals and vectors they contend with change — from fecal bacteria to nitrogen to pharmaceuticals and plastics, for example. What we think of as safe may be far from it." See also a report by the European Union: "Green infrastructure, as defined by the European Union Green Infrastructure Strategy 2013 is 'a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services'." https://webgate.ec.europa.eu/greencitytool/resources/docs/guidance/nature.pdf

1.3. MOBILITY CORRIDOR

…In a POLYCENTRIC REGION (1.1), develop proper high-speed connections between the centers of the region as well as to other regions.

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Problem-statement: There is a need for corridors that allow high-speed vehicular movement within and between cities. This need extends into the hearts of the cities. But these structures must not be allowed to sever and destroy the tissue of the city.

Discussion: Few structures have been more damaging to modern cities than freeways. Yet the solution of creating freeway bypasses on the outskirts of cities is equally disastrous — sapping the centers of commercial movement and activity, and at the same time generating new sprawling zones at the edges.

This is not a unique problem of the automobile age. Railways can be no less destructive of urban areas, and so can canals, rivers and other structures — in fact, any structure that significantly interrupts the connectivity and flow of pedestrians is likely to be problematic. But there are excellent examples of cities that have managed this problem, by separating the grades of the mobility corridors, and by creating a continuous fabric of connections across them. Examples can be seen in London, Paris, and many other mature cities.

Grade-separated mobility corridor in Paris: Place de l'Europe over a railway line.

The issue is not whether a mobility corridor is present, but whether the urban fabric surrounding it remains intact. This must be done carefully, maintaining a continuous, tight fabric with minimal intrusion of noise, emissions, and visual disorder. Examples like Place de l'Europe in Paris demonstrate the value of ample vegetation, fences and other screening devices. Some cities have simply taken their mobility corridors underground, like Oslo. Some cities bring buildings across the bridging structures, like the Ponte Vecchio in Florence.[1]

One problem for many cities is the cost of excavation and retaining structures. One strategy to minimize this cost is a "balanced cut and fill" grade change, rising gently in the urban fabric to the edge of the mobility corridor, and then cut more deeply to accommodate travel lanes at a lower grade. A related strategy is to utilize existing natural watershed grade changes, taking care to avoid water pollution from vehicle emissions and other toxic runoff. Because of the cost of excavation, many cities in recent decades have chosen the easier alternative, which is to raise highways and heavy transport tracks above the pedestrian urban fabric. But the evidence shows that there is a profoundly negative impact of such solutions on the urban life underneath them.[2]

Of course, it must be stressed that "mobility" is not just about high speed transportation, but about integrated mobility across multiple modes (see WALKABLE MULTI-MOBILITY, 2.1). A coordinated strategy is needed to keep a balanced and integrated approach to mobility.[3]

Therefore:

Do not push freeways, railways and other destructive activities to the edges of the city. Instead, find ways to integrate them into the urban fabric with minimal disruption, using careful grade-separating strategies. Assure that the streets above are continuous, walkable, and as protected as possible from negative impacts like noise and emissions. Plan for at least two major mobility corridors crossing each large urban area, and connecting to others.

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Integrate mobility corridors into the network, maintaining a 400M THROUGH STREET NETWORK (1.4) across all interruptions, providing bridges and other connections…

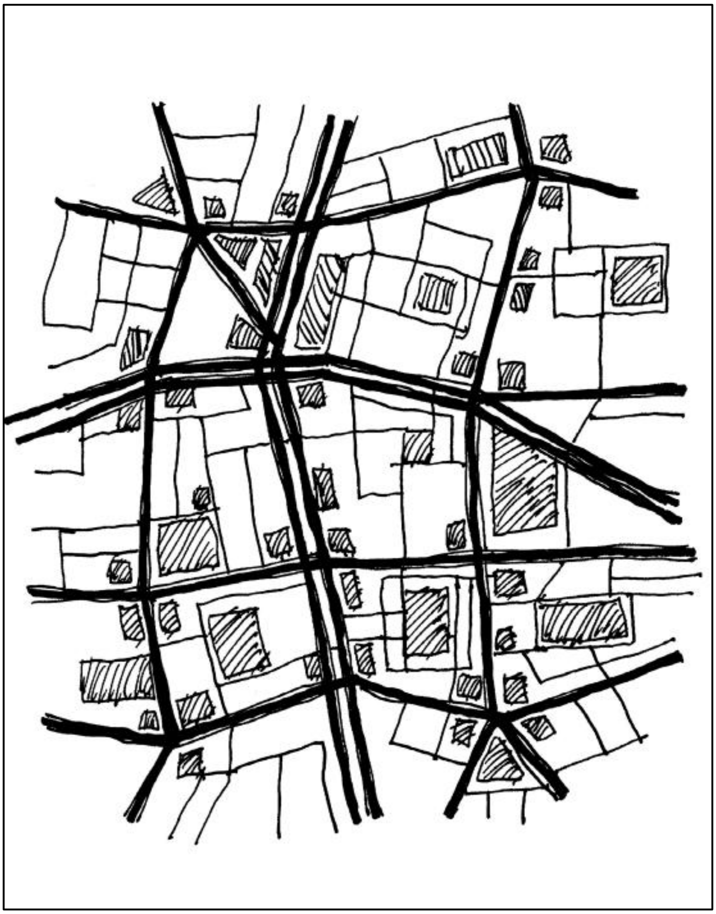
[1] For a discussion of this concept in relation to urban mobility networks, see Mehaffy M.W., Porta, S., Rofè, Y. and Salingaros, N. (2010), Urban nuclei and the geometry of streets: The 'emergent neighbourhoods' model. *Urban Design International, 15*(1), 22-46. Available on the Web at https://tinyurl.com/yy98o68y

[2] The damaging effects of such structures has been discussed extensively, and perhaps most notably by Jane Jacobs in *The Death and Life of Great American Cities* (1961, New York: Random House). She referred to the consequences as "galloping gangrene."

[3] Additional resources on this point include the World Resources Institute Sustainable Mobility Strategies, http://wrirosscities.org/sites/default/files/WRR_Transport.pdf. Among their recommendations: 1) Optimize efficiency: Support planning and implementation of higher fuel and vehicle efficiency standards and lower energy consumption and emissions from the transport sector through engagement and research. 2) Electrify fuels: Support adoption of electric vehicles and the transition to electrified transport systems through localized research and direct engagement with stakeholders from multiple sectors. 3) Integrate systems: Support implementation and management of integrated transport systems through directly influencing the planning and implementation of urban transport systems and publishing high-quality research. 4) Shift and align funding and policy: Build capacity for sustainable transport through research, direct technical guidance, policy recommendations, and stakeholder engagement with the public, private, civil society, and donor communities.

An additional resource is the European Commission's "Green City Tool" on mobility: https://webgate.ec.europa.eu/greencitytool/topic/mobility/guidance.

1.4. 400M THROUGH STREET NETWORK



…Within a POLYCENTRIC REGION (1.1), we need to establish a balance between vehicular mobility and pedestrian safety, while maintaining, as much as possible, a continuous connectivity through the urban region.

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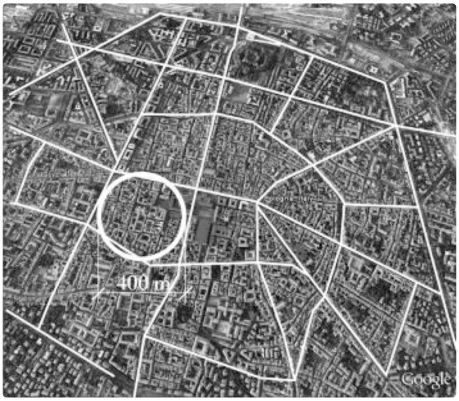
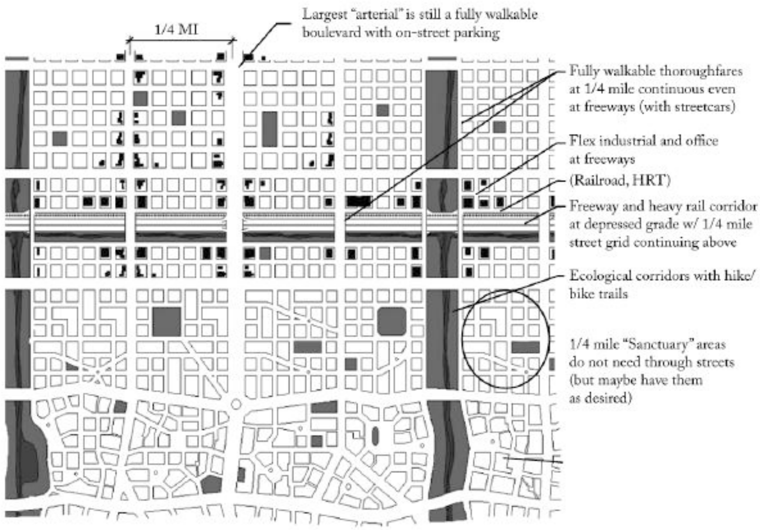
Problem-statement: At a larger urban scale, there is need for higher-speed vehicular mobility. But at a smaller sub-neighborhood scale, there is a need for resident-pedestrians to have a quieter area, free of the dangers and disruptions fast-moving vehicles.

Discussion: In many cities around the world, there is a surprisingly consistent pattern of through vehicular streets, spaced at roughly 400 meters or ¼ mile, or less. This pattern long predates the automobile, a fact that is not so surprising when we consider that vehicles of various kinds (carts, carriages, etc.) have existed in cities for millennia, and that these vehicles all pose some dangers to pedestrians. It seems that neighborhoods have self-organized to achieve a balance between the needs for pedestrian protection and vehicular mobility, by creating a protective zone (or "sanctuary," as described by Donald Appleyard) that is roughly equal to an easy walk, or slow drive, to the nearest vehicular street. That distance is about 200 meters, or 400 meters in diameter.[1]



The striking pattern of roughly 400m spacing of principal through avenues and "sanctuaries" in Bologna, Italy. The same pattern can be seen in many other cities around the world.

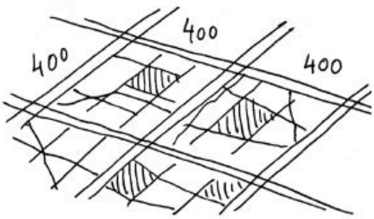
It is important to understand that this pattern does not require a regular grid, or standard block sizes, although many cities (especially older cities in the United States) do in fact have the 400-meter pattern within a regular grid, and often with standard-sized blocks. The pattern also does not prohibit some smaller streets from aligning within these 400-meter zones or through their edges. It only requires that these smaller streets do not accommodate fast-moving vehicles, traveling relatively straight for long uninterrupted distances (typically 3 kilometers or 2 miles).



This illustration (not to scale) shows that regular blocks and street grids are not required for the pattern, and a much more irregular pattern of principal through avenues at 400m (as shown below) is possible.

Therefore:

When laying out street grids, use a rough spacing of 400m (¼ mile) or less for principal through streets. Within these roughly 400m areas or "sanctuaries," make shorter, interrupted, lane-like streets that accommodate vehicles, but allow pedestrians to dominate.



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At larger scales, accommodate higher-speed mobility with the MULTI-WAY BOULEVARD (3.2) that combines mobility with safe paths and crossings for pedestrians and bicycles. Where the highest speeds are required, use a MOBILITY CORRIDOR (1.3) with grade-separated pedestrian and bicycle paths, and crossings at no more than 400 meters. At smaller scales, use the AVENUE (3.3) and SHARED SPACE LANE (3.4) patterns…

[1] This concept was examined at length in Mehaffy M.W., Porta, S., Rofè, Y. and Salingaros, N. (2010), Urban nuclei and the geometry of streets: The 'emergent neighborhoods' model. *Urban Design International, 15*(1), 22-46. Available on the Web at https://tinyurl.com/yy98o68y

2. URBAN PATTERNS

Establish essential urban characteristics…

2.1. Walkable Multi-Mobility
2.2. Level City
2.3. Public Space System
2.4. Biophilic Urbanism

2.1. WALKABLE MULTI-MOBILITY

…Within the 400M THROUGH STREET NETWORK (1.4), we need to assure that pedestrians can access all points within and along the network, as well as access other modes of travel. We must assure that pedestrians are not blocked by a MOBILITY CORRIDOR (1.3) but have multi-modal access to urban points across the POLYCENTRIC REGION (1.1).

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Problem-statement: At the start and end of all trips through the city are walking trips. Since the starting point of these trips is indeterminate, it follows that continuous walkability is needed throughout the city, carefully coordinated with other modes of travel.

Discussion: For most of human history, the ability to walk between destinations was a key requirement of all cities. But especially in the last half-century, many portions of cities have become unwalkable, often because the design of vehicular facilities has disrupted pedestrian movement. This condition is not sustainable, given the correlation with high rates of resource consumption, depletion, pollution, and other impacts of an unwalkable lifestyle.[1,2]

The urban characteristic called "walkability" has a number of elementary requirements.[3] First, there must be a pathway that is adequate in width. Second, the pathway must be safe from vehicles, both physically (preventing vehicles from accidentally plowing into pedestrians) and psychologically (not bringing a pedestrian close to a fast-moving vehicle). Third, the pathway must be visible enough to discourage crime. Fourth, the pathway must be attractive to walkers, offering places to sit, vegetation, interesting views and other rewards. Finally, the pathway must be well-connected with destinations and with alternate routes, at a maximum distance of 400M or ¼ mile (see 400M THROUGH STREET NETWORK, 1.4).

Pervasive walkable multi-mobility in Portland, Oregon.

Therefore:

Make walkability a pervasive characteristic of the city, with special emphasis on the 400M through street network, and the mixed residential areas within this network. Coordinate the walkable network with other modes of travel, including well-distributed multi-modal hubs for public transit.

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Assure that walking is the dominant mode within each local PEDESTRIAN SANCTUARY (4.2). Coordinate other modes of travel including BUS STOP (APL 92), light rail, bicycle racks and other facilities…

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[1] See for example Leyden, K. M. (2003). Social capital and the built environment: The importance of walkable neighborhoods. *American Journal of Public Health*, 93(9), 1546-1551. Available on the Web at https://ajph.aphapublications.org/doi/pdfplus/10.2105/AJPH.93.9.1546

[2] One of the critical challenges for cities that are losing their walkable multi-mobility is declining air quality. The European Commission's "Green City Tool" ties these issues together and makes recommendations, noting that "Clean air is essential for the good health and well-being of humans and for animals and plants."
https://webgate.ec.europa.eu/greencitytool/topic/air/guidance

[3] See Southworth, M. (2005). Designing the Walkable City. *Journal of Urban Planning and Development*, 131(4), 246-257. Available on the Web at https://ascelibrary.org/doi/pdf/10.1061/%28ASCE%290733-9488%282005%29131%3A4%28246%29

Image: Cengiz Sari via Unsplash.

2.2. LEVEL CITY

…Within the POLYCENTRIC REGION (1.1), create variations in density, but following a relatively continuous building volume.

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Problem-statement: Evidence indicates that one of the most optimal urban forms is a relatively continuous building volume with a height of between two and ten stories — what we may refer to as the "level city". Yet in the last half-century, many cities have taken on a discontinuous and disruptive form, with significant long-term negative impacts on the quality and resource efficiency of city life.

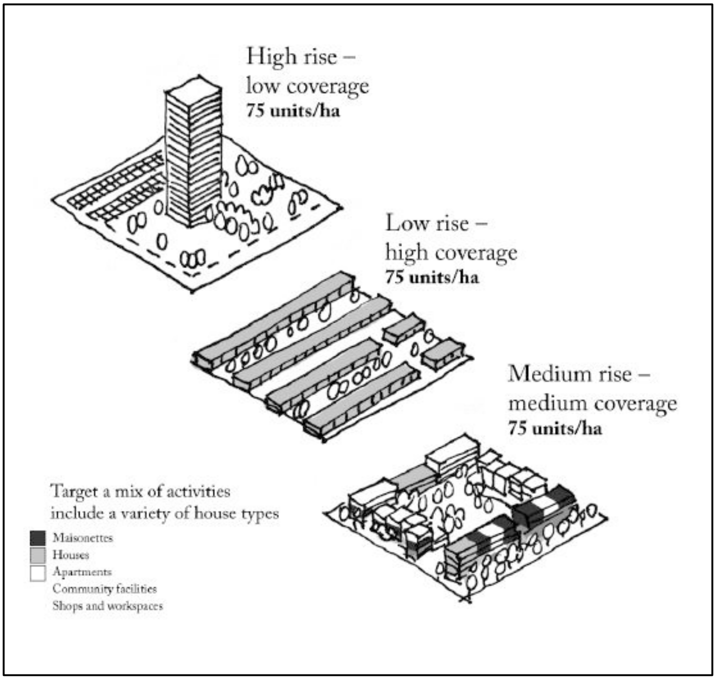
Discussion: Many people assume that in order to achieve a compact, sustainable and prosperous city, it is necessary to "go up" — that is, to adopt an urban form that includes many tall buildings. The evidence shows that this view is mistaken — and it overlooks research on the many negative impacts of tall buildings, especially in the longer term.[1]

First, let us acknowledge that, for many people today, this pattern may be one of the most surprising and perhaps controversial in this collection. The practice of building tall is so widespread, and the assumptions about its benefits are so widely shared, that the actual evidence may come as a shock. However, let us consider the evidence carefully — for the impacts in the future are potentially enormous.

Some advantages of tall buildings are obvious: they offer very nice views (when not blocked by other tall buildings), they confer status and prestige, and they create very visible branding for companies and for ego-centered individuals. But many other commonly claimed benefits of tall buildings are contradicted by the evidence, as our research and others' has shown.[2] (See also FOUR-STORY LIMIT, APL 21.)

Among the more spurious claims are that tall buildings, by adding housing units, will help to promote affordable housing — yet they count among the most expensive construction systems in the world, particularly given costs associated with structural stiffening, egress requirements (space devoted to stair and elevator cores), and other diseconomies. No less dubious is the claim that tall buildings can be inherently more sustainable, given their high embodied energy and materials, greater exposure to heat gain and loss, and typically high-maintenance, short-lifecycle mechanical systems, requiring frequent and resource-intensive overhauls.

In fact many of these claims rely on a deeper misconception, that tall buildings are necessary to achieve beneficially higher densities. But there is abundant evidence to disprove this fallacy as well. As a UK House of Commons fact-finding report concluded, tall buildings "do not necessarily achieve higher densities than mid or low-rise development and in some cases are a less-efficient use of space than alternatives... Tall buildings are more often about power, prestige, status and aesthetics than efficient development."[3]



Three very different urban forms at very different heights — yet they all achieve precisely the same density. Many people fail to understand that tall buildings are commonly placed very irregularly, typically between large unwalkable areas of green space, parking lots, or low buildings, with little or no net increase in density over other possible forms. Source: UK Urban Design Task Force, 1999.

The research also shows that there are many other negative impacts of tall buildings, including environmental impacts on adjacent buildings and public spaces (shading, loss of views, wind effects, loss of human-scale experience); social impacts ("vertical gated communities," loss of ground-floor activation, etc), and economic impacts (increased maintenance costs over time, obsolescence of design fashions, threat of market failures and abandoned buildings, etc).[4]

Perhaps the most alarming evidence against residential tall buildings is recent evidence of psychological impacts, most severely in children. Negative effects include higher levels of depression and anti-social behavior, and marked impairment of child development.[5]

Tall buildings do indeed allow some people and companies to achieve literal superiority over the city, expressing their social and economic dominance. At some point, however, this concentration of wealth is likely to prove unhealthy, exacerbating inequality and instability. A "level city" (maintained by zoning codes, incentives and disincentives, or a mix) offers a more "level playing field" — a more equitable and more evenly distributed kind of urbanism.

This is not to say that higher density is not desirable — or, at the other extreme, that a very high density is *always* required. In fact the best cities offer a range of densities, tending to increase toward their regional centers, but containing many variations or "density rings" throughout the region. For example, a "polycentric region" will contain many density rings of lower and higher densities, offering choices corresponding to stages of life (children, couples, singles, elderly etc.) and preferences (active centers, quieter backs, etc.).

Finally, it is important to note that there is an important role for some tall buildings to serve as wayfinding landmarks, and as monuments to the city's public life. These structures should be exceptional, and they should be civic in nature — for example, spires within public spaces, like the Eiffel Tower in Paris, or structures that express a shared spiritual experience, like the Sagrada Familia cathedral in Barcelona (seen in the photo at the beginning of this pattern).

Therefore:

Maintain a building height limit of typically no more than ten stories, together with incentives for maximizing infill of buildable sites, aiming to produce a continuous and efficient urban form. Allow taller structures when they are civic monuments and public buildings, and when they assist with wayfinding. Allow variations in density, while assuring a continuous walkable urban fabric.

❖ ❖ ❖

Use the pattern PERIMETER BUILDING (9.1) to maximize continuous fabric along the street. Cluster each group of housing and other activities within a DENSITY RING (APL 29). Use a FORM-BASED CODE (16.1) to provide for coherent massing with extra height only where appropriate…

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[1] See for example Alterman, R. and Mehaffy, M. (2019). Tall Buildings Reconsidered: The Growing Evidence of a Looming Urban Crisis. Working Paper, Centre for the Future of Places. Available on the Web at http://sustasis.net/TallBuildings.pdf.

[2] Our colleague Patrick Condon has described a similar argument in work on what he calls "The Flat City". See Jing, H., & Condon, P. M. (2018). Flat City: Development Trend of World Cities Under the Influence of Digital Communication Technology Progress and Its Enlightenment to China. *Urban Planning International, (2)*, 8.

[3] See UK House of Commons (2002), *Sixteenth Report of Session 2001-2002.* London: UK Parliament Publications. Available on the Web at https://publications.parliament.uk/pa/cm200102/cmselect/cmtlgr/482/482.pdf.

[4] Our colleague Rachelle Alterman has done notable work in this area. See for example Alterman, Rachelle (2009). *Failed Towers: The condominium maintenance conundrum.* Haifa: Center for Urban and Regional Studies, Technion — Israel Institute of Technology.

[5] See for example the research collection by Boys Smith, N. (2016), *Heart in the Right Street: Beauty, happiness and health in designing the modern city.* London: Create Streets.

2.3. PUBLIC SPACE SYSTEM

…Within the POLYCENTRIC REGION (1.1), establish the distribution and connectivity of public space, following its BLUE-GREEN NETWORK (1.2).

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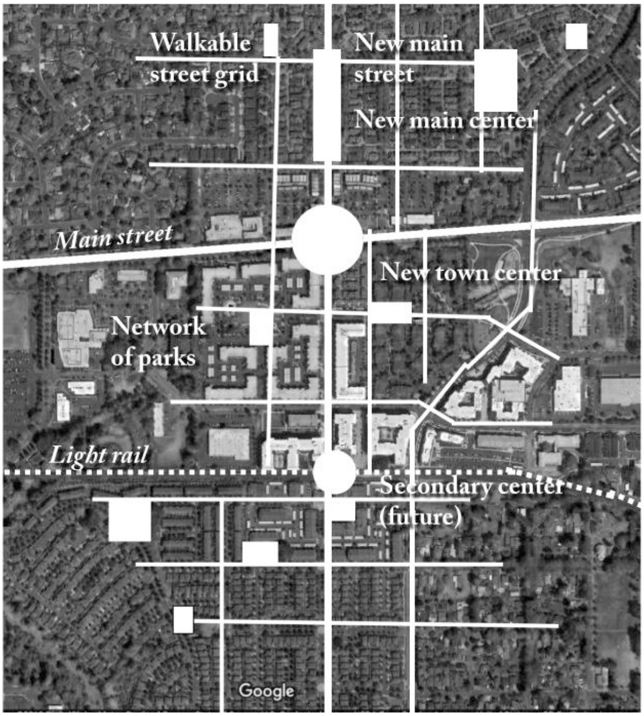
Problem-statement: Public space is the ultimate foundation and connective structure for all human spaces. Cities with inadequate public space systems will fail in critical ways.

Discussion: Over the last century, cities have seen an alarming decline in the quantity and quality of their public spaces.[1] In part this has occurred because of the increasing prevalence of the automobile, but another major reason is the failure to understand the importance of public spaces — including pedestrian-friendly streets — as integral components of settlement. This problem is becoming more urgent with rapid urbanization around the world in the early 21st Century.

Extensive research has documented the many important benefits of healthy public space systems, including social, economic and ecological benefits.[2] By contrast, cities that lack well-connected, walkable public spaces, must make up for this weakness with an artificial system of connection — automobiles, private spaces, communication networks and other systems, requiring growing and unsustainable levels of resource consumption.

Today we are gaining a clearer evidence-based understanding of the role of urban space, in comparison to the heady days of post-war planning that privileged the automobile. We see that a healthy city connects a fractal distribution of urban spaces (i.e. a few large ones, more intermediate-size ones, and very many small ones) via a protected set of pedestrian paths (public spaces in their own right) to create a pedestrian web-network. The larger public spaces appear as the 'beads' in a complex kind of 'necklace'. Each larger public space needs specific factors to make it work, however. It must (i) be semi-enclosed by a perimeter of attractive building façades with many entrances; (ii) be 'fed' by pedestrians coming from several surrounding blocks of mixed residential and commercial use; (iii) embed a path structure that crosses the plaza and is not cut by sculptures, street furniture, changes of level, or pools of water (these elements should instead be placed strategically so as to define and reinforce the cross-paths); and (iv) have at least one side that is strictly pedestrian.[3]



A network of large, medium and small public spaces, well-connected to each other and within 200m (750 feet) of all homes, in a new development on the Portland OR light rail line.

For this reason, a public space will usually not work if there is traffic all around it. If the climate permits, one side could have a portico or arcade. Further enhancement could come from the visual interest and ordered complexity in the surrounding façades (no blank concrete or brick faces without entrances, or plate glass curtain-walls).

These design rules are abstracted from successful historic urban spaces. Nevertheless, we need a drastic change in design philosophy (and in economic valuations) to apply them again today, because every signature building has become central in the mind of the contemporary architect. And yet public space needs buildings that help it by creating its border rather than drawing all the attention onto themselves. There is also the question of versatility: public space must accommodate a wide variety of users in different time scales. Those might include a busy person who crosses to get to the other side; someone with time to stroll leisurely; someone with time to sit down and enjoy the space; families with children needing space for their activities; and so on. Designed plazas coming from abstract schemes on the computer screen will invariably fail to cover all of these multiple functions, because each particular activity depends upon multiple factors that are only apparent on the site itself.[4]

Therefore:

Lay out every city, and every increment of a city, as a system of inter-connected public spaces, large, medium and small, including streets, squares, parks, and the public areas of buildings. Make these spaces walkable and pedestrian-friendly, with attractive destinations at frequent intervals. Assure that every residence is within 200M of an active public space.

❖ ❖ ❖

Assure that the public space system follows the 400M THROUGH STREET NETWORK (1.4), and extends along its streets, squares and parks. Lay out the system as a series of PATHS AND GOALS (APL 120), incorporating ACTIVITY POCKET (APL 124) and OUTDOOR ROOM (APL 163) patterns. Apply FRACTAL PATTERN (11.3) to design the street furniture and its details, in order to satisfy human scales. Create a PLACE NETWORK (6.1) all along its edges, and assure it has POSITIVE OUTDOOR SPACE (APL 106)…

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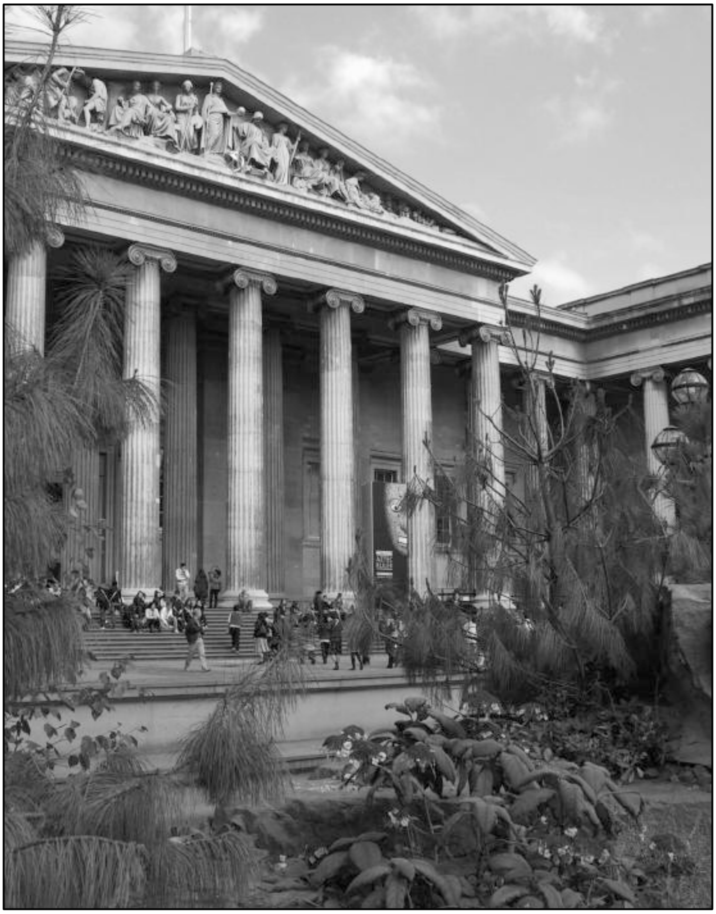
[1] UN-Habitat (2016). *World Cities Report* (p. 5). New York: UN-Habitat.

[2] See for example citations included in Mehaffy, M. (2018). *White Paper on Valuing the Benefits of Public Space Systems* (Working Paper). Stockholm: Centre for the Future of Places, KTH Royal Institute of Technology. Available on the Web at http://sustasis.net/PS-Benefits.pdf.

[3] See for example Salingaros, N.A. and Pagliardini, P. (2005) Geometry and life of urban space, Chapter in: Back to the Sense of the City, 11th Virtual City & Territory International Monograph Book, Centre of Land Policy and Valuations (Centre de Política de Sól i Valoracions), Barcelona, Spain (2016) pages 13-31.

[4] This is further discussed in Salingaros, N.A. (2005) *Principles of Urban Structure.* Techne Press, Amsterdam, Holland.

2.4. BIOPHILIC URBANISM



…Within the POLYCENTRIC REGION (1.1), assure that buildings and structures are conducive to high-quality human experience.

❖ ❖ ❖

Problem-statement: People have an instinctive need to be surrounded by the forms of nature, including biological nature. This need extends into the structures of cities, including their buildings.

Discussion:

Research has shown the importance of natural characteristics within the built environment for promoting human health and well-being. Yet many urban areas are harsh and unnatural, and as research has shown, these environments can produce high levels of stress, with negative impacts on human health and well-being.[1]

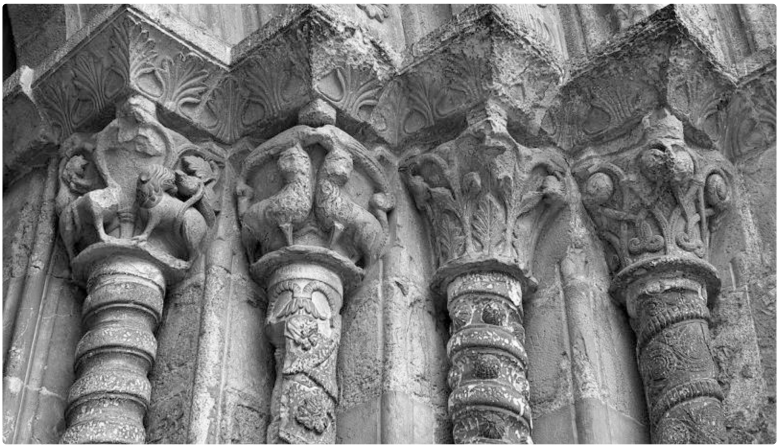
Many people recognize the value of greenery, especially in urban areas. Indeed, many cities have lush canopies of street trees and other vegetation. At the same time, many cities have buildings and building elements that also produce a biophilic effect to elicit positive emotional and physiological responses from users.[2]

Biophilia works by combining two mechanisms: an intimate contact (emotional, visual, physical, tactile) with living beings, and human response to geometries that are created by following biological rules. This does not however mean a superficial copying of natural forms, but is achieved through mimicking the very process by which living structure is generated. Biophilic design can be incorporated to improve the healing effects experienced in the built environment. Ten factors listed here contribute to enhance the human experience, and these can be combined into the "biophilic index B".

1. Sunlight
2. Color
3. Gravity
4. Fractals
5. Curves
6. Detail

7. Water
8. Life
9. Representations-of-nature
10. Organized-complexity[3]

We cannot emphasize strongly enough that these are not stylistic suggestions, nor a personal preference, nor indeed a desire to turn to the past, but have everything to do with improving human health. Recent studies have documented the health improvements of persons who experience biophilic environments. Mainstream architecture is fast adopting these ideas. Biophilic design has the potential to revolutionize architecture and urbanism in the 2020s, perhaps to the same degree that Modernism did in the 1920s.



Biophilic design has been integrated into some of the most enduring and beloved urban and architectural works created since antiquity. Above, forms of animals and plants are integrated into columns in the Igreja de Santiago, in Coimbra, Portugal. Photo: Jl FilpoC via Wikimedia Commons.

Therefore:

Incorporate biophilic properties and their components into urban structures at all scales, down to the details, including buildings and ornaments.

❖ ❖ ❖

Create biophilic urbanism with STREET TREES (8.3), FRACTAL PATTERN (11.3), HUMAN-SCALE DETAIL (15.2) and CONSTRUCTION ORNAMENT (15.3). . . .

[1] Much research confirms the increased stress levels including higher activation of the amygdala that are associated with negative experiences of urban living, in relation to exposure to more "natural" environments. See for example the work of Lederbogen, et al. published in *Nature*, "City living and urban upbringing affect neural social stress processing in humans" (2011): https://www.nature.com/articles/nature10190. Additional intriguing findings show that natural characteristics within the city can also produce important benefits, including naturalistic and "biophilic" elements of architecture. See for example Yannick Joye (2007). Architectural lessons from environmental psychology: The case of biophilic architecture. *Review of General Psychology*, 11(4), 305-328. https://journals.sagepub.com/doi/full/10.1037/1089-2680.11.4.305

[2] For a deeper discussion of this topic, see Kellert, S.R., Heerwagen, J.H. and Mador, M.L., Editors (2008). *Biophilic Design. The theory, science and practice of bringing buildings to life.* Hoboken, NJ: Wiley & Sons.

[3] Salingaros, N.A. (2019) The Biophilic Index Predicts Healing Effects of the Built Environment. Journal of Biourbanism, Volume 8, No. 1.

3. STREET PATTERNS

Identify and allocate street types…

3.1. Urban Greenway
3.2. Multi-Way Boulevard
3.3. Avenue
3.4. Shared Space Lane

3.1. URBAN GREENWAY

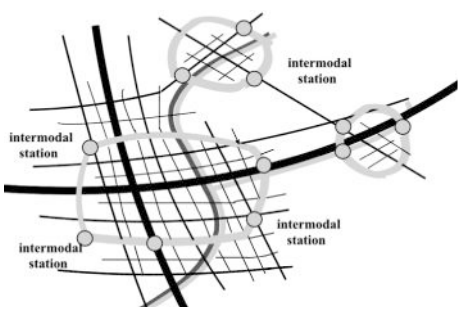
…Within the POLYCENTRIC REGION (1.1), provide functional and beautiful pathways for transportation and ecology.

❖ ❖ ❖

Problem-statement: People need human-scaled pathways around their city that offer many different modes of travel including walking and cycling, that are beautiful, ecological and functional, and that link with other modes of travel.

Discussion: Mobility corridors are focused on high-speed inter-urban mobility for vehicles, but they leave out the lower-speed forms of travel for more routine urban trips. The pattern of the urban greenway described here combines generous lanes for walking, biking, surface trams, moderate-speed surface vehicles, and below-grade trains, all linked by periodic intermodal stations. It is thus convenient to travel along an urban greenway corridor to intersect other train stations and transit lines within the region and beyond.

Urban greenways can be laid out, in some cases, along existing stream and river corridors to maintain ecological corridors for natural vegetation and wildlife, taking care to protect ecologically sensitive features — for example, placing the more disruptive pathways along the banks above stream corridors.[1] Urban greenways can also be developed out of previous beltways, such as the Ringstrasse in Vienna — seen in the photo at the beginning of this pattern — which was redeveloped from the beltway formed by the old city wall.



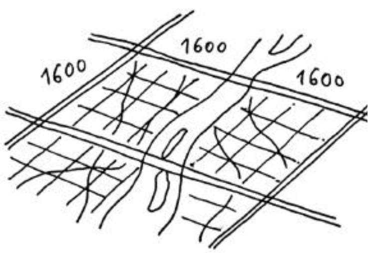
A polycentric region with several urban greenway loops.

Care must be taken to lay out greenways to optimize both pedestrian safety and ecological viability, which can be difficult. However, a number of investigations have begun to establish strategies and approaches to do so.[2]

The philosophical basis for this pattern is shared by the pattern BLUE-GREEN NETWORK (1.2) — namely, that we can creatively combine distinct systems of networks, including ecological and transportation networks. Some networks work relatively well parallel to each other (e.g. walking, biking, trams) whereas others have to cross, with careful control at their intersections (e.g. a bridge over a river or creek).

Therefore:

Within the rough 400-meter grid pattern, lay out an urban greenway corridor system at a roughly 1600 meter (1 mile) spacing. Assure that the corridors connect to key nodes of transportation and intermodal travel.



❖ ❖ ❖

Run each urban greenway adjacent to a PEDESTRIAN SANCTUARY (4.2) that provides housing and other uses. . . .

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[1] See for example the greenway corridor system in Singapore, considered a model for other Asian and international cities: Tan, K. W. (2006). A greenway network for Singapore. *Landscape and Urban Planning, 76*(1-4), 45-66. Available on the Web at http://faratarjome.ir/u/media/shopping_files/store-EN-1458113022-7947.pdf

[2] See for example Luymes, D. T., & Tamminga, K. (1995). Integrating public safety and use into planning urban greenways. *Landscape and Urban Planning, 33*(1-3), 391-400.

3.2. MULTI-WAY BOULEVARD

…At a scale smaller than the MOBILITY CORRIDOR (1.3) we need slower surface corridors that still accommodate a higher volume of vehicular traffic.

❖ ❖ ❖

Problem-statement: The major surface arteries of cities can choke the life out of their neighborhoods.

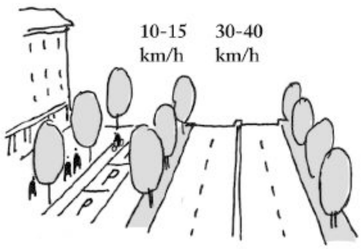
Discussion: There are several problems with major surface arteries in cities. One is that they lack safe places for pedestrians to cross at regular enough intervals. Another is that they are so fast-moving that their edges create unsafe and unattractive zones for pedestrians. In addition, bicyclists also require another level of mobility, as well as vehicles that need to move more slowly in order to park, or to pick up pedestrian passengers. These multiple (sometimes conflicting) needs have been met with the pattern of a multi-way boulevard, combining faster travel lanes, slower "slip lanes," and ample spaces for pedestrians and bicycles to travel, and to cross the faster-moving vehicular lanes safely.

Any high-speed vehicular corridor is of necessity out-of-bounds for the pedestrian. Even in urban situations where pedestrian crossings with traffic lights are in place, pedestrians will still feel threatened. The multi-way boulevard permits a mix of traffic and pedestrians as a compromise solution — but one that creates a more optimum balance between modes.[1]

A multi-way boulevard design in West Linn, Oregon

Therefore:

Periodically (typically at 800m or ½ mile spacing in both directions) create multi-way boulevards, consisting of several lanes for faster travel, slip lanes for slower travel and parking, wide pedestrian and bicycle sidewalk zones, and periodic crossings as frequent as possible, but not more than 400 meters apart. Make these beautiful urban spaces, with tree-lined medians and periodic focal points.



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Space multi-way boulevards regularly between AVENUE (3.3) patterns, and at the edges of each PEDESTRIAN SANCTUARY (4.2). Provide ample medians and STREET TREES (8.3)…

[1] One of the best sources of information and research findings about multi-way boulevards is Jacobs, A., MacDonald, E. and Rofè, Y., *The Boulevard Book.* New York: Random House.

Image: via wikipedia.org by Luestling

3.3. AVENUE

…In laying out the 400M THROUGH STREET NETWORK (1.4), create a sub-network of streets between the MOBILITY CORRIDOR (1.3) and MULTI-WAY BOULEVARD (3.2).

❖ ❖ ❖

Problem-statement: People need streets that allow their vehicles to travel longer distances safely at moderate speed, while still giving good access to the buildings and neighborhoods along them.

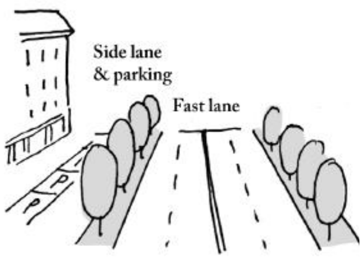
Discussion: Multi-way boulevards are a good solution for large volumes of traffic, but many other streets within the network do not require multiple separated lanes. It is sufficient for these streets to have a single group of lanes — typically no more than two in each direction — and on-street parking to provide protection to pedestrians, and to slow traffic to moderate speeds (typically 30 kilometers per hour, or 20 miles per hour). If these streets are spaced (together with multi-way boulevards) at a regular 400m interval, they can handle ample volumes of traffic without negatively impacting pedestrian safety and neighborhood livability.

In a well-functioning multi-modal avenue, on-street parking slows traffic down and provides a buffer, making it possible for pedestrians to navigate the avenue safely. Unfortunately, transportation engineers have too often removed on-street parking in order to speed up traffic flow. This action will severely compromise the pedestrian component of avenues. Transportation engineers should recognize that they need not handle avenue traffic at the same high speeds as multi-way boulevards and other mobility corridors. Indeed, a growing movement in "context-sensitive design" (also called "complete streets") is arguing for a design speed for avenues and other local streets of no more than about 30 kilometers per hour, or 20 miles per hour.[1]

It is not only the street itself that must be designed carefully, but also the streetscape, building frontages, and non-vehicular circulation zones (e.g. for pedestrians and bikes). There might be spots where fast traffic passes close to pedestrians, and these need protection with attractively designed bollards. Bicycle pathways need to be carefully designed to avoid car doors as well as pedestrians, and also to avoid effectively widening the street. (This generally means any separate bike lane needs to go next to the sidewalk, not in the street.) Building entrances need to be close to the street, with frequently spaced locations. The street must be seen as a system, with all of these components combined and integrated.[2]

Therefore:

Alternate multi-way boulevards with a network of avenues within the 400M spacing system. Provide on-street parking, and limit lanes to no more than two in each direction.



❖ ❖ ❖

Develop each area between avenues as a PEDESTRIAN SANCTUARY (4.2), incorporating the pattern SHARED SPACE LANE (3.4)…

[1] See for example LaPlante, J., & McCann, B. (2008). Complete streets: We can get there from here. *ITE Journal, 78*(5), 24.

[2] One approach to ensuring that the components of the streetscape, including the building elevations, are coordinated into a "complete street" regime is the use of a FORM-BASED CODE. See for example Talen, E. (2009). Design by the rules: The historical underpinnings of form-based codes. *Journal of the American Planning Association, 75*(2), 144-160.

Image: Alexey Topolyanskiy via Unsplash

3.4. SHARED SPACE LANE

…Between an AVENUE (3.3) and a MULTI-WAY BOULEVARD (3.2), there is a need for a much slower, safer kind of street.

❖ ❖ ❖

Problem-statement: Within quieter local areas, vehicles must move slowly and safely around pedestrians. They can do so within lanes that are designed to share space with pedestrians, bicycles and other slower modes of travel.

Discussion: There are many varieties of shared-space lane that have been developed around the world. One of the best known is the Dutch "woonerf", which is a generally narrow, irregularly shaped passageway designed to slow vehicles and to create safe places for pedestrians to move.[1]

It has been assumed that areas that mix cars and pedestrians would be unsafe without extensive controls including signals and signage. Research has shown, however, that in low-speed areas, vehicles and pedestrians can share space, as long as the visibility is good, and as long as the geometry prevents high-speed driving. An example is the Seven Dials intersection in London, where a monument in the center forces vehicles to drive slowly as they enter the intersection.

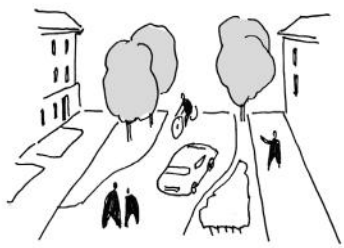
Seven Dials, a remarkably busy intersection in the heart of London, yet lacking conventional traffic controls. Pedestrians and cars mingle freely.

The idea of shared space has sometimes been stretched to allow cars and buses into wide paved spaces, whose geometry does not inhibit speed.

This practice can make the pedestrian experience dangerous. A pragmatic approach does not take it for granted that motorists will automatically control their vehicle's speed, and will provide geometrical and other constraints (e.g. bollards and level changes) to help control the situation. It is always important to assess the context and fit the design accordingly.[2]

Therefore:

Within the spaces of the 400M network, and where not occupied by other special districts, create a network of shared space lanes providing vehicular access, but also providing safe movement throughout for pedestrians.



❖ ❖ ❖

Create shared space lanes within the PEDESTRIAN SANCTUARY (4.2) as a slower and quieter part of a neighborhood, between busier kinds of streets…

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[1] See e.g. Karndacharuk, A., Wilson, D. J., & Dunn, R. (2014). A review of the evolution of shared (street) space concepts in urban environments. *Transport Reviews, 34*(2), 190-220.

[2] Shared space lanes are not an "anything goes" environment, and care must be taken to ensure that vehicles, when they are present, operate safely. For a broader discussion of this issue, see Hamilton-Baillie, B. (2008). Shared space: Reconciling people, places and traffic. *Built Environment, 34*(2), 161-181.

4. NEIGHBORHOOD PATTERNS

Define neighborhood-scale elements…

4.1. STREET AS CENTER

…URBAN GREENWAY (3.1), MULTI-WAY BOULEVARD (3.2) and AVENUE (3.3) patterns need to serve as connectors, not as dividers.

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Problem-statement: Too often in the last century, streets have been used to divide instead of unite.

Discussion: It is often assumed that streets are inherently dangerous, and therefore it is necessary to turn away from them and face inward toward a cell-like residential enclave. This practice is terribly destructive, promoting the idea that streets are only "car sewers" meant to convey cars away at maximum speeds. In fact streets fulfill many functions, and must do so on a balanced and responsible way.[1]

We have already seen that streets are the catalysts for urban life in traditional urbanism. But 20th century post-war planning lost the distinction between through highways and urban streets, which have fundamentally distinct functions. Optimizing fast vehicular speed and traffic volume diminishes the urban experience and cuts the city along that street. The opposite — a street full of life — requires comparatively slower traffic and encourages the presence of pedestrians.[2]

This street forms an impenetrable barrier between its two sides. It in no way serves as a center of the surrounding neighborhood.

It helps to conceive an urban street as a long and narrow public space, much like an urban plaza. The key difference is that vehicular traffic is allowed to run through its median. All the other characteristics of an urban space remain valid, however. Those include accommodations for pedestrians along the sides (wide sidewalks), traffic-calming measures implemented by means of the geometry, complex building façades on both sides with many entrances, and so on. To emphasize the sense of enclosure, the building's corners at the intersection should ideally bulge outwards into the intersection so as to visually define each end of that particular block. A protruded block corner is psychologically felt by everyone on the street. This suggestion is often at odds with the instincts of transportation engineers, who seek to increase vehicular speed on turning by cutting the corners (which encourages the block corners to be chamfered). There are several flaws with this approach. First, it is important to slow traffic when turning so that pedestrians can be seen and divers have time to brake. Second, in order to foment city life, the urban street must prioritize pedestrians, and should do so by employing geometries that slow down traffic.

Therefore:

When developing on both sides of a street, make certain that the development is compatible, and that it aligns to and engages with the street. Do not turn away from the street with blank walls, parking lots or other unsuitable structures, but make the street a focus of attention and use.

❖ ❖ ❖

Assure that all sides of streets have a WALKABLE STREETSCAPE (6.2). In area with the PERIMETER BLOCK (7.2) pattern, use the PERIMETER BUILDING (9.1) pattern to establish well-defined spatial volumes…

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[1] There are a number of studies of the importance of a street as neighborhood center — see for example Southworth, M. (2005). Reinventing main street: From mall to townscape mall. *Journal of Urban Design, 10*(2), 151-170.

[2] Many studies show that the co-presence of many people on a street makes it safer. See for example Hillier, B., & Sahbaz, O. (2008). An evidence-based approach to crime and urban design. London: Bartlett School of Graduates Studies, University College London.

4.2. PEDESTRIAN SANCTUARY

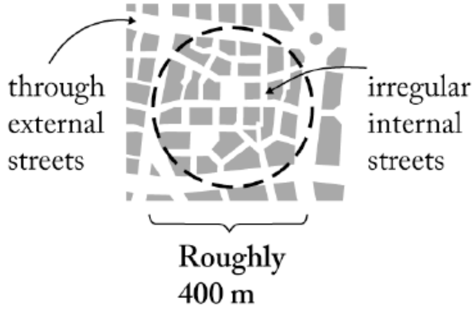
…Within the 400M THROUGH STREET NETWORK (1.4), identify the zones between the principal streets — roughly 400M square — and treat them differently from the areas along the streets themselves, which include STREET AS CENTER (4.1). Away from these streets, incorporate SHARED SPACE LANE (3.4) for quieter, safer spaces around residences and businesses requiring slow-low-volume traffic.

❖ ❖ ❖

Problem-statement: Within the scale of a neighborhood, there is a need for a quieter zone where pedestrians dominate, and where vehicles are guests on their best behavior.

Discussion: Vehicles are needed in daily life, to carry goods, to convey those who are unable to walk, to serve as transit, and for many other needs. Yet there are places in the city where vehicles are dangerous to pedestrians, especially children and the elderly.

Vehicles do have the right of way on the principal street network of the city, which provides efficient mobility while also allowing pedestrians to navigate their sides. But away from these streets, pedestrians should have greater right of way, within "sanctuaries" that provide quieter, safer spaces, including streets. Post-war urbanism confused vehicular access (allowing very slow local traffic, and delivery and emergency vehicles to enter when needed) with optimization for vehicular circulation open to anybody. Each typology has a distinct place in the city, and follows distinct design and planning rules. But the two should no longer be lumped together as a simplistic "one solution fits all".



The streets within a sanctuary can be quite irregular and "picturesque," which helps to make walking more interesting and more pleasant than driving.

Therefore:

Lay out the streets within the principal through streets as slower, narrower and more irregular lanes. Do not attempt to optimize for flow, but deliberately give the priority to pedestrians through design.

❖ ❖ ❖

Within the sanctuaries, create NEIGHBORHOOD PARK (4.4) to provide for quieter recreation and gatherings. At the edges, create NEIGHBORHOOD SQUARE (4.3) that are adjacent to more active commercial activities…

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[1] The classic description of sanctuaries was developed by Donald Appleyard. See for example Appleyard, D. (1980). Livable streets: protected neighborhoods? *The Annals of the American Academy of Political and Social Science, 451*(1), 106-117.

4.3. NEIGHBORHOOD SQUARE

…At the edges of a PEDESTRIAN SANCTUARY (4.2), identify key sites, especially corners, for the provision of neighborhood public spaces.

❖ ❖ ❖

Problem-statement: At the scale of neighborhoods — roughly 1-2 square kilometers, or ½ square mile — there is a need for a lively public space for gathering, recreation, markets, and community events, adjacent to neighborhood commercial activities. This need is different from the need for recreational "green" parks.

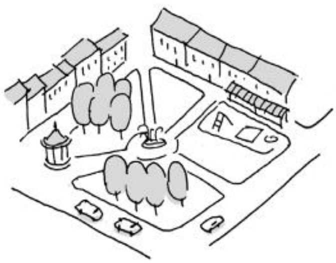
Discussion: The size of urban squares and plazas can vary, and some can be quite small. The critical factor is the maximum distance that residents must walk to reach these spaces — optimally a maximum of 400 meters or ¼ mile. This in turn suggests a spacing of roughly 800 meters or ½ mile in all directions.

Old Town Plaza in Albuquerque, New Mexico, a classic neighborhood square following the "Laws of the Indies" regulations that required squares to be placed at the center of commercial and civic activity.[1]

We rely upon a fractal distribution in the sizes of public squares, in which the neighborhood square represents an intermediate size. This smaller, distributed square cannot be substituted by a larger or equal size "green" park, because both size and function are important.[2]

Therefore:

Create neighborhood squares adjacent to neighborhood through streets, and at nodes where commercial activities are present or likely. Place them where climatic and other physical conditions make sitting there attractive.



❖ ❖ ❖

At the edges of the neighborhood squares, place at least some active commercial uses in each PERIMETER BUILDING (9.1), positioning carefully for economic success. Develop a PLACE NETWORK (6.1) along the streetscape, and assure the WALKABLE STREETSCAPE (6.2) all around the square…

[1] See a description of the Laws of the Indies and their generative capabilities in Hakim, B. S. (2007). Generative processes for revitalizing historic towns or heritage districts. *Urban Design International,* 12(2-3), 87-99. It is worth noting that the Old Town Plaza is now very much an anomaly in the wider Albuquerque cityscape, and the pattern expressed in the Laws of the Indies has not survived into contemporary growth. Nonetheless we can see such spaces as instructive exemplars within the context of multiscalar networked interventions.

[2] A good description of successful neighborhood square structure as it has evolved in a European context — similar to but not identical to other international contexts — can be seen at Lennard, C. H. & Lennard, L. H. (2008). *Genius of the European Square.* Portland: International Making Cities Livable.

4.4. NEIGHBORHOOD PARK

…Within the PEDESTRIAN SANCTUARY (4.2), provide amenities for recreation and gathering.

❖ ❖ ❖

Problem-statement: At the scale of a neighborhood, there is a need for quieter recreational spaces with ample vegetation, and more protected from faster-moving vehicles.

Discussion: Neighborhood parks are not the same as regional parks, which may be quite large. Generally, neighborhood parks can range from one hectare (2.5 acres) to as small as 20 square meters (200 square feet) or the size of a "pocket park". The important factor is that every residence is within about 250 meters, or about 750 feet, of one of these parks. A secondary factor is that these spaces are focal points for the surrounding neighborhood, allowing quieter family-scale gatherings and informal sports events.

Overwhelming scientific evidence links human health to intimate exposure to natural green vegetation, as discussed in the pattern BIOPHILIC URBANISM (2.4). At the same time, people will not use a park frequently unless it is close to their home, and easily accessible by foot. This implies a need for local neighborhood parks distributed regularly throughout the city — close enough for everyone to access one or more by walking. That suggests a distribution of approximately 400 meters (1300 feet), so that each home is within 200 meters (650 feet) of one or more parks.

A key requirement for neighborhood parks is that they are visible from nearby residences, and there is an opportunity for residents to provide stewardship for their security and care. There is also a need to have active uses along their edges, so that these edges do not become dead zones, severing and isolating the parks from the surrounding neighborhood.[1]

Neighborhood parks can also provide pavilions and other shelters to allow for small-scale events such as weddings, acoustic music performances, and other activities that are compatible with surrounding residences.

Pavilions in a neighborhood park in Hillsboro, Oregon, that hosts weddings, acoustic music events and other neighborhood-scale activities.

Therefore:

Within the sanctuaries, create neighborhood parks that serve as quiet oases for residents, with ample greenery and natural characteristics such as ponds and waterfalls. Assure that one of these parks is within about 200 meters (650 feet) of every residence. Provide for recreational activities including play structures for children. Provide sheltered spaces for activities including acoustic music and small neighborhood gatherings.

❖ ❖ ❖

Create room-like spaces, especially at the edges, forming a PLACE NETWORK (6.1)…

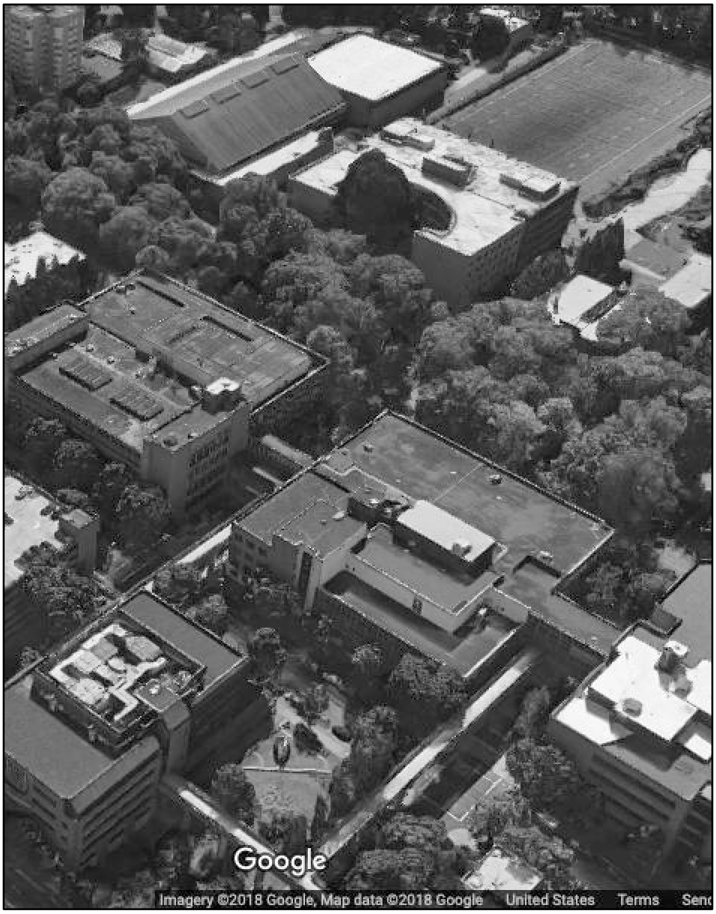
[1] One of the seminal accounts of neighborhood park structure and its requirements was provided by Jane Jacobs in her landmark *The Death and Life of Great American Cities*, and especially , Chapter 5, "The Uses of Neighborhood Parks." See Jacobs, J. (1961) *The Death and Life of Great American Cities*. New York: Random House.

5. SPECIAL USE PATTERNS

Integrate unique urban elements with care…

5.1. School Campus
5.2. Market Center
5.3. Industrial Area
5.4. Hospital

5.1. SCHOOL CAMPUS



…Within PEDESTRIAN SANCTUARY (4.2) zones, place school campuses, distributed according to need.

❖ ❖ ❖

Problem-statement: School campuses too often turn their backs on the surrounding city or suburb, and create dead zones in the urban fabric as well as isolated, boring places for students.

Discussion: Schools are certainly unique elements that have special requirements — among them safety for students, ample space for recreation, and sufficient size to provide for economies of management. Yet there is no fundamental reason that they must be isolated, or pose impenetrable barriers to the city.

Perhaps the best example of a necessarily large school is the university campus, which often must accommodate many thousands of students. Yet even large university campuses can be integrated directly into the walkable urban fabric, served by streetcars and other public transit, thus forming an integral part of the city separated from it by a semi-permeable (not solid) boundary.[1]

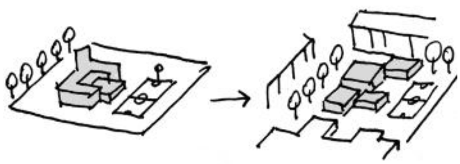
The special requirements of a campus give it even more urgent pedestrian needs. Every building generally needs vehicular access for services, but that must take second place to the pedestrian connectivity. An obsession with mono-functional zoning often forces all student dormitories on a campus to be clustered together, while all administrative functions are housed in a single, imposing building, etc. Yet functional segregation works against mixing and compactness, and does not produce an ideal learning environment.

Left, an isolated and boring university "supercampus" in Olympia, Washington, and right, a lively campus integrated into the urban fab-

ric of Portland, Oregon. The latter campus is in a walkable, bikeable setting, and served by streetcar and other transit.

Therefore:

Do not isolate school facilities and surround them with dead inactive edges, but weave them into the city fabric, providing stimulation to students and non-students alike. Wherever possible, put buildings on the edges, and where sports fields must go to the edges, build attractive pergolas and other structures to promote walkability. Assure that buildings are attractive at pedestrian scale, and offer interesting window views to surrounding streets.



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Assure that the school campuses have a WALKABLE STREETSCAPE (6.2) with a well-articulated PLACE NETWORK (6.1)...

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[1] It is helpful in this context to review patterns by Christopher Alexander and colleagues for a campus at the University of Oregon. See Alexander, C., Silverstein, M., Angel, S., Ishikawa, S., & Abrams, D. (1975). *The Oregon Experiment,* New York: Oxford University Press. The pattern descriptions given below are our own summaries:

OPEN UNIVERSITY. Do not isolate the university by surrounding it with a boundary; instead, interweave at least one side of the campus into an adjoining city, if that is possible.

STUDENT HOUSING DISTRIBUTION. Locate some student housing within the center of the campus, with different percentages in regions as one moves away from the center. The first 500m radius containing ¼ of the resident students; ¼ in a ring between 500m and 800m radius; and the rest outside 800m.

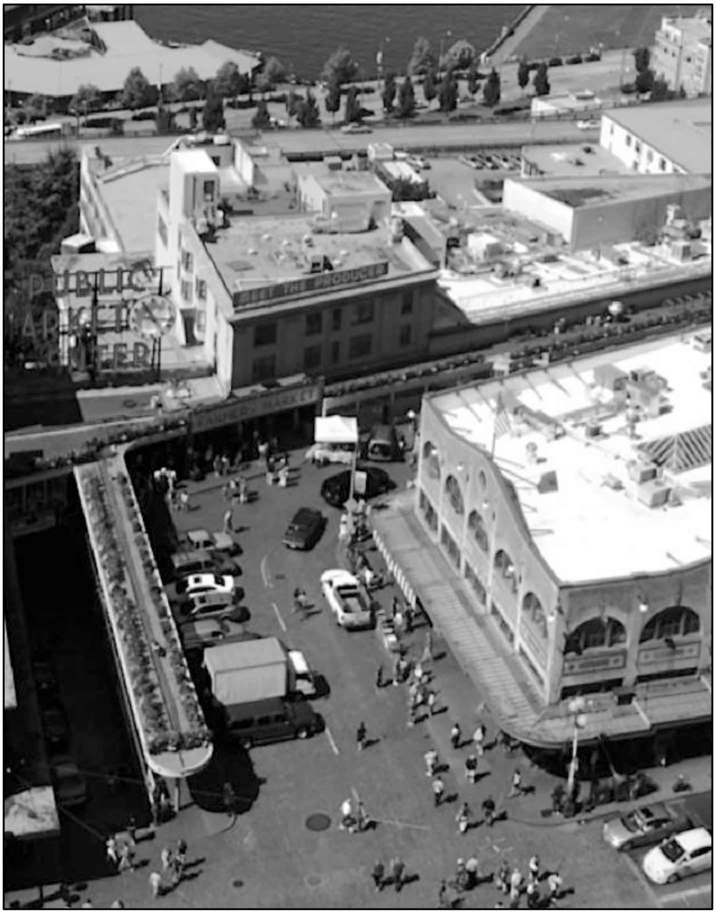
UNIVERSITY SHAPE AND DIAMETER. If possible, situate classrooms within a central core of ½ km radius, and non-class activities such as administration, sports centers, and research offices outside.

LOCAL TRANSPORT AREA. Give priority to pedestrian flow in the central core of the campus, within a radius of ½ - 1 km. Vehicular traffic here must be made to go on slow and circuitous roads.

FABRIC OF DEPARTMENTS. While each academic department ought to have a home base, it should be able to spread over into other buildings and interlock with other departments.

For further reading see Salingaros, N.A. (2020). Planning, Complexity, and Welcoming Spaces — The Case of Campus Design. In *Handbook on Planning and Complexity,* De Roo, G., Yamu, C. and Zuidema, C. (Eds.) Cheltenham UK: Edward Elgar Publishers.

5.2. MARKET CENTER



…Along the active edges of a PEDESTRIAN SANCTUARY (4.2), where the demand for market centers is significant, and transit service and mobility are highest, create integrated complexes of buildings that serve as market centers.

❖ ❖ ❖

Problem-statement: Shopping is one of the most fundamental activities of daily life, and it should be accessible, convenient, safe and attractive. It should not be allowed to destroy the quality and pedestrian scale of the surrounding neighborhood.

Discussion: Too often, shopping centers have been allowed to grow monstrous, and create urban dead zones at their edges: parking lots, concentrated vehicular arterials, and other disruptions. This is unnecessary. A market center can be successfully integrated with the surrounding pedestrian fabric, by providing multiple blocks connected by subterranean levels and bridges.

The original plan for shopping "malls" came from the architect Victor Gruen, who was — ironically — seeking to reproduce the car-free ambience of European village squares. Of course, nearby residents pay a heavy price, for the edges of these inward-turning megastructures draw the life from their surroundings, and create large dead zones within the urban fabric — either ugly and unecological parking lots, or inactive streets, or both.

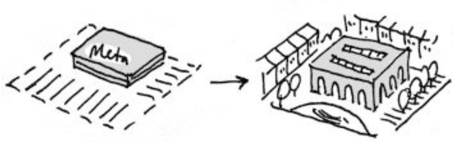
The final irony is that enclosed shopping malls are becoming much less popular, and buyers increasingly crave real streets with vibrant activities. In response, some shopping mall developers have created "lifestyle malls" built around open streets, only some of which are pedestrian-only. This is a step in the right direction — although any market center will thrive on adjacency and mix, rather than a segregated monoculture of whatever kind.[1]

The problem is not simply that malls have roofs (typically of glass). Indeed, some of the most successful and well-loved market centers in the world have glazed roof enclosures, among them the Galleria Vittorio Emanuele in Milan, Italy. So do many city-operated market centers. The important factor is the connectivity of the center to its surrounding urban fabric, and its mix of lively activities at many hours of the day.

Left, a typical shopping "mall" outside of Portland, Oregon, surrounded by an ocean of parking lots. Right, an integrated shopping center with similarly large stores, but integrated into the surrounding urban fabric of downtown Portland. Multiple blocks are connected by bridges and tunnels. Parking is accommodated with garages built into the urban fabric, and many people arrive by transit, walking or bike.

Therefore:

Do not build gigantic, isolated shopping "malls", which are cut off from the urban fabric surrounding them, and damaging to it. Instead build lively market centers, allowing different buildings to span over (or even under) the street network.



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Assure that the edges of the centers have a WALKABLE STREETSCAPE (6.2). Articulate these spaces, and the spaces within, with a PLACE NETWORK (6.1)…

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[1] See for example Southworth, M. (2005). Reinventing main street: From mall to townscape mall. *Journal of Urban Design, 10*(2), 151-170.

5.3. INDUSTRIAL AREA

…Within the POLYCENTRIC REGION (1.1), there are many places where industrial activities must be accommodated. These should be integrated into the walkable street...

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Problem-statement: Industrial employees increasingly want to work in vibrant, mixed neighborhoods. But industries need a certain amount of security and privacy for their operations.

Discussion: Well-meaning planners reacted to pollution within early industrial cities by relocating all industry outside the city. But that move threw out the baby with the bathwater: it forced employees to commute long distances, and created isolated, lifeless districts. Today, only genuinely heavy industry needs to be accommodated outside. Most other light industrial activities fit well within a mixed-use city (with air and water quality protected by enlightened regulation). This mixing of work and life is the way that cities have thrived for millennia. Mixed use also facilitates commuting to work, and is one of the cornerstones of a new conception of the city as a complex system: the functions cannot be simplistically segregated without damaging it.

A new rationale for segregation in the 20th century has been security, especially security of trade secrets. This has given rise to the "supercampus" — a very large, gated, and impenetrable section of the urban (or more often suburban) fabric. This has been a terrible mistake, creating dead zones at the edges of these supercampuses, and almost always preventing employees from walking, biking or even taking transit to or from work — more likely forcing them to drive, and therefore to own a car. Even worse, this supercampus model further isolated work from home and other activities, causing an imbalance between jobs and housing, requiring extensive commuting time, and contributing to a fragmented, resource-inefficient, dysfunctional city.

In the early years of the 21st Century, the most sought-after employees have begun to demand more walkable, mixed places of work, closer to their homes and other destinations, and the supercampus is rapidly losing its competitive edge. More companies have begun to integrate their buildings into the urban fabric of walkable "innovation districts" and other creative neighborhoods.[1]

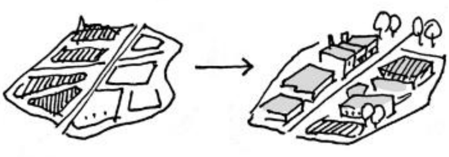
Evidence has grown that there are significant economic benefits for the companies as well. Creative innovation does not thrive in isolated, inward-turning campuses, but in places that allow mixing and "knowledge spillovers" — not only within industries, but between them as well, and within the public spaces surrounding them.

Of course there are requirements to protect intellectual property as well as other kinds of company property. However, in an age of advanced digital security, it is no longer necessary to have prison-like guard houses and fortifications, and security is now much more easily managed at the building scale. Employees can now move securely between buildings with proper digital technology.

Left, an industrial "supercampus" outside of Portland, Oregon, and right, an industrial district within the city. Walkable mixed neighborhoods like the one on the right are in high demand by today's most sought-after technology employees.

Therefore:

Do not build isolated "supercampuses" as industrial workplaces. Instead, create a flexible cluster of buildings within a walkable street system, mixed with other uses so that employees can live nearby, and visit other destinations.



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Provide a WALKABLE STREETSCAPE (6.2) within the industrial area, with a mix of other uses to provide amenities and close-by housing for some employees…

[1] Notable research on this trend and its dynamics has been done by the Brookings Institution. See for example Katz, B., & Wagner, J. (2014). *The rise of innovation districts: A new geography of innovation in America.* Washington: Brookings Institution.

5.4. HOSPITAL

…Also at the edge of a PEDESTRIAN SANCTUARY (4.2) and within the 400M THROUGH STREET NETWORK (1.4) there is a need to accommodate medical facilities, following the principles of BIOPHILIC URBANISM (2.4).

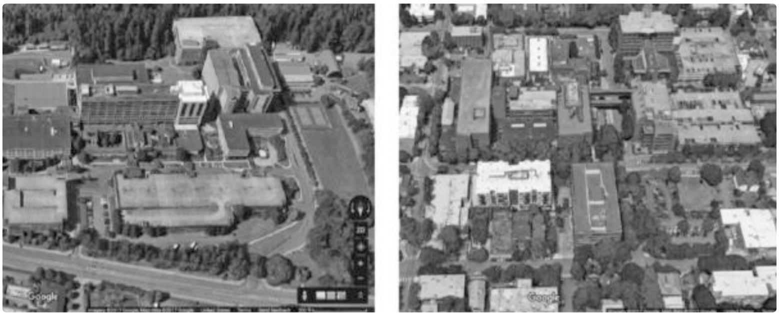
❖ ❖ ❖

Problem-statement: Hospitals have advanced requirements for germ isolation and patient protection; yet their patients also have a basic need to stay connected to their neighborhood environments.

Discussion: In the past, it was assumed that the best way to maintain sterile conditions and patient comfort was to isolate hospitals in remote campus locations. This practice has caused excessive driving for patients and staff, and contributed to the fragmentation of urban areas.

However, a hospital facility need not be confined to a single massive building. Many hospitals successfully use a cluster of several buildings, inter-connected with subterranean spaces as well as overhead bridges. Sensitive areas can be located in the subterranean levels, such as surgery and nuclear medicine facilities.

In this way, the hospital complex can integrate with the surrounding walkable street network, providing a vital connection for patients to the life of the neighborhood.

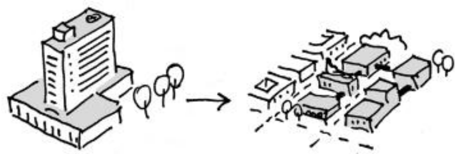


Two hospitals in Portland, Oregon — one a disconnected supercampus that requires driving for almost all visits, and the other, integrated into the walkable neighborhood fabric.

In addition, there is a growing recognition of a connection between healing environments and the desire for close exposure to nature, or so-called "biophilia". This recognition is now driving the "greening" of hospitals, as they move away from an isolated industrial factory typology, and toward a model that embraces the neighborhood and its human and natural life.[1,2]

Therefore:

Build hospitals as integrated facilities within their neighborhoods. If necessary, use bridges, tunnels and subterranean levels to connect different buildings and functions as needed across the walkable street fabric.



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Create a WALKABLE STREETSCAPE (6.2) around the hospital, with a mix of other uses including clinics, offices, commercial spaces and residences…

[1] A major movement in so-called "biophilic" hospital design was begun in part by a famous paper by Roger Ulrich (1984), "View through a window may influence recovery". *Science*, 224(4647), 224-225. (Available on the Web at https://is.muni.cz/el/1423/jaro2014/HEN597/um/47510652/Ulrich_1984.pdf.) Since then, the field has developed significantly. However, biophilic hospital design requires more than just siting a building in a remote leafy locale. As Yannick Joye noted, the buildings and the surrounding urban environment also need to reflect biophilic principles. See Joye, Y. (2007). Architectural lessons from environmental psychology: The case of biophilic architecture. *Review of General Psychology*, 11(4), 305- 328.

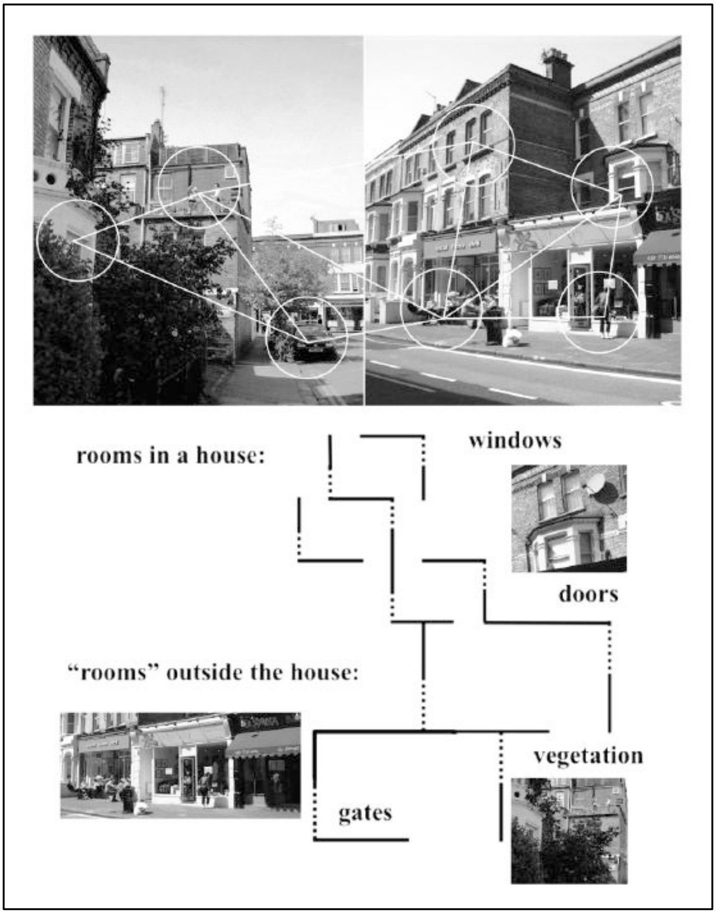
[2] Another important dimension of hospital design, especially acute in the developing world, is the provision of essential standards of water, sanitation, hygiene, and health care waste management and cleaning (known by the acronym WASH). These must be provided by the infrastructure supplying the hospital, as an integral part of the hospital planning, and the urban planning around it. But as this Global Baseline Report from the World Health Organization and UNICEF makes clear, too many places do not have adequate standards. And it is an urgent priority now to provide them. See https://washdata.org/sites/default/files/documents/reports/2019-04/JMP-2019-wash-in-hcf.pdf

6. PUBLIC SPACE PATTERNS

Establish the character of the crucial public realm…

6.1. Place Network
6.2. Walkable Streetscape
6.3. Movable Seating
6.4. Capillary Pathway

6.1. PLACE NETWORK



…Along the <u>400M THROUGH STREET NETWORK (1.4)</u> and within the <u>PEDESTRIAN SANCTUARY (4.2)</u> too, there is a need for articulation of public space and private space, and the tissue that connects them.

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Humans have a basic need to occupy room-like spaces that are connected to other spaces — but whose connections they can control. This basic need exists at all scales of place.

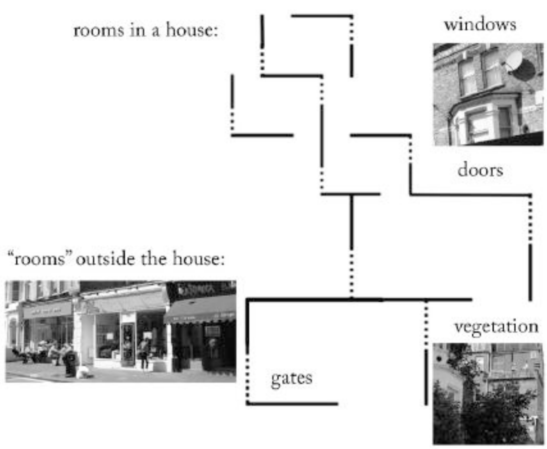
<u>Discussion:</u> The human mind tends to segregate elements from one another, like buildings, streets and squares. Designers tend to follow this segregation in the works they produce too, with the result that these structures are separated from one another as if they were stand-alone objects. Yet the web-like connections between these elements are the very essence of life in the city.

It's easier to think of the rooms in a house as being part of a system of spaces that allow us to control our degree of contact with others, and conversely, our privacy, starting with the most private rooms in the house, the bedrooms and bathrooms, and progressing to the more public spaces where we come into more contact with one another, and ultimately, to the people from outside who may come in as visitors. We can control the degree of contact by modulating the connections between these spaces. We can close doors, open windows, draw blinds.

But just so, the spaces outside of a house or other building also need to afford us an ability to control our connectivity to others, or else they will not function well — and we will not be well (comfortable, secure, and able to control our own activities). We need yards with gates, or porches with steps and railings, or street frontages with subtle demarcations of zones, expressing a gradient of privacy and offering a measure of control of our contact with others.

Human beings need this degree of control, not so that they can retreat into the most private parts of a building, but precisely so that they can feel in control when making even greater contact with others. A house that has no gradient of privacy at the edge is like a goldfish bowl, and the occupants can only retreat to the back corner — and often do. But a house with a gradient of privacy, and well-sheltered spaces offering both connection and refuge, will invite more contact with the outside.

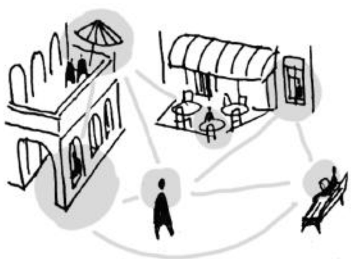
Why do we speak of a "place" network? Let us remember that a "place" is a geographical entity that invites us to enjoy being there for psychological reasons that are not always obvious. The success or failure of a place depends upon its geometrical relationship to other places — how well each is defined, and how well all of them link up. We can all recognize some common failures: front porches that feel too exposed to use; balconies that sit empty because they are too shallow; front lawns that look nice but are never actively used, resulting in a waste of valuable space. Re-envisioning them as room-like spaces helps us to correct the deficiencies of all these typologies. Then we might be able to identify remedies — for example, put up a permeable fence on the porch; make the balcony at least 2m deep (the original Alexandrian Pattern SIX-FOOT BALCONY, APL 167); or enclose a front yard with a picket fence, to make it a more protected area. The goal is to create a tapestry of psychologically well-defined places. The street transitions into the partially fenced-in front yard, then into the partially fenced-in porch, then to the house entrance, and to interior rooms. The public realm is better connected to the private realm — and private realms are better connected to one another.[1]



The best places are a tapestry of room-like spaces, whether indoors or out.

Therefore:

When planning a building, a street or other parts of an environmental structure, conceive of them as part of a tapestry of places — a place network. Work to articulate these places as part of a continuous network with many connections, and many points of modulation of connection: doors, windows, gates, hedges, fences and other structures.



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Create place networks all along a WALKABLE STREETSCAPE (6.2). Weave the networks into the other parts of the city at all scales, including MAIN GATEWAYS (APL 53) and QUIET BACKS (APL 59). Create CIRCULATION REALMS (APL 98) with a FAMILY OF ENTRANCES (APL 102). Link up CONNECTED BUILDINGS (APL 108) surrounded by place networks featuring a HIERARCHY OF OPEN SPACE (APL 114). . . .

[1] This pattern draws on the work of a great many people. A summary of it can be found in Mehaffy, M., Elmlund, P. and Haas, T. Public Spaces and Private Conflicts in the New Urban Agenda. In *Proceedings of the 13th International Conference on Urban Regeneration and Sustainability*. Chilworth UK: WIT Press. Available on the Web at Sustasis.net/PSPC.pdf

6.2. WALKABLE STREETSCAPE

…Along an AVENUE (3.3), URBAN GREENWAY (3.1) or MULTI-WAY BOULEVARD (3.2) there is a need to provide for WALKABLE MULTI-MOBILITY (2.1).

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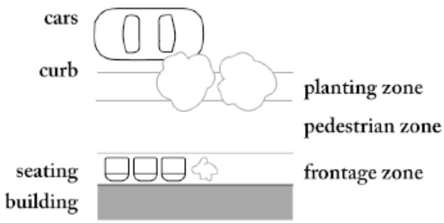
Problem-statement: There are many potential conflicts between pedestrians and other forms of movement, as well as potential conflicts between pedestrian needs and the needs of adjacent building users.

Discussion: Along streets, pedestrians need ample space to walk, and to pass other pedestrians who are walking in the other direction or standing briefly. This pedestrian travel zone will vary depending on the population of the area, but in general it is a minimum of 1.5 meters, or approximately 5 feet. More ideally it is at least 3 meters, or 10 feet. In addition, there is a need to accommodate seating areas and commercial elements such as planters and signage, which generally require another 1.5 meters or 5 feet. Finally there is a need for a zone for street trees, light poles and other elements, which require approximately 1.5 meters or 5 feet. Altogether, the space for the pedestrian right of way should be at least 4.5 meters or 15 feet, and more typically 6 meters or 20 feet, not including any additional yard space for adjacent buildings.

There is also a need to accommodate bicycles, which can pose dangers to pedestrians. The best way to do both is to have a separate travel lane for bicycles at a separate grade, between the pedestrian area and the parking zone, or other protective zone between bicycles and vehicles.

In low-speed street areas — typically those with speeds limited to 30 kilometers per hour, or about 20 miles per hour, the bicycles can travel safely in the vehicle lanes.

Do not neglect a pedestrian's psychological need to feel safe from vehicles, even slow-moving ones. This requires careful design of the curb, with an appropriate height, or sometimes the use of attractively designed bollards. On-street parking can also be helpful — see AVENUE (3.3).[1]



The distinct zones of a walkable streetscape.

Therefore:

Assure that every streetscape along an avenue, greenway corridor or multi-way boulevard is walkable, by providing adequate width for pedestrian travel (typically at least 3 meters, or 10 feet) in addition to space for seating, and space for planting and light poles. Provide psychological (and actual) protection from dangerous fast-moving traffic.

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Line the streetscape wherever possible with a PERIMETER BUILDING (9.1), and elsewhere place pedestrian-friendly visual elements such as trellises, pergolas, vegetation and other attractive screens. Provide HUMAN-SCALE DETAIL (15.2) including architectural and urban elements, along the length of the streetscape. . . .

[1] Our colleague Vikas Mehta has done leading research on walkable street design and its psychological dimensions, for example in Mehta, V. (2008). Walkable streets: Pedestrian behavior, perceptions and attitudes. *Journal of Urbanism,* 1(3), 217-245.

6.3. MOVABLE SEATING

…Along the WALKABLE STREETSCAPE (6.2), provide places for people to sit and relax comfortably.

❖ ❖ ❖

Problem-statement: Along streets and in other public spaces, people need to do more than walk — they need to sit too. And they need to be able to change the position of their seating depending on their activity.

Discussion: Sometimes people are comfortable in public spaces with rigid benches that face in only one direction. Many times, however, they want to turn toward their companions, or toward interesting things happening within the public realm. For this reason, they need movable seating. This need is greatest at the edges of public space, where people are most likely to congregate and view others.[1]

This feature poses a problem for security, since the seats can potentially be stolen. There are two remedies for this problem: either tether the seats to secure cables, or provide seating via adjacent private businesses, who can remove and store them at closing time.

This pattern, which may appear trivial, in fact goes to the heart of adaptive design philosophy and practice. The shaping of space and the positioning of built components are influenced by an enormous number of subtle factors, often perceivable only on the actual site. These may include: direction of sunlight; prevailing wind; shadows from adjoining buildings; psychological effects from nearby traffic; very fine adjustments to adjust to existing pedestrian flows; and so on. For this reason, the odds of getting the placement of fixed public seating exactly right by fitting them through premeditated design are infinitesimally small. Moreover, since conditions change all the time, an accidentally correct permanent placement will not continue to be valid in the future. On the other hand, having movable seats lets the users make the adjustments themselves. There is also the psychological feeling of control and ownership if a user can move a chair, even slightly. This freedom allows people to enjoy a public space.

Movable chairs — and tables — in New York City.

Therefore:

Provide ample seating within the walkable public realm, especially at the edges. Make sure that at least some of the seating is movable, so that people can adjust their position for comfort.

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Provide HUMAN-SCALE DETAIL (15.2) adjacent to the seating. Give the chairs HANDLES (12.1) and FRIENDLY SURFACES (12.3). . . .

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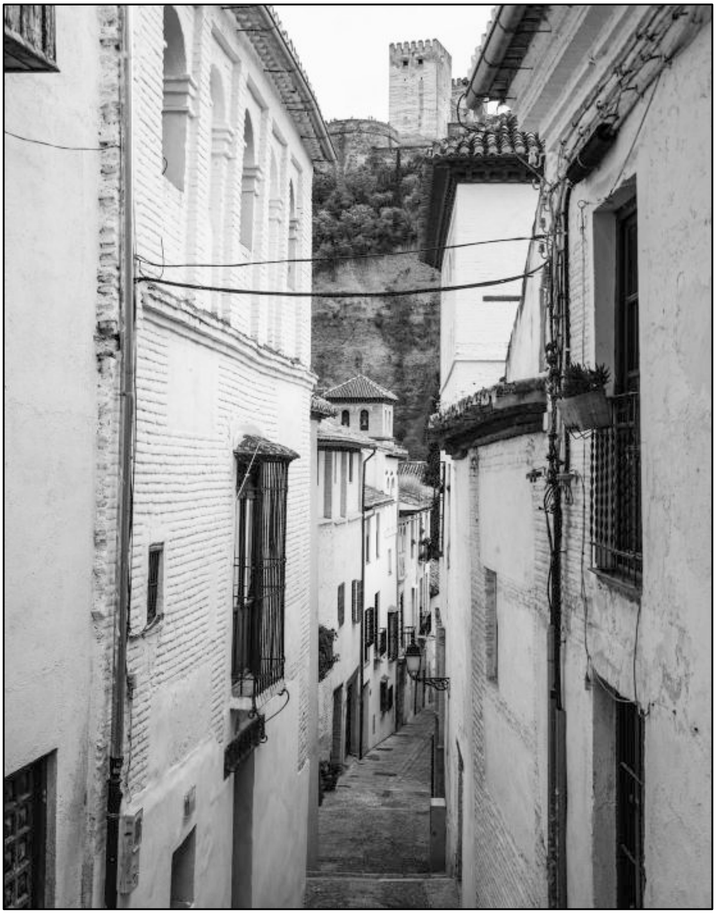
[1] A classic study on movable chairs was done by William H. Whyte in his 1980 New York public space study. See Whyte, W. H. (1980). *The Social Life of Small Urban Spaces.* New York: Project for Public Spaces.

6.4. CAPILLARY PATHWAY



…Within a PEDESTRIAN SANCTUARY (4.2) there is a need to provide pathways that are not part of the street or lane system, but are nonetheless public pathways.

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Problem-statement: Some of the most appealing urban public spaces are not along streets, but along separate pedestrian pathways. These pathways form a kind of "capillary" system for pedestrians.

Discussion: The term "capillary" refers to the very small hair-like passageways of the bloodstream, where individual blood cells reach individual body cells. A similar structure exists in the best cities, where capillary pathways form a secondary system of pedestrian movement, partly away from and complementing the street network.

Capillary pathways are components of a larger movement system exhibiting what is called fractal scaling in mathematics. In fractals, there are typically a few large examples, more intermediate-size ones, and very many smaller ones. In the case of capillary pathways, these are in effect the smallest-scale streets that become the smallest (long and narrow) urban public spaces.

Such pathways were common in traditional cities, as can be seen in the example of the Old Town Plaza from Albuquerque on the next page. This pattern was generated from a set of Spanish laws and practices known as the "Laws of the Indies."[1]

In some cases, these pathways may be owned by private entities, but to be successful, pedestrians need easements for regular access. Private ownership of adjacent structures is also a beneficial condition, since they provide security as well as potential commercial activities and other active uses.[2] In addition, it is important to provide visual surveillance including from nearby streets, ensuring that these passageways do not become dangerous "blind alleys".

Capillary pathways should not be allowed to draw too many pedestrians away from the surrounding streets. Rather, they should be seen as a complementary network, making the entire experience of walking more interesting, varied and attractive, and drawing more pedestrians to an area.

A capillary passageway leading to a courtyard and beyond in Albuquerque's Old Town Plaza.

Therefore:

Where there is sufficient volume of pedestrians, and sufficient activities to provide adequate security, create capillary pathways in an orthogonal pattern, crossing streets and interconnecting them, as well as other destinations. Provide ample "eyes on the pathway" and other security measures to assure safety.

❖ ❖ ❖

Where feasible, take pathways into a COURTYARD BUILDING (9.3), or create courtyard-like spaces along their lengths. . . .

[1] A discussion of the patterns from Old Town Albuquerque, and new applications of the "generative" characteristics of the Laws of the Indies, can be found in Hakim, B. S. (2007). Generative processes for revitalizing historic towns or heritage districts. *Urban Design International,* 12(2-3), 87-99.

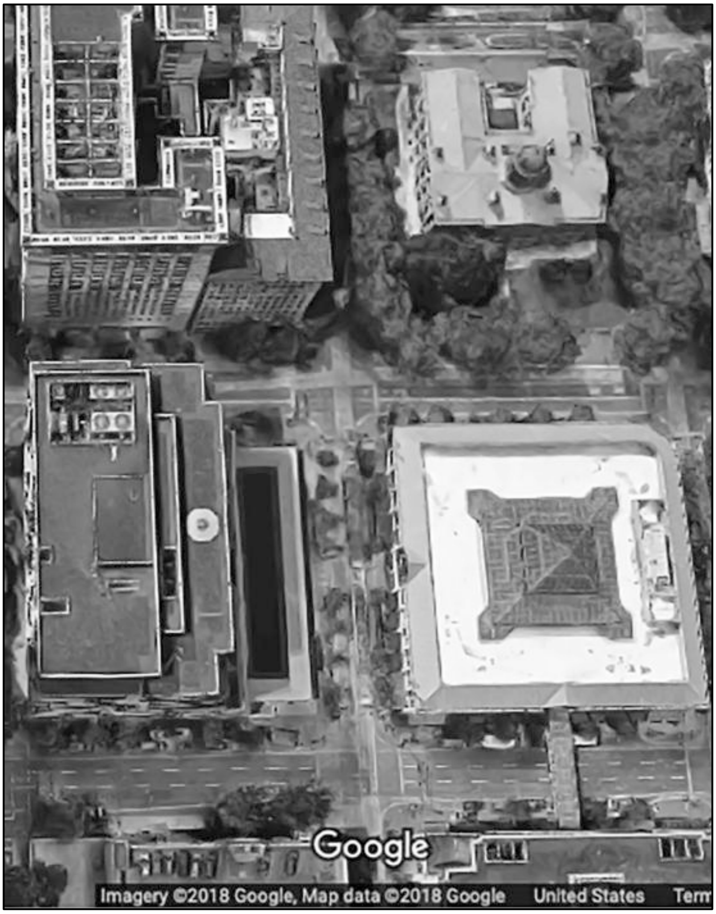
[2] Sometimes it is the owners themselves who have created these capillary passageways as public easements, so that they could get more use and value from their own properties. For an account of this process in a traditional urban context, see Ben-Hamouche, M. (2009). Complexity of urban fabric in traditional Muslim cities: Importing old wisdom to present cities. *Urban Design International,* 14(1), 22-35.

Image: Tabea Damm on Unsplash

7. BLOCK AND PLOT PATTERNS

Lay out the detailed structure of property lines…

7.1. SMALL BLOCKS



…Within the network of WALKABLE MULTI-MOBILITY (2.1), there is a scale of block patterns that is most conducive to walking.

❖ ❖ ❖

Problem-statement: Blocks that are too big create street networks that are unwalkable. But there is a practical limit to how small a block can be.

Discussion: Blocks that are smaller than about 60 meters in any one direction (about 200 feet), exclusive of the street right of way, create problems for accommodating outdoor space or alley conditions within the blocks. A more optimal minimum dimension is about 70 meters (230 feet).

But blocks that get much larger than double this distance in their longest dimension — about 150 meters or 500 feet — begin to create long pathways for pedestrians that discourage walking.

Jane Jacobs, in her landmark *The Death and Life of Great American Cities*, argued that small blocks are one of the four most important factors in generating diversity, in turn the most essential ingredient of great cities. She noted that long blocks disrupt the "intricate pools of fluid street use" that are necessary to support diverse economic and cultural interactions, and to maintain a "fabric of intimate economic cross-use". In addition, shorter blocks help to generate more visual interest and more attractive walking experiences. Jacobs suggested that a block size much greater than about 400 feet (about 120 meters) was problematic.

Recent research has tended to confirm these insights, but added some nuance to the picture. One of the complicating factors is that block size need not be the same in length and width, and indeed may be irregular. Where one dimension is shorter, another dimension may be longer, and still result in an overall walkable form.[1]

Smaller block size is also correlated with a denser street pattern, which has also been shown to be beneficial for walking and multi-modal transportation as well as active living and health outcomes.[2]

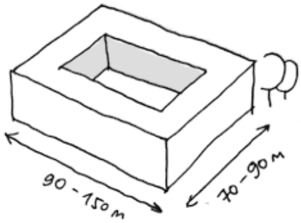
Yet another factor is the overall pattern of street connectivity, in which smaller block size plays an important role in promoting greater connectivity. Hillier and his associates have developed a "space syntax" model for street design, in which it can be shown that "natural" pedestrian movements (including those to commercial destinations) are dependent on "global properties of the street grid". This is a confirmation of Jacobs' insight that block sizes affect economic patterns and interactions.[3]

Unfortunately, today many commercial forces push towards gigantism, with the result that blocks of correct size have been amalgamated into large superblocks in many parts of the world, with their essential fine grain of streets removed. The result turns out to be negative for the users, and for the city as a whole (and perhaps positive only for the real estate speculators). For as we have seen, such an out-scale disruption strains and often damages the urban fabric, not only on the site and in the immediate vicinity, but also throughout the surrounding area. Jacobs memorably referred to the destructive edges of these superblocks as "border vacuums."

The small blocks of Portland, Oregon — almost too small perhaps, but praised by Jane Jacobs and others for their walkability.

Therefore:

Lay out blocks so that their shortest dimensions are roughly 70 meters (230 feet) and no more than 90 meters or approximately 300 feet. Make their longest dimensions no more than about 150 meters or 500 feet.



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Create a mix of block sizes using SMALL PLOTS (7.3) within regulated parameters. Use the PERIMETER BUILDING (9.1) pattern at the edges of the blocks. . . .

[1] The correlation of smaller block size with walkability was later demonstrated by a number of researchers. See for example Moudon, A. V., Lee, C., Cheadle, A. D., Garvin, C., Johnson, D., Schmid, T. L., & Lin, L. (2006). Operational definitions of walkable neighborhood: theoretical and empirical insights. *Journal of Physical Activity and Health, 3*(s1), S99-S117. Additional nuance came from a study by Sevstuk and colleagues, suggesting that there are tradeoffs from smaller blocks, and that it is possible to be *too* small — see Sevstuk, A., Kalvo, R., & Ekmekci, O. (2016). Pedestrian accessibility in grid layouts: The role of block, plot and street dimensions. *Urban Morphology, 20*(2), 89-106.

[2] See for example Marshall, W. E. & Garrick, N. W. (2010). Effect of street network design on walking and biking. *Transportation Research Record*, 2198(1), 103-115. The same authors looked at data for traffic safety and also found a benefit: Marshall, W. E., & Garrick, N. W. (2011). Does street network design affect traffic safety?. *Accident Analysis & Prevention*, 43(3), 769-781.

[3] See Hillier, B., Penn, A., Hanson, J. Grajewski, T., & Xu, J. (1993). Natural movement: or, configuration and attraction in urban pedestrian movement. *Environment and Planning B: Planning and Design*, 20(1), 29-66.

7.2. PERIMETER BLOCK

…Within the SMALL BLOCKS (7.1), buildings must be organized in relation to outdoor spaces for various functions.

❖ ❖ ❖

Problem-statement: Within a block there is a need for outdoor space which is connected to the buildings, but not to the street.

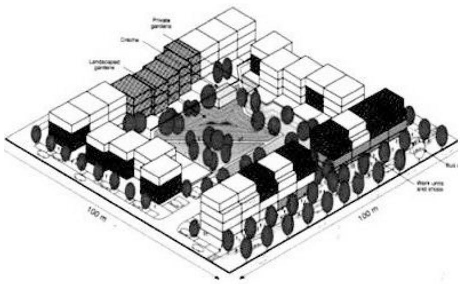
Discussion: Residences require outdoor space for recreation, for gardening, for parking and other needs. Commercial users also need outdoor space for utilitarian functions and service access. If this space is between the building and the street, it will cut the building off, and probably damage the experience of walking on the street. Putting it behind, inside the block and with buildings forming a perimeter, solves this problem, and offers other advantages.

The perimeter block arose independently in different civilizations over millennia as a naturally economical and practical urban typology. One important advantage is that buildings benefit from proximity to the walkable streetscape, and at the same time get ample light and adjacent private outdoor space in the quieter and more secluded interiors of the blocks.[1] Another benefit is that the perimeter block saves energy by clustering the buildings along the perimeter, and by facilitating a low-tech passive solar orientation, especially when exploiting deciduous trees and other near-ground benefits.[2] In addition, enclosing a gradient of small private gardens, parking courts and utilitarian spaces in the rear keeps the street intact for more public uses, and helps to frame more active, better-quality streetscapes.

Nevertheless, perimeter blocks fell into disfavor by industrial-modernist planners, who favored a very different typology: the apartment "slab" tower set in a large, undifferentiated green space. From an urban point of view, this is exactly the wrong geometry: the seldom-used green space is outside, separating buildings from streets and creating amorphous, unwalkable and often dangerous zones that Jane Jacobs memorably called "project prairies."[3]

This contradiction is due to a misunderstanding of human psychology, which requires comfortable space to be defined by boundaries, and not left too open. It is also at the heart of the switch from traditional design — where buildings help to define urban space — to using open space instead to define a stand-alone building.

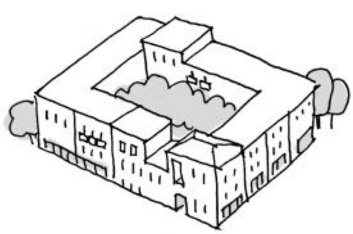
A perimeter block has the right sequence of public and private space: well-activated streets with close-grained private spaces in tight spacing; buildings that look out onto the streets; and then private outdoor space for gardening or utilitarian uses. Parks are where they should be: frequently distributed in lively locations. The entire perimeter block structure facilitates a greater mix of uses and grain of streetscape.[4]



A very flexible perimeter block with a mix of uses, as proposed by the UK's Urban Task Force (1999).

Therefore:

Place the bulk of building mass at the perimeter of the blocks, leaving the interior for outdoor space to serve the adjacent occupants, accommodating recreation, gardening, parking, service and other functions.



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Use the PERIMETER BUILDING (9.1) pattern at the edges of the blocks. Use LAYERED ZONES (10.3) and careful transitions from public to semi-private to private, and again to semi-private in the courtyards. . . .

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[1] One of the most thorough discussions of the perimeter block and its benefits is in Carmona, M., Heath, T., Oc, T., & Tiesdell, S. (2012). *Public Places-Urban Spaces.* London: Routledge.

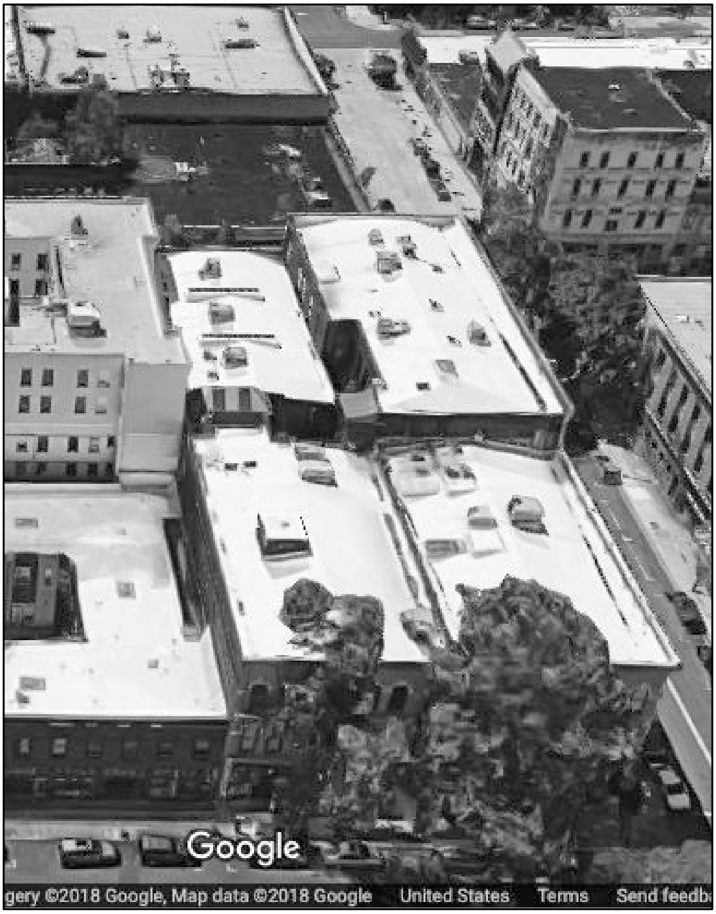
[2] See for example Vartholomaios, A. (2015). The residential solar block envelope: A method for enabling the development of compact urban blocks with high passive solar potential. *Energy and Buildings*, 99, 303-312.

[3] There has been much debate and research on the safety of such spaces. The architect Oscar Newman famously argued for "defensible space" rather than open park-like spaces. UCL's Bill Hillier presented evidence that the picture is more complex, and that an overriding problem is the lack of "co-presence" of others and natural surveillance from buildings. See for example Hillier, B., & Sahbaz, O. (2008). *An evidence-based approach to crime and urban design*. London: Bartlett School of Graduates Studies, University College London.

[4] Urban Task Force (1999). *Towards an Urban Renaissance.* London: Routledge.

Image: Kaspars Upmanis via Unsplash

7.3. SMALL PLOTS



…Within a PERIMETER BLOCK (7.2), it is important to keep a variety of scales of buildings.

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Problem-statement: Large plots are more expensive, and tend to attract a more limited pool of users. A mix of small plot sizes helps to keep spaces more affordable, and promotes greater diversity of business types and characteristics.

Discussion: The evidence for this pattern is easy to see in examples where plot sizes are universally large. The buildings on these plots are also generally very large, often with large users as well. Even in the case of smaller "demised" lease spaces with in a larger building (such as a "strip" shopping center) there is often a homogeneity of "chain" type businesses.

There is a place for some large plot sizes as well, particularly if they are "demised" into smaller retail and residential spaces (e.g. in condominiums, or smaller rental stalls). But there is an advantage in having a mix of individually-owned plots, each of which is able to grow and adapt according to its owner's individual needs. (Demising means to separate spaces according to individual tenants and uses, and includes erecting partitions and party walls.)

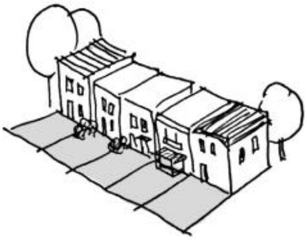
Another supporting rationale comes from optimizing the pedestrian urban space of the street, which is necessary for urban vitality. It is far easier to achieve the design variety and spatial rhythm necessary for a positive urban experience if the plot sizes are small, and individual agents are working on a variety of different projects and scales (but within an overriding code or coordinating plan). Unfortunately, there are many examples where unfriendly façades made possible by large plot size has ruined a street, so that no one wants to walk along it.

Having control of the entire street length, when combined with a preference for minimalist walls, tends to generate unfriendly surfaces made even more oppressive because of their length.

Rowhouses on small plots in Washington, D.C.

Therefore:

Lay out plots with the fundamental unit quite small, perhaps no wider than 6 meters or 20 feet. Include a mix of sizes, with some larger plots depending on market conditions.



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Use the ROW BUILDING (9.4) pattern at the edges, and maintain LAYERED ZONES (10.3) with PLACE NETWORKS (6.1). . . .

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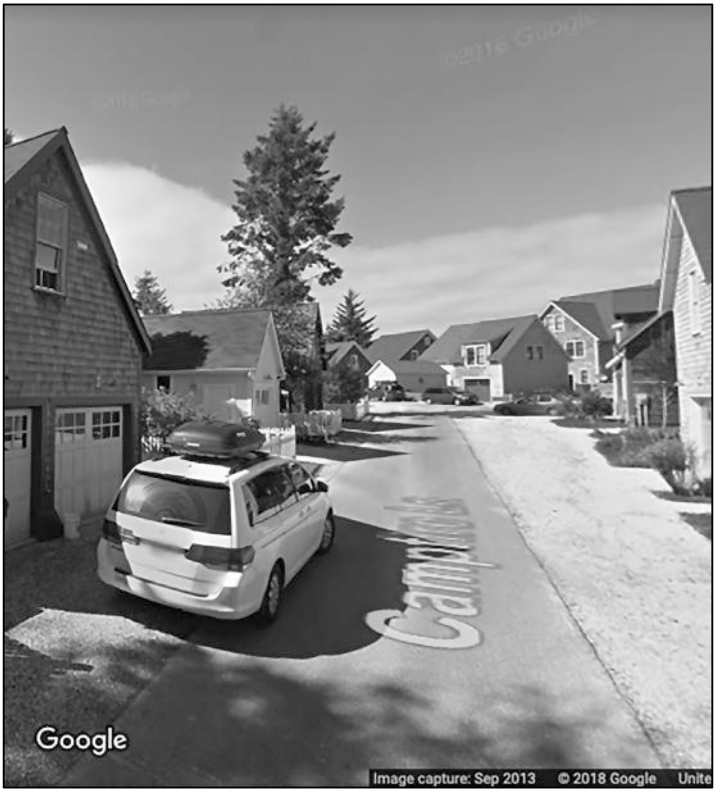
[1] Our colleague Sergio Porta and his associates have done some of the most relevant work for this pattern — see e.g. Porta, S., & Romice, O. (2014). Plot-based urbanism: Towards time-consciousness in place-making. In *Dortmunder Vorträge zur Stadtbaukunst* [Dortmunder Lectures on Civic Art]: New Civic Art (pp. 82-111). Dortmund DE: Deutsches Institut für Stadtbaukunst.

7.4. MID-BLOCK ALLEY



…Within SMALL BLOCKS (7.1), make sure there is room where needed for vehicular access.

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Problem-statement: Within and through the interior of a block, there is a need for low-speed vehicular and pedestrian movement

Discussion: The mid-block alley can provide an important function of service access, car parking, utility easements, and movement of pedestrians and vehicles. But a number of conditions need to be carefully considered.

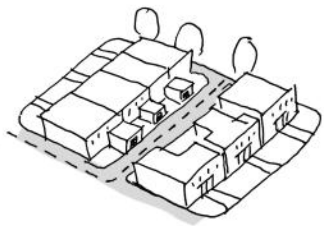
One of the most important is to ensure that the alley is safe, which generally requires good sight distance from the windows of adjacent buildings. An additional measure of security is provided by accessory dwellings ("carriage houses") positioned directly on the alleys.

An additional concern is that the alleys should not disrupt the pedestrian character of the intersecting streets. This is best accomplished by enclosing the buildings on either side of the alley at the street, to make the entrance as narrow as possible (typically approx. 6 meters or 20 feet).

A mid-block alley in Seabrook, Washington, also pictured in the photo at the beginning of this pattern.

Therefore:

Where vehicular access is needed to the interiors of blocks, consider using a mid-block alley. Place dry utilities in this alley easement, and provide parking as needed. Assure that there is good visibility on the alley from adjacent buildings to provide minimal security.



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Make the mid-block alley attractive to pedestrians, lining it with garages and accessory dwellings. Provide HUMAN-SCALE DETAIL (15.2) and CONSTRUCTION ORNAMENT (15.3). Assure that there are LAYERED ZONES (10.3) between the indoors and outdoors, with windows overlooking the alley and providing natural surveillance. . . .

[1] A useful discussion of the pros and cons of alleys can be found in Martin, M. D. (2001). The question of alleys, revisited. *Urban Design International, 6*(2), 76-92.

8. STREETSCAPE PATTERNS

Configure the street as a welcoming place…

8.1. STREET AS ROOM

…To encourage a WALKABLE STREETSCAPE (6.2) and ensure the STREET AS CENTER (4.1), it is necessary to create proper spatial definition.

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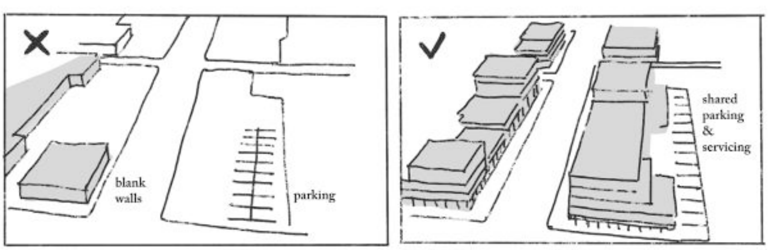
Problem-statement: There is a basic psychological need to feel a sense of spatial definition and enclosure. This need exists for pedestrians on streets — but it is often unmet.

Discussion: Many authors have commented on the difficulty of creating spatial enclosure along walkable streets, and the importance of creating "street walls" that help to do this. For example, Ewing and Handy (2009)[1] discuss this problem:

"In an urban setting, enclosure is formed by lining the street or plaza with unbroken building fronts of roughly equal height. The buildings become the 'walls' of the outdoor room, the street and sidewalks become the 'floor', and if the buildings are roughly equal height, the sky projects as an invisible ceiling. Buildings lined up that way are often referred to as 'street walls'. Alexander *et al.* [PEDESTRIAN STREET, APL 100] state that the total width of the street, building-to-building, should not exceed the building heights in order to maintain a comfortable feeling of enclosure. Allan Jacobs [in *Great Streets*] is more lenient in this regard, suggesting that the proportion of building heights to street width should be at least 1:2. Other designers have recommended proportions as high as 3:2 and as low as 1:6 for a sense of enclosure… The expert panel… opined that the required building height to enclose street space varies with context, specifically, between a big city and small town."

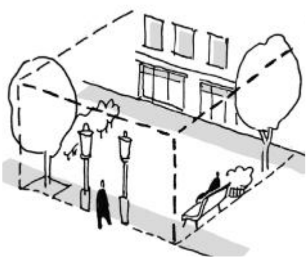


A guideline for street enclosures including street walls, showing what not to do (left) and what to do (right), from the Ohio Department of Transportation (USA), 2018.

In Ewing and Handy's own research using visual surveys of expert panelists, they did not find a significant relationship between a precise width-to-height ratio and perceived sense of enclosure. This finding further suggests that there is no single ideal ratio, but rather, a general rule of thumb that varies by context.

Therefore:

When seeking to make a street more attractive to pedestrians, conceive of it as a room, or a series of linked rooms. Assure that there are "walls" in the form of buildings, rows of trees, or other forms of enclosure that are at least half as high as the distance between these walls, but no more than twice as high. Avoid "dead spaces" of large parking lots and other major gaps in the street wall.



❖ ❖ ❖

Create a sense of enclosure on the long ends of streets with a TERMINATED VISTA (8.2) of a building or landmark. Establish a relatively uniform street wall (with some defined jogs, setbacks and step-backs) using a FORM-BASED CODE (16.1)…

[1] See Ewing, R., & Handy, S. (2009). Measuring the unmeasurable: Urban design qualities related to walkability. *Journal of Urban design, 14*(1), 65-84.8.2.

8.2. TERMINATED VISTA

…At the ends of the STREET AS ROOM (8.1), there is a need to close off the street, and not let it vanish into infinity.

❖ ❖ ❖

Problem-statement: People need to see landmarks, both to find their way, and to feel a sense of enclosure and spatial definition in the city. This need is particularly acute at the visual ends of streets and paths.

Discussion: Evidence shows that pedestrians are not comfortable walking down long straight streets with endless "vanishing point" perspectives ahead. This experience seems to be disorienting as well as lacking in a sense of enclosure, which in turn is essential to make the street more attractive to pedestrians.1 Drivers and riders in vehicles also benefit from the identification of wayfinding landmarks.

One of the best ways to handle this need is to interrupt the street with one or more structures along its axis, creating "terminated vistas". These can be buildings or parts of buildings, natural features, or other landmark elements. The streets can wind around the structures (as in the photo at the beginning of this pattern) or change angle, or simply terminate in a T-intersection.

Jane Jacobs (1961) described this challenge most insightfully in her classic book *The Death and Life of Great American Cities*, in Chapter Nineteen, "The Uses of Visual Order:"

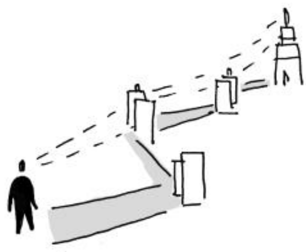
"[If] a street goes on and on into the distance, with the intensity and intricacy of the foreground apparently dribbling into endless amorphous repetitions of itself and finally petering into the utter anonymity of distance, we are also getting a visual announcement that clearly says endlessness… The general effect is bound to be chaotic… Therefore a good many city streets (not all) need visual interruptions, cutting off the indefinite distant view and at the same time visually heightening and celebrating intense street use by giving it a hint of enclosure and entity. Bridges that connect two buildings up above a street sometimes do this service; so do buildings which themselves bridge a street. Occasional large buildings (preferably with public significance) can be placed across straight streets at ground level — Grand Central Terminal in New York is a well-known example. Straight, "endless" streets can be interrupted and the street itself divided around a square or plaza forming the interruption; this square can be occupied by a building. In cases where vehicular traffic can actually be dead-ended on straight streets, small parks could be thrown across from sidewalk to sidewalk; the visual interruption or diversion would be provided here by groves of trees or by small (and, let us hope, cheerful) park structures. In still other cases, a visual diversion need not extend across a straight street, but can be in the form of a building or group of buildings set forward from the normal building line to make a jog, with the sidewalk cut underneath."[2]

Jacobs also referred to the argument of Kevin Lynch, author of the classic Image of the City,[3] that a city needs to create "imageability" through its landmarks, and through the relationship of its paths and nodes. Jacobs also noted that sometimes geographic interruptions can serve the same purpose, such as the hills of San Francisco.

The hills of San Francisco serve as natural terminated vistas, enhanced by added monuments like Coit Tower. Photo by Erica Chang via Wikimedia Commons.

Therefore:

Plan streets to have periodic visual interruptions by introducing buildings, natural features, or other monuments along their axes, with the streets either going around, changing angles ("deflected vista"), or terminating in an intersection. Make the monument distinctive and memorable, perhaps indicating the kind of human activity taking place there.



❖ ❖ ❖

Use LOCAL SYMMETRY (11.1) and HUMAN-SCALE DETAIL (15.2) to assure that the terminated vista will be appealing and memorable…

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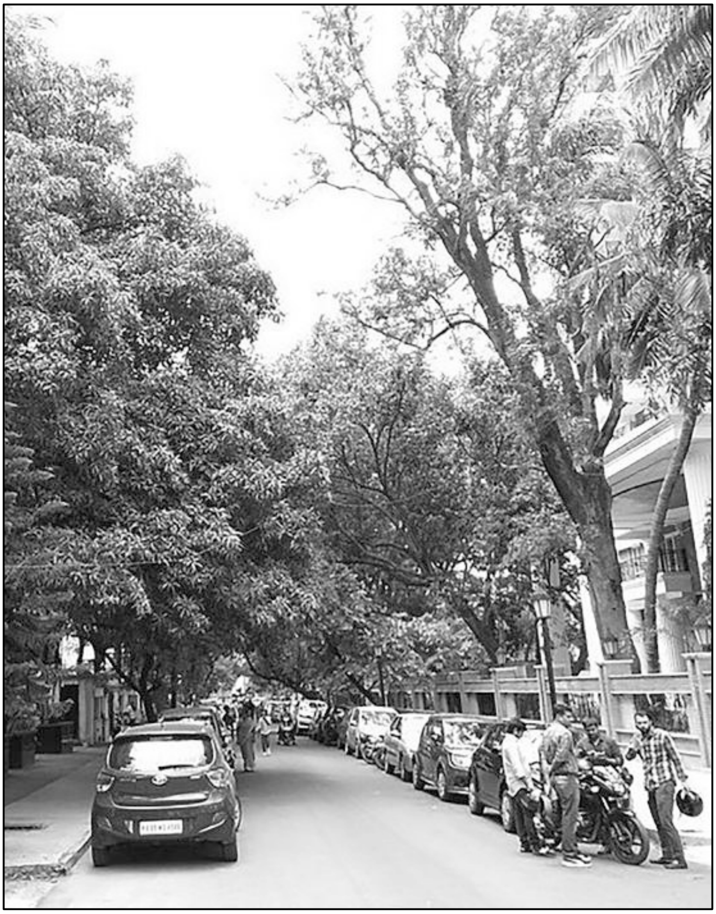
[1] For a more detailed discussion of this and many other aspects of walkable street design, see Dover, V., & Massengale, J. (2013). *Street Design: The secret to great cities and towns.* New York: John Wiley & Sons. For further research findings on the topic, see Clemente, O., & Ewing, R. (2005). Identifying and Measuring Urban Design Qualities Related to Walkability. Final Report prepared for the Active Living Research Program of the Robert Wood Johnson Foundation. Princeton NJ: Robert Wood Johnson Foundation. Available on the Web at https://drum.lib.umd.edu/bitstream/handle/1903/21519/ewingclemente-handyetal_walkableurbandesign_2005.pdf?sequence=1

[2] Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Random House.

[3] Lynch, K. (1960). *Image of the City.* Boston: MIT Press.

8.3. STREET TREES

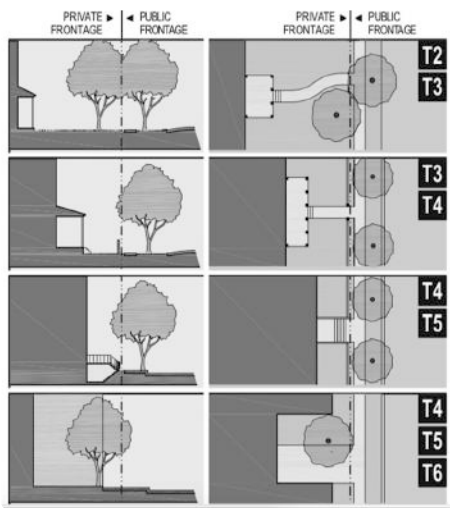


…Along your WALKABLE STREETSCAPE (6.2) and PERIMETER BLOCK (7.2), assure that there is attractive vegetation.

❖ ❖ ❖

Problem-statement: Few element provide more benefits to neighborhoods and cities than street trees. But there are challenges with their placement and maintenance.

Discussion: Sometimes the assumption about street trees is that they will march down every street, identical species at a regular spacing. But they need not have such a relentless pattern. For example, some trees might be of a distinctive species, producing a particularly beautiful flower or leaf color. The pattern of trees can also vary, sometimes alternating, sometimes grouping into natural patterns, or forming "bosques" of parallel rows.



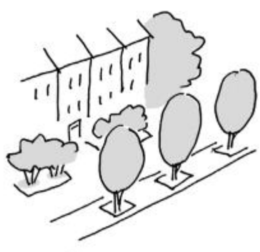
The "SmartCode", a form-based code developed by DPZ CoDesign, shows a number of different patterns for street trees, varying according to urban intensity or "Transect zone."

There are other considerations for street trees as well, and one of the most important is the ability of trees to survive with low maintenance in what can be a stressful urban environment and climate. Many neighborhoods have lost huge numbers of trees due to disease (for example, Dutch elm disease). It is therefore important to pick hardy, climate-appropriate species, and mix them so that a die-off of any one species will not denude the entire street.

Street trees must also be placed to avoid interfering with overhead power lines, and with buried utilities. So-called "root guards" — barriers that force the roots to travel downward and not sideways — can protect utilities as well as concrete sidewalks. Trees that are in vulnerable locations, prone to damage.

Therefore:

Plan streets with street trees at their edges and medians, varying in species and in placement as appropriate for building frontages. Place trees to avoid conflicts with overhead power lines, and protect buried utilities with root guards if needed. Protect them with tree guards when young.



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Use street trees to create FRAMING (11.4) of vistas. Coordinate placement of street trees with a FORM-BASED CODE (16.1)…

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[1] A review of benefits and challenges can be found at Mullaney, J., Lucke, T., & Trueman, S. J. (2015). A review of benefits and challenges in growing street trees in paved urban environments. *Landscape and Urban Planning, 134,* 157-166. A shorter overview of some of the same issues is provided by Dan Burden, at Burden, D. (2006). 22 benefits of urban street trees. Orlando FL: Glatting Jackson and Walkable Communities, Inc. Available on the Web at http://www.walkable.org/download/22_benefits.pdf

8.4. STREET FURNISHINGS

…A STREET AS ROOM (8.1) needs the what a room has, including seating, tables, decorative furnishings, MOVABLE SEATING (6.3), and other elements.

❖ ❖ ❖

Problem-statement: People need furnishings on streets in order to be comfortable, to have places to sit, to chat, to be protected, and to watch other people go by. But there are a number of challenges.

Discussion: We have already discussed the advantages of MOVABLE SEATING (6.3) in public spaces, but also their challenges for theft. The solution is that they can either be tethered down with secure chains, or removed and stored by adjacent businesses or agencies.

There are many other elements that can make a streetscape more active and appealing. Among them are protective bollards, fencing, planters, lamps, string lights, signs, banners, flags, and of course, works of art. In fact any of these elements can itself be a work of art — like the pedestrian barriers in Stockholm that are lion sculptures, symbolizing the Swedish coat of arms.

In addition to being secure, these and other street furnishings also need to be durable and resistant to moisture and damage.

A barrier to protect pedestrians does not have to be an ugly slab of concrete, but can be an attractive piece of art and even a nice place to sit — like this lion-shaped barrier in Stockholm, inspired by the Swedish coat of arms.

Therefore:

Develop street furnishings for streets, just as you would for rooms in a house. Take care to secure them, and select them for their durability, water resistance, and beauty.

❖ ❖ ❖

Remember to place the furnishings in groups, not in endless repetitive rows — SMALL GROUPS OF ELEMENTS (11.2). Use CONSTRUCTION ORNAMENT (15.3) and HUMAN-SCALE DETAIL (15.2)…

[1] There are a number of publications with more information on street furniture and its placement — see for example Yücel, G. F. (2013). Street furniture and amenities: Designing the user-oriented urban landscape. *In Advances in Landscape Architecture*. DOI: 10.5772/55770

9. BUILDING PATTERNS

Lay out appropriate urban buildings…

9.1. PERIMETER BUILDING

…Within a PERIMETER BLOCK (7.2), create buildings at the edges. Build some of them using SMALL PLOTS (7.3), with fine-grained features at the streetscapes. Generate a PLACE NETWORK (6.1) creating layers and articulations of space along the frontages.

❖ ❖ ❖

Problem-statement: Along the edges of perimeter blocks, the buildings have to meet particular requirements. At the street, they need to form attractive, active edges. On the back sides, the buildings can be much more irregular, but still need to provide light and open space. In both cases they must include zones to form transitional layers from public to private.

Discussion: On the front side, the buildings need not abut the pavement or sidewalk directly, but can step back into small front yard areas (see PLACE NETWORK, 6.1). They can also shift back and forth slightly, creating different articulated zones of outdoor space. They can also step back with terraces at upper levels, or include balconies and other outdoor spaces, creating more interest and variety.

On the rear side, perimeter buildings can take on a much more discontinuous form, as they do in the image at the front of this pattern. They may include accessory buildings, garages, alleys, parking areas, utility areas, private gardens and outdoor spaces, semi-private spaces, allotment gardens, and many more kinds of spaces — but they must do so as part of a coherent and legible pattern of public to private pathways.

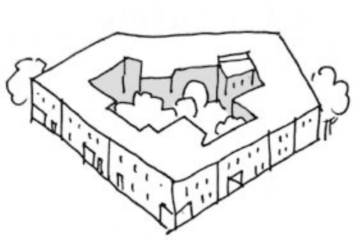
Perimeter buildings must also maintain good light and solar access, modulated in hot weather with appropriate vegetation (e.g. in areas with colder winters, deciduous trees can shade in summer and provide more sun in winter).[1]

Perimeter buildings can also be used to provide blocks-of-blocks — that is, smaller perimeter buildings within the larger block that in turn enclose smaller spaces such as courtyards, gardens and so on. Such a structure can be seen at the upper left of the photo at the beginning of this pattern.[2]

The rowhouses of Orenco Station in Oregon form perimeter buildings, with 12 foot (3.7 m) outdoor terraces as well as small 4 foot (1.2 m) yards forming a double layer of semi-private front space along the streetscape.

Therefore:

Create perimeter buildings that abut the streets surrounding each block, with almost continuous building frontage to the maximum extent possible. Create variety in the building form with step-backs and setbacks, and layers of semi-private space. On the back sides, lay out the buildings with ells, courtyards, outbuildings, and other discontinuous forms.



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Provide HUMAN-SCALE DETAIL (15.2), and use COMPLEX MATERIALS (15.4) along the frontages of the buildings. . . .

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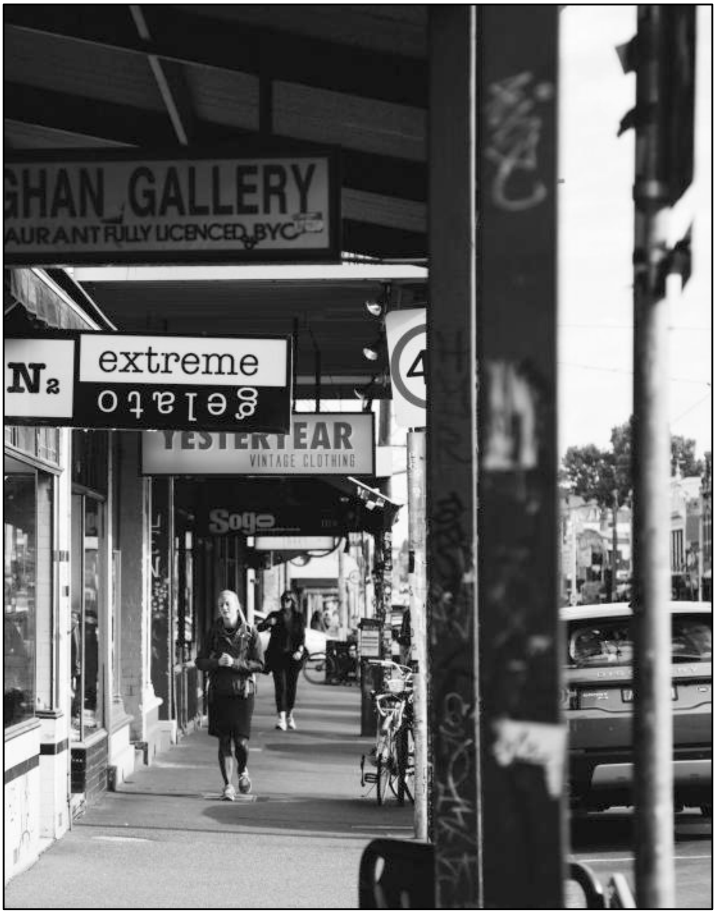
[1] Urban Task Force (1999). *Towards an Urban Renaissance.* London: Routledge.

[2] This urban pattern, and related ones, may seem "old-fashioned," but they actually represent the tip of the iceberg of very recent innovative scientific research. Looking at urban form as a system evolving over time to adapt to human use and changing forces, we can see that the morphology reaches a highly organized and complex state. After centuries of adaptation, building clusters acquire "emergent" properties that were not designed at the beginning. We connect to those geometrical qualities viscerally, and often pay a great deal of money to visit them in places where they can still be found. The trick now is how to accelerate the evolution of urban form, from centuries in physical space, to days in virtual space, so that we can build immediately with a comparable embodied complexity. This is what such patterns represent: "urbanism as computation" giving specific geometrical results. Morphological urban patterns take us away from monotonous and simplistic repetition, but also from random building footprints that come out of a narrow technological response, or a single artist's expression = both of which are likely to be poorly adapted to human need.

9.2. ARCADE BUILDING



…Along the edges of the PERIMETER BLOCK (7.2), there is a need to create a stronger connection between the buildings and the public spaces.

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Problem-statement: In many areas, there is a need for shelter as well as transitional space between the private interior and public exterior. This can be done with galleries and other porch-like structures, designed as integral elements to the building exteriors.

Discussion: Arcade buildings are archetypal structures in many cities. We can think of the famous arcades of Bologna, or the galleries surrounding the plazas of the American Southwest (see photo on next page). They create sheltered places along the street, especially valuable when adjacent to (and overlooking) squares and other public spaces.

We now know that these buildings are archetypal for deep biological reasons. New findings in neuroscience reveal that humans prefer to use paths that also define a spatial sense of place. All animals avoid exposed open space, and prefer to move along protected edges and perimeter boundaries — a phenomenon known as thigmotaxis.[1] For people too, an arcade along the block perimeter provides a most welcoming enveloping space for pedestrian movement. This type of place, with its own characteristics, transitions between the interior of the building and the street. It defines an important intermediate region — one that was lost when well-adapted contextual buildings were replaced by "designed-object" buildings.

However, in designing arcade buildings, care must be taken when arcades front along retail uses that there is adequate visibility. This can be done by ensuring that there is sufficient height to the galleries so that there is adequate light on the retail spaces. In some contexts, however, the customer traffic volume is so high that this is not a concern.

Arcade buildings on the plaza in Albuquerque, New Mexico.

Therefore:

Create arcade buildings when there is a need to shelter people adjacent to public spaces, to promote architectural connectivity to the street and the public realm, or to allow gatherings at upper levels, such as restaurants overlooking squares.

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Use ARCADES (APL 119) built into the lower story of a building to make a pedestrian-friendly space. Create a GALLERY SURROUND (APL 166) whenever possible, using porches, awnings and other structures. . . .

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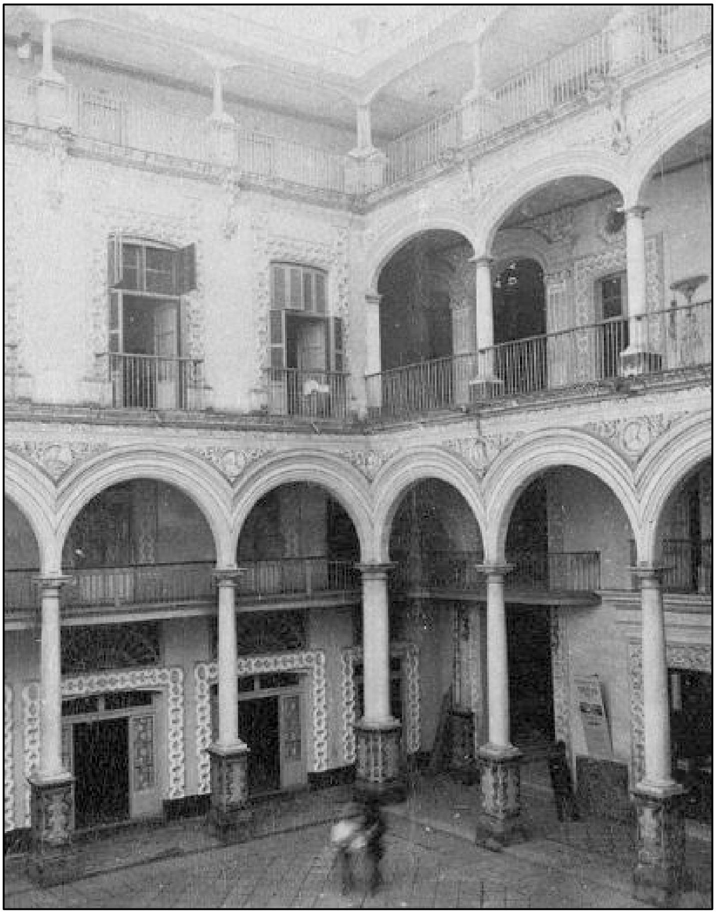
[1] Our colleagues Ann Sussman and Justin Hollander discuss this phenomenon and its relation to urban design at length, with additional research citations, in Sussman, A. & Hollander, J.B. (2015) *Cognitive Architecture.* New York: Routledge.

Image: Zoe Lin via Unsplash

9.3. COURTYARD BUILDING



…When laying out the PERIMETER BLOCK (7.2), conceive of the block as a series of courtyards, with some of them penetrating into individual buildings.

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Problem-statement: In busy neighborhoods, there is a need for quiet outdoor space that is part of the building, and for light and air to enter the rooms in the middle of the building. This is the archetypal courtyard building.

Discussion: We have already discussed why the PERIMETER BLOCK (7.2) is a beneficial pattern, providing an urban connection on one side and private outdoor space on the other. Here we jump down one scale to the individual building that encloses a courtyard, providing the same benefits at a smaller scale.

Courtyard buildings can be seen across many cultures and climates including colder climates, where they typically form small outdoor spaces of L-shaped or U-shaped buildings. In hotter climates, courtyard buildings are often O-shaped, with the outdoor space completely surrounded by the building. In some cases, there are multiple courtyards within the same building.

Courtyard buildings do pose some challenges, including a larger exterior wall area requiring additional insulation in buildings that require heating or cooling. Some courtyard buildings employ operable or retractable roofs over the courtyard, including glazed roofs.

Not often mentioned is the remarkable energy and comfort performance that a courtyard building can achieve (able to remain relatively cool in warm weather, and warmer in cool weather, without high consumption of fuels or other resources)[1]. It was largely for this reason, as well as for qualities of natural light and ventilation, that the pattern can be seen independently in so many traditional building cultures. In addition, courtyard buildings bring sunlight (modulated by shading devices) directly into otherwise deep buildings.

The performance of courtyard buildings can be improved with galleries or porches along one or more sides of the courtyard, shading from excessive sun, and also forming a connecting transition zone.

A courtyard house in California.

Therefore:

When buildings become too deep to admit air and light, or when they would benefit from private outdoor space within them, lay them out as courtyard buildings. Create porches fronting them, or wrapping two or more sides. If the courtyards are not entirely enclosed by buildings, enclose them with appropriate walls or fences, so that they function as private outdoor spaces.

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Create INDOOR-OUTDOOR AMBIGUITY (10.1) within the courtyard building, by using fully or partially glazed roofs. Create a CIRCULATION NETWORK (10.2) within the spaces surrounding the courtyard. . . .

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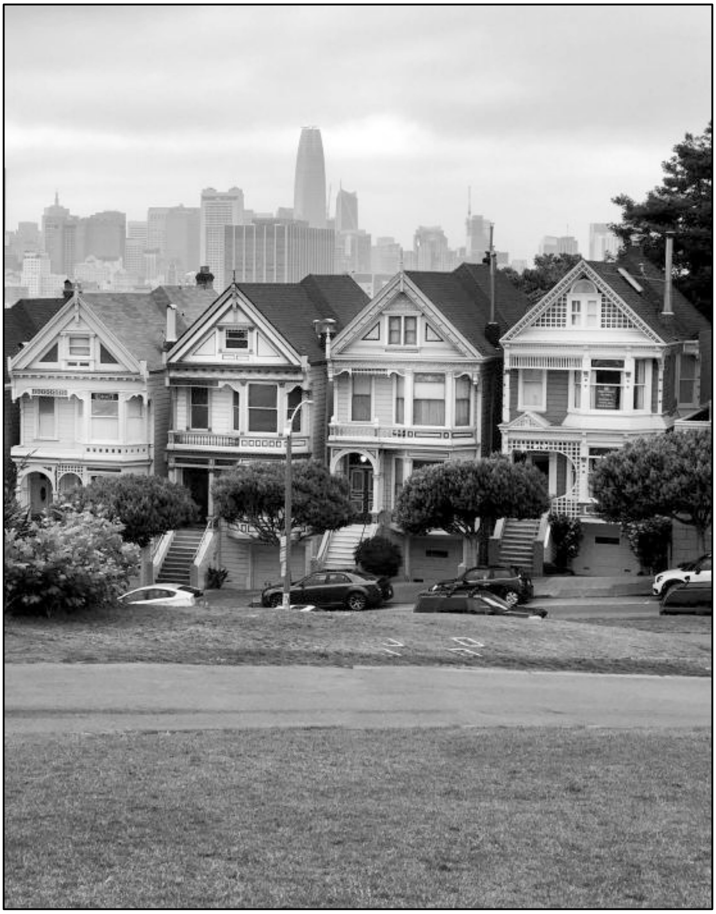
[1] The energy performance of courtyard buildings in different climates has been widely studied. See for example Aldawoud, A. (2008). Thermal performance of courtyard buildings. *Energy and Buildings, 40*(5), 906-910.

9.4. ROW BUILDING



…On the PERIMETER BLOCK (7.2), provide attached buildings on SMALL PLOTS (7.3).

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Problem-statement: It is economical and often beneficial to attach smaller buildings that are legally and physically separate, and line them in a row on the street. But this form of construction also introduces a number of challenges.

Discussion: Row buildings (including rowhouses and other attached buildings) are buildings that are constructed in a row along the street, but at different times by different owners. There are important advantages to this kind of development, including the ability to support finer-grained, better-adapted structures. Another important benefit is the typically greater variety and complexity of the streetscape. Even when a single "master planned" structure is designed as a composition of separate buildings, it almost never reaches the same level of informal variety and beauty. Indeed, many of the most beautiful streetscapes in the world were built in this way.

However, the process of constructing independent but attached buildings introduces many challenges. At any time, one of the houses may be removed or a new house or part of a house added, meaning that the adjoining houses have to maintain wholly independent side wall structures. Moreover, the construction process has to be coordinated with regard to impacts on adjoining buildings, including shared flashings and other elements. That means the owners need to be bound by an agreement or regulation that specifies how these independent construction activities will be managed so as to minimize problems for adjacent buildings.

Let us suppose that two adjacent plot owners are under an agreement to build attached buildings, but their plans are not standardized. One unit may be taller than another, or wider than another. Furthermore, one party may make changes later that will expose parts of the other's wall. In each case, care must be taken to protect the separate buildings from damage by water, fire and other dangers. This requires that a number of steps be taken to protect each side:

- First, each wall must be built as a fully insulated, weather-protected enclosure, of a type that allows flashing to be installed.

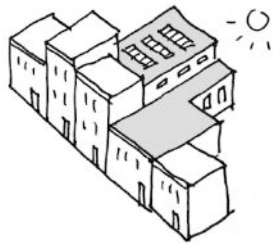
- Second, flashing must be introduced at the top edge where the two buildings abut, at the time that the second building is built.
- Third, an air space (usually approx. 1 inch) must be maintained between the two walls. This gap can be enclosed by a method agreed upon by the parties and the building official, such as caulking with a backer rod at the exposed edges, or covering with a piece of trim.
- Fourth, any elements of one structure that project beyond the surface of another must be built with fire-resistive structure, as typically required by local building codes.

There is another serious problem for many row buildings, which is the amount of natural light that enters the building. The narrower and deeper the building, the less light will enter its interior (except by skylights and light wells, which are of limited benefit). One solution is to jog either the front or back wall of the building, to create an "L" shape. Another solution is to create small courtyards or light wells that bring light into the interior. A third solution, and the simplest, is to keep the depth of the building quite shallow, while the width is greater — at least 6 meters or 20 feet, or wider.[1]

The beautiful row buildings of Amsterdam, often with radically different heights and volumes. Photo: Filip Maljković via Wikimedia Commons.

Therefore:

Make row buildings wide and shallow, and provide natural light to the interior with light wells or L-shaped wall jogs as needed.



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For residential row buildings, create ROW HOUSES (APL 38) with shallow depth and adequate interior light. Create layers of room like spaces or PLACE NETWORKS (6.1) along the fronts of the row buildings, and provide HUMAN-SCALE DETAIL (15.2). . . .

Image: Alex Wolo via Unsplash

10. BUILDING EDGE PATTERNS

Create interior and exterior connectivity…

10.1. INDOOR-OUTDOOR AMBIGUITY

…Within each PERIMETER BUILDING (9.1) or COURTYARD BUILDING (9.3), there is a need to create an experience of spatial richness that binds the indoors to the outdoors.

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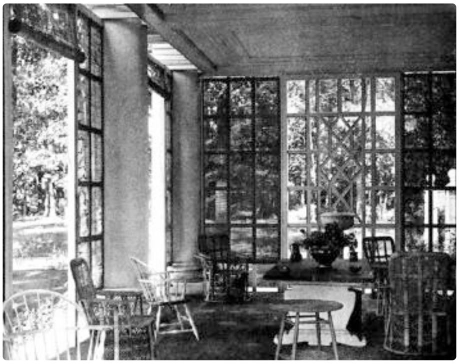
Problem-statement: Buildings should not only contain hermetically sealed "interior" spaces, but should occasionally include ambiguous spaces that are not simply "inside" or "outside".

Discussion: Some of the richest spaces blend interior and exterior elements, often blurring the lines between them. Spaces that appear to be exterior are discovered to be interior but quasi-exterior — like the former courtyard at La Fonda Hotel in Santa Fe New Mexico, seen in the photo at the start of this pattern. The doors appear to be exterior doors, even though they connect to another interior space. Treatments in the courtyard that seem to suggest an exterior, like plants and fountains, add to the ambiguity. Similarly, exterior spaces can begin to take on the characteristics of interior spaces (see for example the pattern OUTDOOR ROOM, APL 163).

It is possible to connect these spaces even further to other indoor and outdoor spaces, further blurring the lines. Courtyard buildings often do this masterfully, as they proceed through a sequence of courtyards, some of which are truly outdoors, and some of which are more ambiguous.

The ambiguity of these places is certainly delightful, and a powerful connective experience. Nevertheless, it is important that each space be experienced as a distinct place, felt as one identifiable piece in a PLACE NETWORK (6.1). The seamless flow into another place is then perceived as emotionally positive. If, on the other hand, the geometrical character (especially the nature of the boundaries) is blurred to such an extent that the spaces are not perceived as distinct places, a user is likely to feel confused, as if swimming in ambiguity. This unsettling experience occurs in many cases where, for example, the indoor-outdoor distinction is totally erased through a plate glass curtain-wall. The original *A Pattern Language* puts a great deal of emphasis on how to achieve this coherence successfully.



It is difficult to say whether this space (from American Homes and Gardens magazine, 1905) is truly "outdoor" or "indoor".

Therefore:

Create structures that blend interior and exterior, including courtyards and solarium galleries. Use glass doors and windows to further blur the distinction between what is truly outdoor and what is quasi-outdoor. At the same time, keep each space coherent and distinct.

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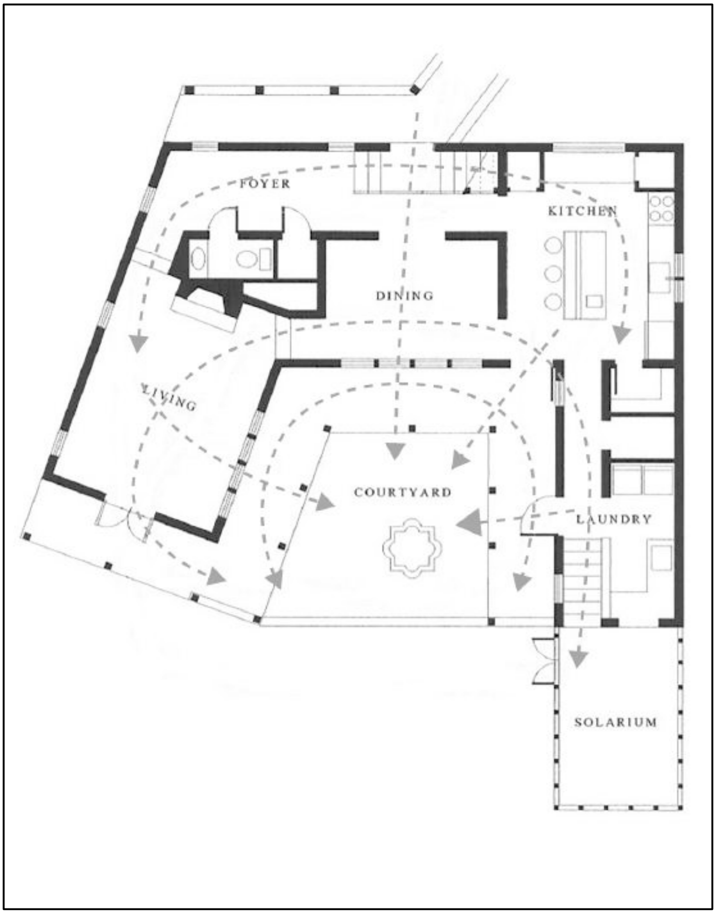
Use INTERIOR WINDOWS (APL 194) and SOLID DOORS WITH GLASS (APL 237) to blur the distinction between indoors and outdoors. Use POOLS OF LIGHT (APL 252) created by skylights and glazed courtyards to create indoor spaces with outdoor qualities. Use rough, typically external materials like stone and brick — COMPLEX MATERIALS (15.4) — to further blur the distinction. . . .

10.2. CIRCULATION NETWORK



…A COURTYARD BUILDING (9.3) (or other larger building with wings) needs to be structured to take advantage of its spatial complexity, without losing coherence.

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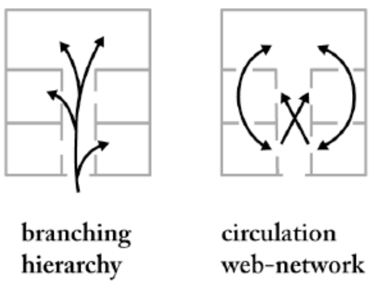
Problem-statement: Too often, circulation within a building is conceived as an elementary branching hierarchy or "tree" structure. This is a deadening kind of space. The richest spatial experiences come from inter-connected circulatory network structures, offering rich overlapping relationships.

Discussion: A "functional" approach to architectural space typically conceives of a linear, branching relationship: a central hallway "spine" leads to some boxy spaces at the sides, and perhaps to some main space at the end. But a more complex kind of spatial relationship comes from circulation networks, where the spaces are part of a circuit that inter-connects around and sometimes across the spaces.



Left, a branching hierarchy, with little interaction between the spaces, and little life. Right, a web-network that allows connection and circulation in a complex pattern that is far richer.

Looping circuits and redundancy are the keys to successful circulation networks. To avoid pre-determining a linear flow through rooms, create the possibility of choosing from among one or more alternative routes. At the same time, have enough available internal paths that some of them can join into a loop, to avoid being forced to move along only a unique path.

As these circulation networks intersect with adjoining spaces, they can offer views or light, while taking care to protect the privacy of these other spaces — for example, by using high clerestory windows, or frosted panes of glass. In this way, the circulation network can address the experience of people using the building from their perspective, and not just make expert determinations of "functionality."[1]

Therefore:

Do not lay out buildings with long boring central hallways, lacking views or connections. Instead, conceive of building circulation as a sequence of interconnected spaces forming a circulation network, retaining views and inter-connections to all the spaces while also protecting privacy.

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Employ LOCAL SYMMETRY (11.1) in creating plan elements. Use LAYERED ZONES (10.3) and FRAMING (11.4) to generate complexity and delight. . . .

[1] A relatively new research field is known as "architectural cognition" — how we see, understand and move through architectural space. See for example Dalton, R. C., Krukar, J., & Hölscher, C. (2018). 19. Architectural cognition and behavior. In *Handbook of Behavioral and Cognitive Geography*, p. 337-356. Cheltenham UK: Elgar.

10.3. LAYERED ZONES

…Along WALKABLE STREETSCAPES (6.2), and within CIRCULATION NETWORKS (10.2), there is a need to articulate the layers of space, especially layers of public to private.

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Problem-statement: People have a basic psychological need to experience layers of space. This need is especially acute at the edges of buildings.

Discussion: The experience of layers is one of the most fundamental of human experiences, with its roots deep in our evolutionary history. It seems closely related to the need to experience enclosure, and to define and control our layers of privacy. It is also closely related to our preference to seek out the most protective parts of a space, which often occur at the edges of different layers — a phenomenon known as thigmotaxis.[1] Layers of space can also exist as articulations of room-like zones, as described in PLACE NETWORK (6.1). We can see quite complex examples of these layers in some of the best and most active streetscapes, as well as in other exterior and interior spaces.

The complex layered zones shown in the photo at the beginning of this pattern.

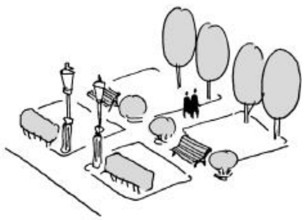
In his four-volume book *The Nature of Order: An Essay on the Art of Building and the Nature of the Universe*, Christopher Alexander considered some of the broader geometrical forces that shape human as well as natural environments. He noted that all complex systems have very similar structural rules. Working systems are typically layered, having multiple levels of scale and interconnected component subsystems. Their morphology frequently reveals marvelous solutions to connecting distinct subsystems through a semi-permeable membrane. Human spaces, it turns out, are really no different.

Typically, the layered zones of a space help to define a complex, tissue-like transition between the most public spaces (e.g the street) and the most private ones (e.g. the most private rooms). They help us to become comfortable in choosing our degree of exposure or protection, and in carrying out other activities in the most appropriate and comfortable situation. But layered zones can also exist in entirely public spaces, like a park, and entirely private ones, like an interior space articulated into layered zones with columns.

Layered zones created by columns define the entry inside a building.

Therefore:

Create layered zones of space, especially where articulations of gradations of privacy are required, or where definition of spaces is needed (such as at the edges of parks and other public spaces). Articulate these zones with columns, railings, fencing, vegetation, elevation changes, and other clear demarcations. But keep a connection as well as a separation of the layers.



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Fill the layered zones with HUMAN-SCALE DETAIL (15.2) and CONSTRUCTION ORNAMENT (15.3). . . .

[1] As discussed previously in ARCADE BUILDING (9.2), our colleagues Ann Sussman and Justin Hollander describe this phenomenon and provide additional research citations in Sussman, A. & Hollander, J.B. (2015) *Cognitive Architecture.* New York: Routledge.

10.4. PASSAGEWAY VIEW

…Within your building's CIRCULATION NETWORK (10.2), be careful about the placement of passages.

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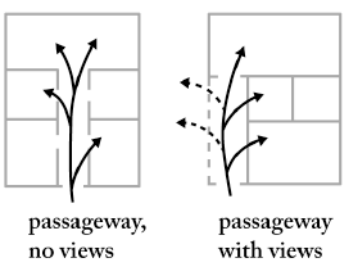
Problem-statement: People tend to assume that in walking from room to room, we are focused on the utilitarian goal of moving, while we only care about a view when we arrive in a room. This is exactly backwards.

Discussion: In fact, when we occupy a room, we are often engaged with tasks that distract us from views: talking to others, reading a computer screen or printed material. It is when we are moving that we are most aware of our surroundings, and most affected by the views they offer.

In practical terms, this means that the common pattern of a dark central hallway feeding a chain of rooms on each side — known as a "double-loaded corridor" — is a terrible pattern, cutting us off from experience of the outside world, and the rest of the building. A better pattern is to wrap passageways along the exterior walls for at least part of their length, and to cluster rooms in a more complex configuration.

The field of graph theory, from mathematics, gives us some insight on this issue. In graph theory, both the nodes and the connections are equally important. In functional terms, connections such as paths are equally as important as destinations that are stationary nodes. In terms of architectural cognition, our vision of spaces changes as we move through it, forming what have been termed "isovists."[1] Previous generations of design tended to focus only on static nodes and to neglect the dynamic connections and the experience of the shape of space as people move between them. We need to pay attention to this crucial aspect of space and movement once again, by designing these transitions with equal care towards the experience and wellbeing of the user.



Left, a typical "double-loaded corridor" passageway, offering no views other than a dark corridor. Right, a passageway offering views of the exterior, and perhaps other parts of the building.

Therefore:

Do not make long, dark passageways that offer no views to the exterior. Instead, connect at least part of each passageway to the exterior, offering views from windows.

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Use FRAMING (11.4) to connect passageways to the outside, and to other parts of the building. Provide HUMAN-SCALE DETAIL (15.2) and LOCAL SYMMETRY (11.1) to create geometric richness and complexity…

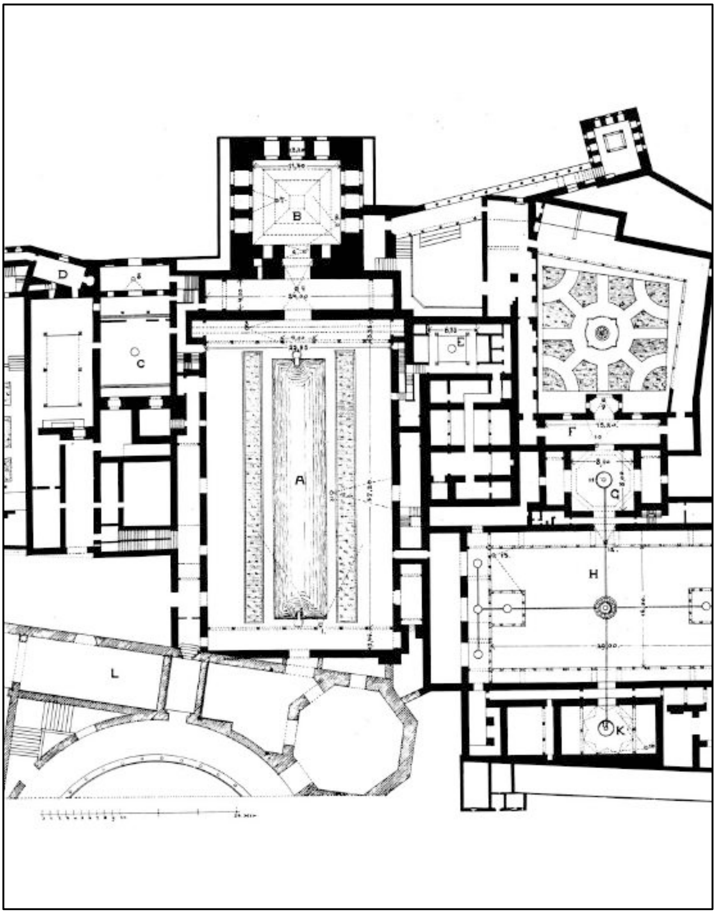
[1] Graph theory and the concept of "isovists" have been applied to understanding architectural space and movement experience by a number of investigators, notably Bill Hillier and Michael Batty, both of University College London. See for example Batty, M. (2001). Exploring isovist fields: Space and shape in architectural and urban morphology. *Environment and Planning B: Planning and Design, 28*(1), 123-150.

SECTION II: PATTERNS OF MULTIPLE SCALE

11. GEOMETRIC PATTERNS

Build in coherent geometries at all scales…

11.1. LOCAL SYMMETRY



…This pattern begins a section on broader geometric properties that are included in many other patterns at many scales. We can see these geometric patterns in BIOPHILIC URBANISM (2.4), in PLACE NETWORKS (6.1), in COURTYARD BUILDINGS (9.3), and in many other parts of the city.

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Problem-statement: Environmental structures without a legible symmetry are chaotic and ugly. But environmental structures with relentless symmetry at all scales can become lifeless and oppressive.

Discussion: Symmetry is in many ways the most important property in cities, and in living structures too. There are many kinds of symmetries — bilateral (like our two hands), radial (like the irises of our eyes), and so on. There are also many compound symmetries, like our eyes (each of which is radial while both are bilateral).

But breaks in symmetry are also very important, as we are learning from many fields today, notably physics. A relentless form of symmetry — one that does not break when adaptive conditions require it — is oppressive, and usually indicates a faulty process of generation. (Including a designer who has become megalomaniacal with their design, as can be seen in, say, the vast, overly-symmetrical palaces of some despots.)

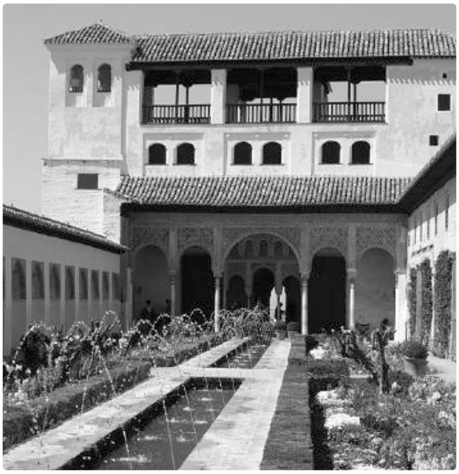
A more benign form of symmetry can be seen occurring spontaneously in many places — exquisitely symmetrical at local and human scales, but interrupted at larger scales, especially when topography or other conditions prompt an adaptive shift. This "symmetry-breaking" is actually a key generator of a more complex form of order.[1]

Three important points are worth explaining. First, symmetries that contribute to perceiving "life" in the environment exist mostly on the smaller and intermediate scales. In the best-loved examples, there are thousands, if not millions, of cooperating smaller-scale symmetries. They all cooperate to generate coherence instead of randomness. The opposite case — where there is an overall symmetry on the largest scale, but no further small-scale symmetries — is perceived as oppressive.

Second, we instinctively compute the coherence and intensity of multiple symmetries in our field of view, and apparently "feed visually" on high degrees of organized complexity. Yet multiple symmetries on façades and perceivable structures have priority over symmetries of the building's plan. While those are also important, we may not be able to grasp the ground symmetries in a complex building. We normally cannot see the plan when we use the building at ground level.

Third, monotonous repetition abuses the symmetry idea to generate a hostile environment. The human mind cannot identify meaningful information presented in, say, endlessly repeating blocks or windows, and tires itself in trying to grasp a non-existent complexity. This is why groupings and variations are necessary to break a monotonous symmetry, and why they arose as an essential part of traditional design solutions (see SMALL GROUPS OF ELEMENTS (11.2).

Nature never shows monotonous repetition. Whenever a design repeats in nature, it adapts to local conditions so that it is never exactly the same. Monotonous repetition thus signals that adaptation has been neglected.

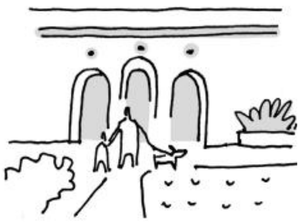


There is a very high degree of symmetry in the Alhambra in Spain, seen above and in the image at the start of this pattern. It includes bilateral, radial and other forms. However, this symmetry exists only at smaller "local" scales. At larger scales the symmetry often breaks, as can be seen in the asymmetrical upper building in this image.

Therefore:

Use symmetry to create beauty at local and human scales, but use it sparingly at larger scales. Break the symmetry as needed to respond to changes in terrain or other environmental condi-

tions. Do not use symmetry slavishly, but as an asset to be applied within a looser, more complex geometric system.



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Use local symmetry to create CONSTRUCTION ORNAMENT (15.3) and HUMAN-SCALE DETAIL (15.2). . . .

[1] The property of local symmetry is discussed at length in Book One (and elsewhere) in Alexander, C. (2003). *The Nature of Order: The Art of Building and the Nature of the Universe*. Berkeley: Center for Environmental Structure.

11.2. SMALL GROUPS OF ELEMENTS

…In laying out a PUBLIC-PRIVATE PLACE MANAGEMENT (2.3), a WALKABLE STREETSCAPE (6.2) or a specific building or structure, consider the groupings of elements and whether they are legible to residents.

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Problem-statement: There is something inherently appealing and satisfying in compositions that are groups of small numbers of elements, typically two, three or four, but rarely more than seven.

Discussion: There is evidence that the human brain prefers to view compositions made up of nested small groups, which are easier to grasp mentally. George A. Miller's classic 1956 paper "The Magical Number Seven, Plus or Minus Two" showed that people prefer these kinds of compositions, made up of subsidiary elements or "chunks" as he called them, totaling a maximum of approximately seven elements (up to as many as nine) within any one group.[1]

Most traditional buildings adhere remarkably well to this pattern. It seems to have its roots in the grouping patterns that form spontaneously in nature, and that humans have encountered repeatedly in their evolutionary history — for example, the Fibonacci Sequence, in which each number is a sum of the two preceding numbers, i.e. 1, 1, 2, 3, 5, 8…

Many contemporary buildings deliberately violate this pattern, favoring a relentless large-scale repetition. They do so in what one architect has called an "alchemistic promise to transform quantity into quality through abstraction and repetition," which he dubbed a failure and a hoax. But this design trick is certainly attention-getting, probably because it contrasts so sharply with natural structures. Of course, getting attention is not the same as creating satisfying human habitats.

There is evidence that monotonous repetition tires the brain, which keeps on computing to find hierarchical meaning missing from what the eye sees. Complex systems (including living systems) avoid monotonous repetition by grouping elements into clusters, then repeating those clusters. This process can be understood as the creation of hierarchical scales, which result in a FRACTAL PATTERN (11.3) below. As in music, repetition needs to be anchored in rhythm with sufficient complexity.

Many "modernist" buildings deliberately violate this pattern — with results that are dramatic for them, but simply ugly and stressful for many others.

Therefore:

Follow a rule of thumb of grouping elements, and making groups of groups — especially twos, threes, and fours. Avoid designs that repeat more than nine elements at any one scale.

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This pattern is a valuable aid in achieving HUMAN-SCALE DETAIL (15.2) and other characteristics of a more legible, human-centered design. . . .

[1] The classic paper by George A. Miller has been widely influential. See Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review, 63*(2), 81. Available on the Web at https://pure.mpg.de/rest/items/item_2364276/component/file_2364275/content

11.3. FRACTAL PATTERN

…Fractals are a basic characteristic of a BIOPHILIC URBANISM (2.4).

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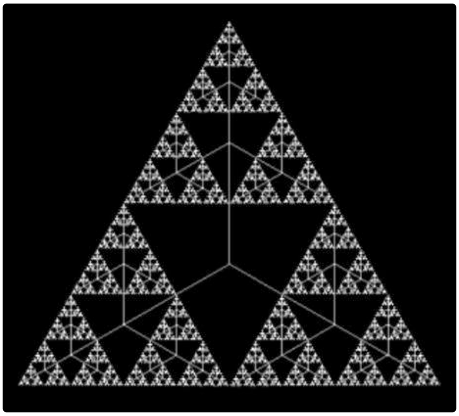
Problem-statement: How can we generate more complex and beautiful patterns in design?

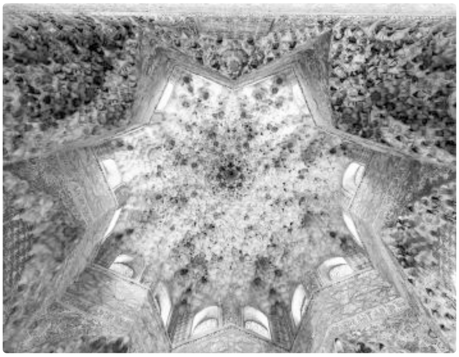
Discussion: One of the most common patterns in nature, and also one of the most beautiful, is known as the fractal. The mathematician Benoit Mandelbrot coined the term to refer to structures that contain self-similar elements at different scales, which can be described with mathematical precision (and even re-generated on computer). He and other researchers found that very many patterns in nature do have this fractal structure — as do many traditional structures in human environments. Examples of common fractal structures include trees (the leaf vein is self-similar to the twig, which is self-similar to the branch, which is self-similar to the trunk, etc).

A common way of generating fractal patterns in a human design is the use of the motif. This can be a particular geometric shape (sometimes quite simple) that is repeated at small and large scales — like the arch patterns that are repeated many times at many scales in the photo at the beginning of this pattern, a section of the Alhambra in Spain.



One of the simplest fractal patterns, a series of identical triangles repeated at many different scales.

Mathematical fractals close upon themselves, and possess self-similarity, where a magnified portion resembles the whole. Magnification can be performed an infinite number of times, and the form looks similar. Some natural shapes, such as fern leaves, cauliflowers, and the mammalian lung, are self-similar through several magnifications right down to their microstructure. Yet most natural fractals are not, and instead obey the weaker condition of "statistical self-similarity". Magnified portions are not exact copies of the whole, but they share some of the same complex properties. The point is that even those "statistically self-similar" fractals never show emptiness at any magnification.



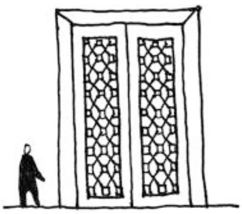
Richly fractal patterns in another part of the Alhambra building, Spain. Photo: Quesada Jua via Wikimedia Commons.

Applying this notion to architecture, pre-industrial and vernacular buildings reveal complex detailed structure whenever any portion is magnified. Natural materials themselves possess substructure that shows up through magnification (see COMPLEX MATERIALS (15.4), below). Contrast this visual richness with industrial-minimalist materials, which can show emptiness after even the first magnification. This is a result of the quest for a smooth minimalism, which may be pleasing to some persons, but represents the opposite of fractal structure.

"Statistical self-similarity" results from a fractal adapting to external conditions; indeed, a requirement for geometrical adaptation is that strict lines and self-similarity need to be abandoned. This is the reason why many natural fractals are approximate in this sense. Fractal patterns that adapt to connections, local conditions, flows, etc. are richly complex, and thus can never be mathematically pure. Since adaptive architecture has to accommodate a variety of human needs, rather than fit some abstract geometrical ideal, its fractal expression is necessarily approximate.[1]

Therefore:

Use fractal patterns in the form of repeated motifs at different scales. These can be simple elements that are repeated, altered in scale, rotated, and otherwise worked into a complex and beautiful pattern.



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Integrate your fractal pattern into a HUMAN-SCALE DETAIL (15.2) incorporating CONSTRUCTION ORNAMENT (15.3). . . .

[1] Yannick Joye has explored some of the beneficial impacts of architecture with a fractal structure — see e.g. Joye, Y. (2007). Fractal architecture could be good for you. *Nexus Network Journal, 9*(2), 311-320.

11.4. FRAMING

…When planning your WALKABLE STREETSCAPE (6.2) or building CIRCULATION NETWORK (10.2) and PASSAGEWAY VIEWS (10.4), strengthen the relationship between different places in a PLACE NETWORK (6.1).

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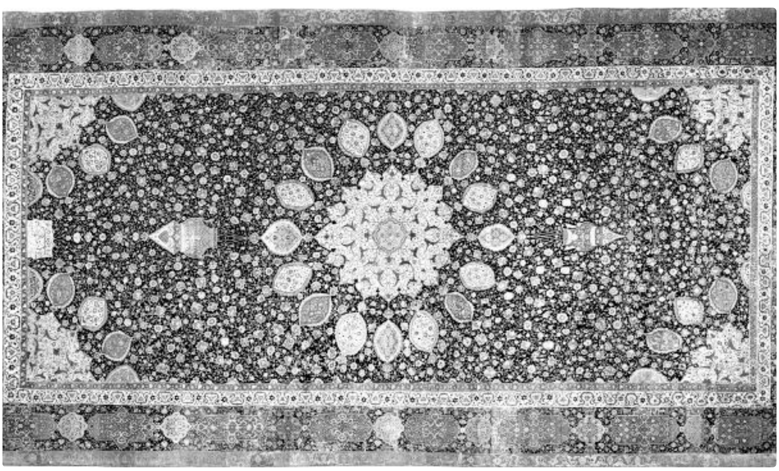
Problem-statement: It is natural to want to remove elements that seem to obscure or clutter a view. But the most powerful views are in fact framed by other elements at their boundaries.

Discussion: Any photographer knows that it's important to have a foreground, middle ground and background, and that the foreground can serve as a powerful way of framing the view — even when it might seem to partially "block" the view. So too, a designer needs to recognize the power of a frame as a border, creating a more powerful relationship between the viewer and the viewed.



The border of this carpet serves to frame the complex pattern inside it.

In mathematics, a region is intimately related to its boundary (Stokes' Theorem), which means they are interdependent.[1] Borders and frames arise from a fractal scaling hierarchy, where something contains smaller structures, and is itself embedded into a larger structure. Often, hierarchical scaling is manifested as the presence of frames. Removing the frames destroys the fractal scaling hierarchy, with undesirable consequences. For example, a space that is not framed is perceived as psychologically ambiguous, hence anxiety-inducing.

Both information theory and eye-tracking experiments verify the need for framing. A message needs to be distinguished from surrounding signals by BEGIN and END tags, i.e. framing in one dimension. In ordinary writing, a sentence is framed by beginning with a capital letter and ending with a period. Eye tracking shows that we focus on frames as the boundaries of architectural surfaces, unless there are sub-frames in the interior. Human physiology has programmed us to look for frames as visual references.

Christopher Alexander and his colleagues described the need for frames in several design patterns in *A Pattern Language: Towns, Buildings, Construction,* including patterns DEEP REVEALS (APL 223), FRAMES AS THICKENED EDGES (APL 225), and SMALL PANES (APL 239). Alexander went further in *The Nature of Order*, where he described the universal presence of "wide boundaries" in stable systems. He also described "boundaries" as one of fifteen fundamental properties of structure, seen repeatedly in natural and human architectures.[2]

Therefore:

Do not try to clear out and simplify a design when there is a natural frame around it — whether that is vegetation, a portion of another building, columns or other interruptions. Instead, work with these elements as frames, and use them to make the experience more powerful.

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Use framing to enrich HUMAN-SCALE DETAIL (15.2). Enrich the framing with CONSTRUCTION ORNAMENT (15.3) and COMPLEX MATERIALS (15.4)…

[1] See Katz, V. J. (1979). The history of Stokes' theorem. *Mathematics Magazine*, 52(3), 146-156.

[2] Alexander, C. (2003). *The Nature of Order: An Essay on the Art of Building and the Order of the Universe*. Berkeley Center for Environmental Structure.

Image: Jorge Fernandez Salas via Unsplash

12. AFFORDANCE PATTERNS

Build in user capacity to shape the environment…

12.1. HANDLES

…Intimately related to the PLACE NETWORK (6.1) and its function is the perception and physical ability to grasp our surroundings. Provide functional but also ergonomic handles on an entrance and within a room.

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Problem-statement: People need to experience human-scaled handles in their surroundings, which include functional handles on doors and windows, and also frames, ledges, and trim having a 'graspable' dimension.

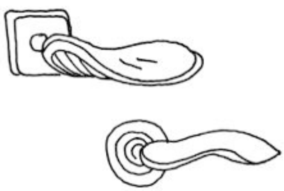
Discussion: We are continuously judging whether our immediate environment provides 'affordance', which is the ability to accommodate our body and especially our hands. This notion is essential in using tools and utensils, but we point out that it is also crucial in 'fitting-into' the built environment.

We feel comfortable in a room if we sense its range of human dimensions. There is no better way to do this than by having obvious structures of a 'graspable' dimension. Built features such as moldings, trim, etc. are usually associated with ornamentation, but are in reality quite distinct and equally necessary for psychological wellbeing. Psychologist James J. Gibson used the notion of affordance[1] to explain how we fit (or not) into our immediate environment, which was developed further by Donald Norman.[2] This idea goes far deeper into both physics and the world's religions, in a philosophy of connecting the Cosmos to small details that humans experience in everyday life. The German physicist Ernst Mach stated the principle that "local physical laws are determined by the large-scale structure of the universe". This idea was instrumental to Albert Einstein in developing the General Theory of Relativity. At the same time, in many traditional religions, especially Eastern ones, it is accepted that what we experience here locally is connected to the large-scale structure of the Cosmos. The idea of small/large connectivity is backed by millennia of human thought about how human beings fit into the Universe. Therefore, design cannot arbitrarily choose to ignore such powerful precedents.

The quality of handles may ultimately provide the quickest test of whether a new building is good or not. If the designer has truly thought about accommodating the human hand and psyche in designing comfortable door handles and other features on a 'graspable' scale, then they have probably paid the same attention to guarantee the affordance of other elements such as room shape, ceiling height, indoor lighting, circulation realms, etc. The opposite is also valid: an uncomfortable door handle probably indicates that the entire building in all its details is non-accommodating.

Therefore:

Pay special attention to include structural features that are shaped to be easily 'graspable' by the hand, which fit comfortably, even if we never need to physically grasp them. Actual handles should revert to older ergonomic design and abandon the ubiquitous uncomfortable shapes due to abstract 'design'.



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On doors and windows use well-known psychological design techniques to indicate whether one needs to push or pull, rather than a minimalistic design aesthetic that confuses the user…

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[1] See Gibson, J.J. (1979). "The Theory of Affordances." In *The Ecological Approach to Visual Perception*. Boston, MA, US: Houghton, Mifflin and Company.

[2] Norman, D. A. (1999). Affordance, Conventions, and Design. *Interactions, 6*(3), 38-43.

12.2. CO-PRODUCTION

…Give people the power to shape their PUBLIC SPACE SYSTEM (2.3) and PLACE NETWORK (6.1) as well as their private realms.

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Problem-statement: The best urban places are not produced all at one time, by experts. They are continuously "co-produced" by all of the people — residents, businesspeople, pedestrians, children. This capacity for co-production must be developed and sustained.

Discussion: Jane Jacobs was famous for pointing out, in her landmark *The Death and Life of Great American Cities*, that the city cannot be made only by experts:

> *"Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody."*

What Jacobs knew was that, in addition to the infrastructure and the buildings that tend to be built as more static works by larger institutions, there are many smaller and medium-sized actions that shape the life of cities. There are works of art; signs and banners; ornament and decoration; vendors; and above all, people, moving, gathering, talking, arguing, singing, and ultimately shaping the character of public space.

Moreover, there are other, slower scales at which the city is also co-produced: a vendor adds plants to mark the entrance to their store; a couple adds a rooftop terrace with a new fence; a café removes seating along the street; a builder builds a new building; a group of citizens attends a hearing to comment on new development plans.[1]

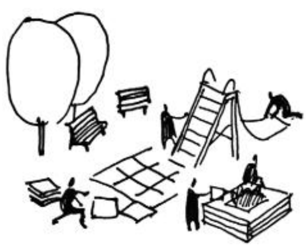
We can see the powerful emergent results of this kind of transformation in beautiful cities all over the world — for example, the drawing at the start of this pattern by the morphologist Saverio Muratori. It shows the remarkable transformation of Venice over about 100 years, largely by small acts of individual owners. There were of course other influences too, including the regulatory codes, and the patterns and practices maintained by the traditional craftspeople of the city.

Many small changes have been made by many different agents on this section of a London street over just five years, including new rooftop terraces and fencing, removed seating, new planters, and other awnings and signage.

Many thinkers of diverse political viewpoints have argued that urban space is "produced" as a social construct, and that the maintenance of this capacity is an essential component of urban justice.[2] A forgotten space under a bridge, for example, may be invested with meaning and become a cherished public space when a group of teenagers, say, begins using it as a skateboard park. The government has a responsibility to protect their right to "co-produce" this public space, in balance with its other responsibilities.

Therefore:

Recognize processes of co-production in the city, and provide additional mechanisms for the involvement of all stakeholders in the co-production of their shared common realm.



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Maintain the opportunity for DESIGN-BUILD ADAPTATION (15.1), MALLEABILITY (12.4) and HUMAN-SCALE DETAIL (15.2), with the addition of CONSTRUCTION ORNAMENT (15.3). Preserve the overall coherence of individual co-production with regulatory codes such as a FORM-BASED CODE (16.1)…

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[1] See Sharp, E. B. (1980). Toward a new understanding of urban services and citizen participation: The coproduction concept. *Midwest Review of Public Administration, 14*(2), 105-118.

[2] One of the most influential theorists on the social production of space was Henri Lefebvre. See for example Lefebvre, H. (1991). *The Production of Space.* Translated by Donald Nicholson-Smith. Oxford UK: Blackwell

12.3. FRIENDLY SURFACES

…One of the components of BIOPHILIC URBANISM (2.4) is concerned with how attractive we perceive surfaces to be when we are near them. Then, HUMAN-SCALE DETAIL (15.2) can help to define surfaces that we can connect with. Lastly, COMPLEX MATERIALS (15.4) offer far more visual interest, hence emotional engagement, than dull industrial materials.

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Problem-statement: The physical characteristics of surfaces affect us in a profound yet subconscious manner. Neuroscience, rather than antiquated and unprovable architectural creeds, should decide on their qualities.

Discussion: The surfaces of buildings we are exposed to play a determining role in how we experience the environment. There exist 'friendly', 'neutral', and 'hostile' surfaces as judged by our neuro-physiological responses to them. Experiments determine why we feel attracted to touch a particular surface, and are repelled by another. Continuing to apply unprovable architectural diktats on how surfaces have to be finished and shaped ignores this information.

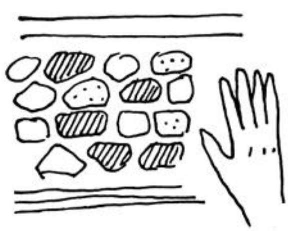
Industrial-minimalist surroundings don't 'belong' to us, because their geometry and surfaces are often contrary to what our sensory system instinctively seeks. But even if we find surfaces aggressive and hostile, we are legally prohibited from modifying them. Yet adapting a surface to human sensibilities (through paint, or owner-created ornament) is the easiest and cheapest way of significantly improving our environment. In the past, people from the most impoverished settings, to those belonging to a social class with power and wealth, injected delight, personal meaning, and serenity into their living spaces. The tool was to create tactile surfaces smooth to the touch, framed by ornament, using emotionally attractive color, etc. Those qualities were eliminated in turning towards early 20th century industrial minimalism.

Designing by satisfying the human senses makes a building more sustainable. A building that is loved by its users because they feel it to be 'friendly' will be taken care of and survive normal wear and tear. A blank wall can be interesting if it shows visual texture, but not if that makes it hostile to touch. For example, using smooth slabs of natural materials such as colored marble and travertine creates an intimate bonding with the user up close. (A famous example is the Barcelona Pavilion by Ludwig Mies van der Rohe, 1929). This effect can be explained by the new patterns BIOPHILIC URBANISM (2.4) and FRACTAL PATTERN (11.3), from the fossil microorganisms that comprise the rock. In contradistinction, both tactile and visual senses perceive brutalist concrete as hostile, especially if it maintains the texture of the casting forms. Users could scrape their skin from rubbing against it. Its typical gray color triggers subconscious associations with death (decomposing bodies, putrefied food) and pathologies of the eye-brain system that reduce our vision to grayscale (cerebral achromatopsia from a stroke). Smooth concrete allows one to touch it, but this does not change its depressing color. Visually attractive materials when used outside (brick, roughly-finished stone) become tactually hostile when used in interiors.

The ubiquitous use of plate glass curtain walls removes us from our millennial connection to surfaces, and is neutral. Being transparent, a large percentage of the world's built surfaces simply don't register in our mind and body. Physical material, if it follows some traditional guidelines, can establish a positive connection with the user. We are aware of the moral, philosophical, and political arguments that supported erecting exclusively hostile surfaces for decades. Even though generations of architects treated those as articles of faith, we do not find any scientific merit in them.

Therefore:

Shape wall surfaces to engage us on a visceral level so that we feel at home in our environment. Liberate architecture to once again include attractive colors, and shape surfaces that we can experience up close so they are inviting to touch. Beware of an overwhelming reliance on the psychologically neutral glass curtain wall.



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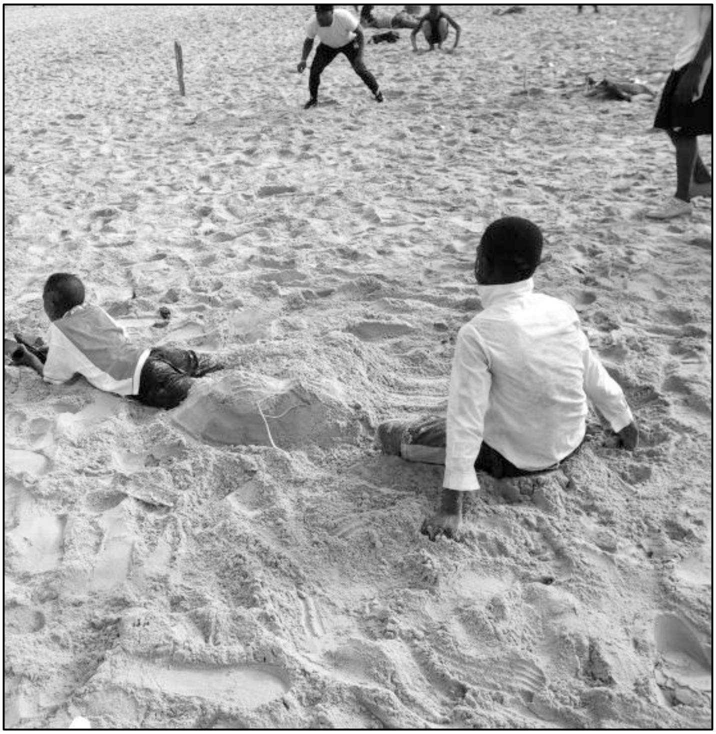
Use ORNAMENT (APL 249) to complement a wall surface that has been made friendly, especially where it connects to other surfaces.…

[1] A good discussion of the findings on the aesthetics of surfaces (and other aspects of the built environment is in Cold, B., Kolstad. A, and Larssaether, S. (2001). *Aesthetics, Well-Being and Health: Abstracts on theoretical and empirical research within environmental aesthetics*. Oslo: Norsk Form (The Foundation for Design and Architecture in Norway).

12.4. MALLEABILITY



…Make the PUBLIC SPACE SYSTEM (2.3) responsive to human need for CO-PRODUCTION (12.2) and adaptivity.

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Problem-statement: People need environments that they can shape for themselves, as play, as art, or just to be comfortable.

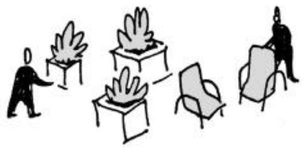
Discussion: A malleable environment is one we can shape ourselves, and engage with our creativity and enjoyment. Not every environment needs to have malleability — but at least some of them do. A playground with sand… a garden with plants and dirt... a public space with MOVABLE SEATING (6.3)…

In a sense, all of our human environments need some form of malleability.[1] For example, we close curtains, we open doors, we position windows for just the right amount of fresh air — not too much… We need responsive environments to meet our needs, and moreover, to meet these needs as they change over time.

Gardens offer an especially malleable (and pleasurable) environment.

Therefore:

Provide for malleability in the urban environment, in the form of materials that can be shaped, adjusted, and changed over time.



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Use malleability to produce HUMAN-SCALE DETAIL (15.2) with COMPLEX MATERIALS (15.4). Use malleable materials, like cardboard, foam or sandbags, to shape a COMMUNITY MOCKUP (16.4) to develop a more permanent structure later. . . .

[1] The idea of environmental responsiveness is discussed in Bentley, I., Alcock, A., Murrain, P., McGlynn, S., Smith, G. (1985). *Responsive Environments: A manual for designers.* London: Routledge.

13. RETROFIT PATTERNS

Revitalize and improve existing urban assets …

13.1. Slum Upgrade
13.2. Sprawl Retrofit
13.3. Urban Regeneration
13.4. Urban Consolidation

13.1. SLUM UPGRADE

…Within the POLYCENTRIC REGION (1.1), do not leave areas of disconnection, poor sanitation, and low safety, but work to upgrade and integrate them into the surrounding fabric.

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Problem-statement: How can we help those who live in slums to enjoy a better quality of life and greater opportunities, without forcing them to leave their existing social networks and move to places that might actually make their lives worse?

Discussion: Informal settlements — slums — often have many positive qualities, including existing neighborhood relationships, cultural creativity, resource efficiency, and remarkable levels of innovation and resourcefulness. But they often also lack mobility and access, good utility service, sanitation, security, and other essential conditions necessary for quality of life.

The approach often used in the past was to force slum dwellers to move to new buildings which included utilities, sanitation and other amenities. But this approach is expensive, and history shows that it often fails. People lose their web of social contacts, and the new buildings often become even more unsafe than the buildings from which they moved.

We are recognizing that a key aspect of healthy urbanization is its self-organizing character, where people work "bottom-up" to address their own needs, and to create remarkably complex, well-functioning neighborhoods with strong social capital.[1]

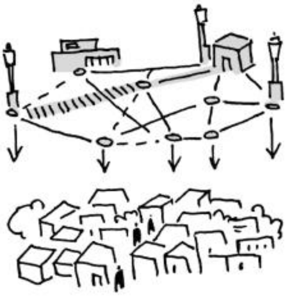
At the same time, people need transport and utility systems and they need a public realm that is sufficiently structured to promote safety in numbers and "eyes on the street" to improve security.

In essence, a major source of the problem we have comes from two incompatible geometries. The geometry of an informal settlement is evolved almost exclusively from the bottom-up. This is the geometry of organized complexity, adapted by incremental building according to the residents' immediate needs. By contrast, the geometry in the minds of government planners, or construction companies that most often undertake social housing projects, is rigid and top-down. Bulldozing the slum and moving its inhabitants into neatly-ordered boxes with infrastructure and sanitary amenities is not a viable solution, as history has shown.[2] The negative aspects — the loss of adaptive complexity in the built environment, and the loss of networks of relationships that are severed by the top-down geometry — can outweigh all the genuine positive benefits of better sanitation, better connectivity and so on. In many cases, the relocated residents have turned against the built fabric that they identified as dehumanizing, and destroyed it.

As an alternative strategy, many cities have begun to implement strategies to upgrade slums in place, reinforcing their best qualities and addressing their weaknesses with pro-active policies. For example, the city of Medellín, Colombia, instituted participatory budgeting to allow neighborhoods to decide their own allocations for infrastructure, including escalators and overhead cable cars. Beautiful new civic structures like libraries were placed directly in the center of slum communities, promoting a mixing of populations and an opportunity for commerce across a wider section of the city.[3]

Therefore:

Do not assume that the only remedy for informal settlements is to demolish and relocate. Instead, institute policies for slum upgrading, allowing people to stay in their homes and communities, and improve their quality of life.



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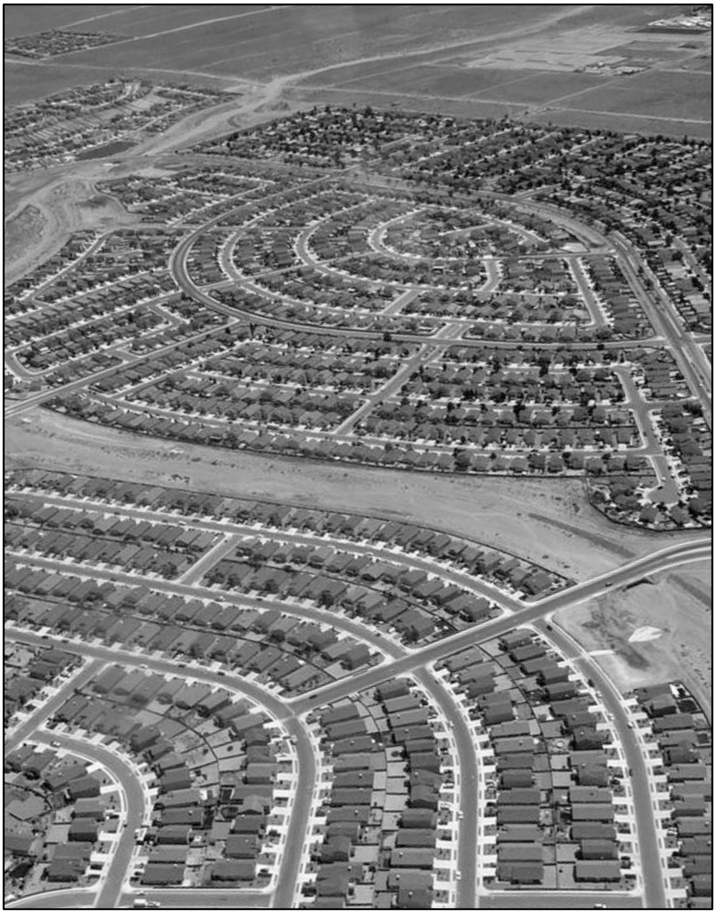
Provide secure LAND TENURE (14.1) and processes for INCREMENTAL SELF-BUILD (14.4). Provide resources for upgrading through a NEIGHBORHOOD PLANNING CENTER (16.3) and through DATA WITH THE PEOPLE (14.3). . . .

[1] This approach is sometimes known as "community-driven development." See for example this World Bank report, http://siteresources.worldbank.org/INTUSU/Resources/cdd-urban-upgrading.pdf. The World Bank also offers an online resource for learning about slum upgrading, available at https://olc.worldbank.org/content/upgrading-urban-informal-settlements-self-paced.

[2] See series of articles being published online on ArchDaily: Salingaros, N.A., Brain, D., Duany, A.M., Mehaffy, M.W. and Philibert-Petit, E. (2019-2020) Socially-Organized Housing. https://www.archdaily.com/922149/socially-organized-housing-biophilia-connectivity-and-spirituality

[3] A more detailed account of the remarkable upgrading work in Medellín is in the case study section of this book. See also Calderon, C. (2008). *Learning from Slum Upgrading and Participation: A case study of participatory slum upgrading in the emergence of new governance in the city of Medellín, Colombia.* Stockholm SE: KTH Royal Institute of Technology, Department of Urban Planning and Environment.

13.2. SPRAWL RETROFIT



…Within the POLYCENTRIC REGION (1.1), one of the most important tasks is to improve the urban quality of many suburban areas.

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Problem-statement: The existing suburban regions that are low-density, segregated by use and by population, high-consumption, fragmented and dysfunctional, represent one of the greatest land resources for the future. But the challenge of retrofitting and urbanizing these areas is enormous, with many barriers remaining.

Discussion: The sprawling suburbs represent a large and growing percentage of the world's population, particularly in countries like the USA where auto-dependent suburban development has dominated for decades.

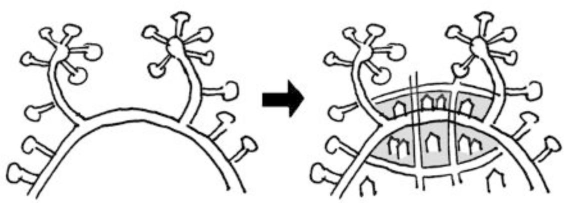
One challenge is that existing owners are resistant to change, and political processes therefore often inhibit urbanization. But there are economic mechanisms to promote urbanization, including developing attractive new urban centers on adjacent empty land such as parking lots and unneeded right of way. Another strategy is to acquire future easements that do not go into effect for the foreseeable future, and that property owners will therefore be more willing to sell or otherwise grant permission.

Another significant barrier is the holdover of zoning codes and laws from a period when sprawling development was seen as more benign than it is now. A key challenge is that sprawling development is still very profitable, even to city bureaucracies in the form of increased fees and tax base. This means it is necessary to find ways to change the "operating system", especially by changing the economic incentives and disincentives. For example, taxes, fees, system development charges, and other mechanisms can help to make good-quality urbanism more cost-competitive in these suburban locations.

In addition to the legal mechanisms, we must also be clear about the geometry that we wish a sprawling suburb to evolve towards. That geometry is described by other patterns in this book (400M THROUGH STREET NETWORK (1.4), PUBLIC SPACE SYSTEM (2.3), WALKABLE STREETSCAPE (6.2), TERMINATED VISTA (8.2), *et al.)*. We can also describe it as a geometry of organized complexity, of diversity and inhomogeneity, where the urban fabric forms overlapping heterogeneous zones that support mixed activities and uses. The first indicator that newly-implemented legal incentives are working to "fix" the sprawling suburb is a departure from the original homogeneous urban footprint.

Therefore:

Find creative ways to retrofit suburban sprawl, by creating new infill development, by re-using declining malls, empty parking lots and other under-utilized sites, and by changing old zoning laws, standards, codes and charges. Find new economic incentives and other creative mechanisms to fund good projects.



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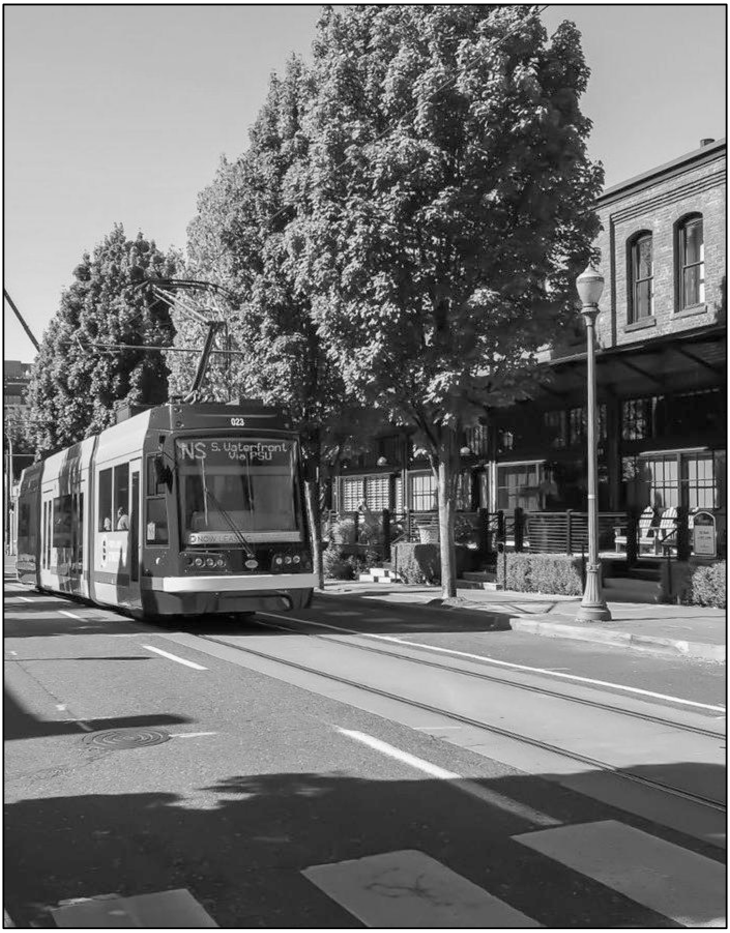
Use TAX-INCREMENT FINANCING (17.1) and LAND VALUE CAPTURE (17.2) to make good-quality urbanization more competitive, and more likely to proceed. . . .

[1] Several books have appeared recently with many ideas about retrofitting suburbia — for example see Dunham-Jones, E., & Williamson, J. (2008). *Retrofitting Suburbia: Urban design solutions for redesigning suburbs.* New York: John Wiley & Sons. For a compendium of ideas for retrofits, see Tachieva, G. (2010). *Sprawl Repair Manual.* Washington D.C.: Island Press. A number of design techniques are also discussed in Steil, L., Salingaros, N., and Mehaffy, M. (2008). Growing Sustainable Suburbs: An incremental strategy for retrofitting sprawl. In Haas, T. (ed.), *New Urbanism and Beyond.* New York: Rizzoli. Available on the Web at http://zeta.math.utsa.edu/~yxk833/suburbia.pdf

13.3. URBAN REGENERATION



…Within the POLYCENTRIC REGION (1.1), the urban cores also represent a valuable asset for careful regeneration.

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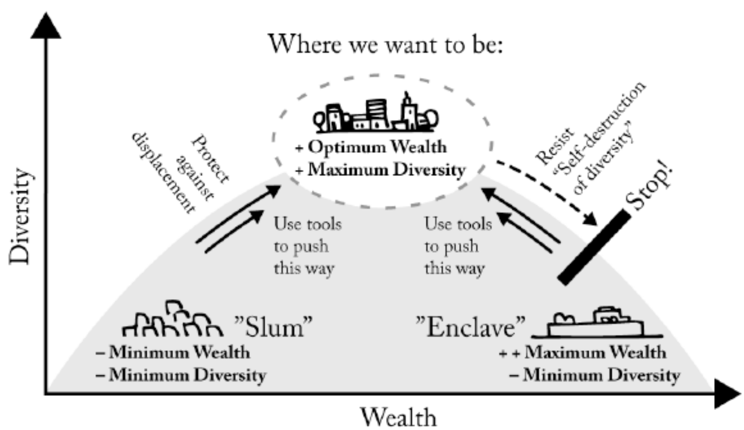
Problem-statement: There are many opportunities to re-urbanize existing declining urban areas. But care must be taken to avoid runaway gentrification.

Discussion: In her landmark *The Death and Life of Great American Cities*[1], Jane Jacobs described the dangers of gentrification, but she also made an important point. The problem is not when the wealth of a neighborhood increases from poverty to a mix of incomes — a condition she called "unslumming". The problem arises when the neighborhood tips over from there into higher income, driving out those of more moderate income. She called this "the self-destruction of diversity." In other words, increasing wealth that increases diversity is good, but increasing wealth that decreases diversity is very bad — perhaps as bad as decreasing wealth that also decreases diversity (e.g. when a neighborhood declines into a slum).

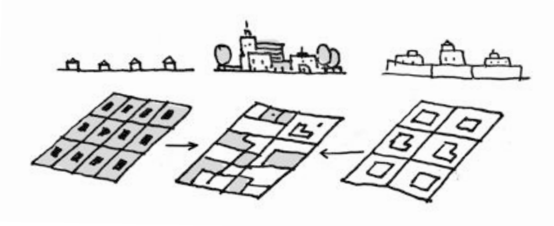


The "Jacobs Curve" shows an optimum point of diversity reflecting a mix of incomes, Anything on either side of this "Goldilocks zone" — either too much poverty, or too much wealth — is bad for the neighborhood.

Jacobs' point could be illustrated with a graph (previous page), showing a kind of "Goldilocks zone" of maximum diversity. Our goal, not only as planners and designers, but also as policy leaders and citizens, is to implement policies and tools to resist the destruction of diversity on either side of the curve. In existing neighborhoods, our challenge is to restore diversity with policies that can recognize when "enough is enough."

Therefore:

Implement policies to regenerate existing urban areas in decline, while also assuring that these areas do not tip over into gentrification. Do this by providing a range of new housing at a range of prices, and by expanding opportunities in many places at once, so that no one place becomes over-heated.



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Promote a more equitable form of urban development with a LAND VALUE CAPTURE (17.2), INTEGRATED AFFORDABILITY (19.1), MULTI-FAMILY INFILL (19.3), and other tools. . . .

[1] Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Random House.

13.4. URBAN CONSOLIDATION

…At times the POLYCENTRIC REGION (1.1) is developing erratically, and emphasis needs to be shifted to consolidate some areas.

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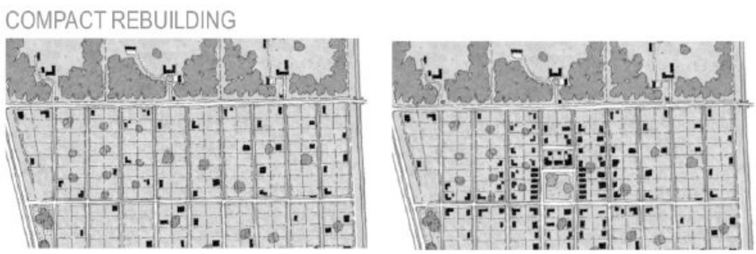
Problem-statement: In some areas where homes have been lost due to environmental disasters or population decline, it is sensible to consolidate homes and businesses in more compact, walkable areas, and to create new public spaces or environmental preserves with the remaining land.

Discussion: The decision to consolidate development needs to be a democratic one, taking special care to allow residents to choose their own futures. However, often there are no residents, or few residents, and a more sensible alternative is to offer them a higher-quality alternative in a consolidated area.

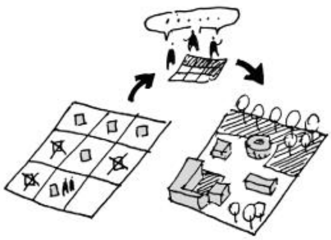


The proposal for new public squares in the Gentilly district of New Orleans, where many homes were destroyed by Hurricane Katrina. (Drawing by DPZ CoDesign.)

In practice, the obstacle to urban consolidation has been a legal one: resistance coming from both government agencies and the insurance companies underwriting reconstruction. Those entities insist that what is rebuilt either has to exactly duplicate what was destroyed, or the residents have to be forcibly removed to entirely new locations. Of course, residents are often extremely angry at this latter idea. In both cases, a rigid bureaucratic restriction makes it impossible to upgrade a region toward a much more resilient (and human) type of urbanism. Planning regulations often reinforce this flawed approach. We need a more "agile" form of planning, to produce the more "agile" form of urbanism that we need for the future.

Therefore:

When consolidation of urban areas is warranted, take care to give the remaining homeowners a say in their future. Create a meaningful choice for a more consolidated, higher-quality urban form, with new parks and green spaces nearby.



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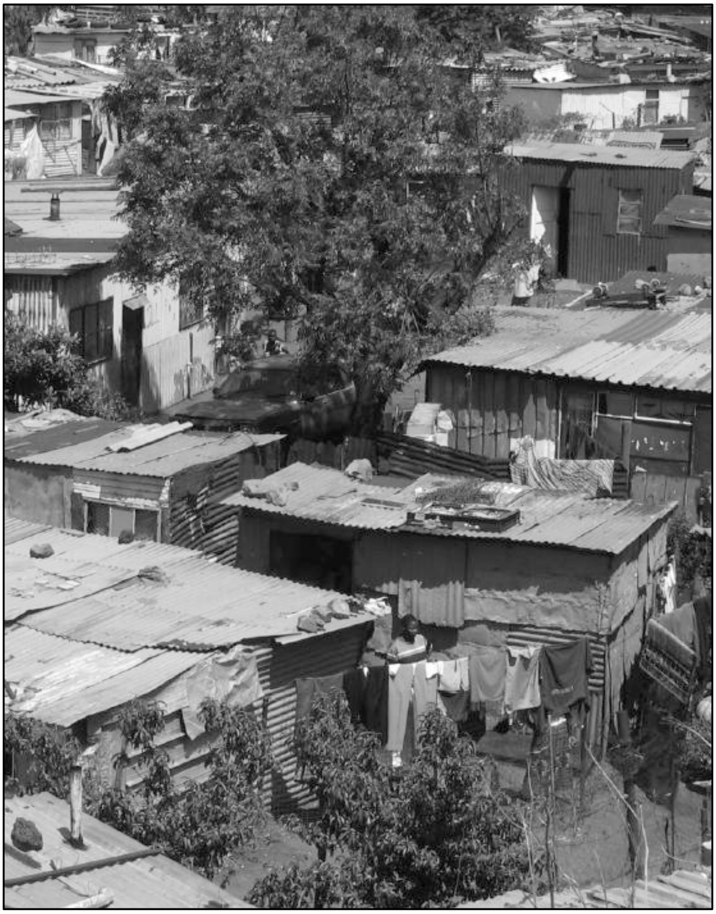
Give people resources to choose whether to relocate, and how to rebuild, through the NEIGHBORHOOD PLANNING CENTER (16.3). Facilitate rebuilding by providing ENTITLEMENT STREAMLINING (16.2).

[1] See DPZ CoDesign (2006). *Unified New Orleans Plan, District 6*. Miami: DPZ CoDesign. Summary available on the Web at https://www.dpz.com/Projects/0632

14. INFORMAL GROWTH PATTERNS

Accommodate "bottom-up" urban growth…

14.1. LAND TENURE



…For URBAN REGENERATION (13.3), and especially for a SLUM UPGRADE (13.1), the legal status of land ownership is critical.

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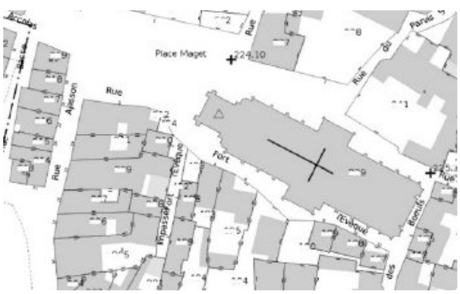
Problem-statement: One of the fundamental problems for residents of informal settlements is the simple question of who actually owns their land.

Discussion: Many informal settlements are created by developers who do not themselves own the land, or who do not legally convey a "clear title" to the residents who live there. This creates many problems for the residents — which may include the inability to secure a legal address for their home, to receive mail, to secure credit, or even to complete a job application. Worst of all, the residents may be evicted from their homes at any time, either by the "legal" owner of the land, or by a government action based on conflicting ownership claims — or in some cases, no ownership records at all.[1]

The best way to secure land tenure is to create a single "cadastral plan" that locates plots and records ownership. This document is recorded with the local government, together with deed records to establish accuracy. The owner need not be the resident of the plot, who can be a renter, or a grantee of usage rights — as for example when the land is in a COMMUNITY LAND TRUST (19.2). If there is a conflict between ownership claims, the cadastral plan governs, unless and until a disputing party can establish through the local court system that they have legal tenure.



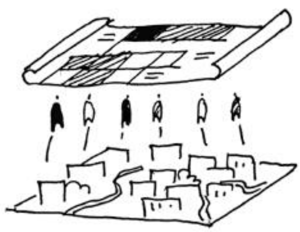
An example of a cadastral plan that was created after the fact for a village in France. Image: ManiacParisien via Wikimedia Commons.

Secure land tenure is an important condition of healthy urban growth. It is typical that, once residents have clear ownership of their land, they will continue to invest in their self-built house. Also in the case where a basic house unit is already built, owners will continue to maintain and upgrade it. This is the way that cities have evolved historically, with piecemeal additions and gradual improvement of house components with more permanent materials.

In securing land tenure, serious procedural and legal conflicts can and do arise. Residents in dire financial straits may be induced to sell their deed to someone better off and move to another location, thereby perpetuating the loss of land tenure. Protections must also be made against criminal activities, including coercion by local organized crime. In some cases, residents are coerced to sell their deeds to allow a syndicate to become a district's overall landlord. This kind of coercion must be prevented through cadastral transfer review and enforcement mechanisms.

Therefore:

Work to identify and record the ownership of all plots of land within existing and future informal settlements.



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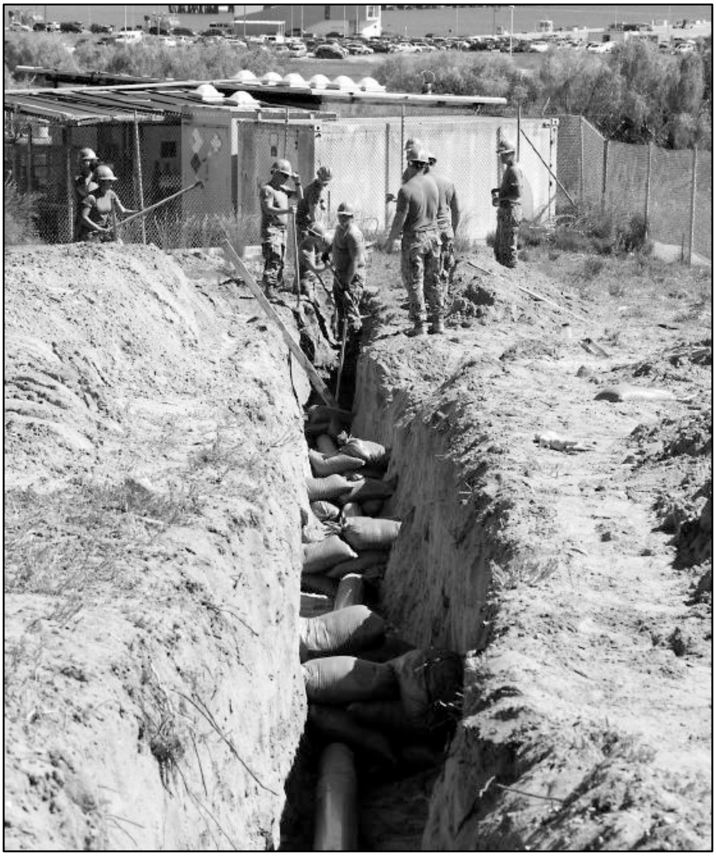
Provide a NEIGHBORHOOD PLANNING CENTER (16.3) offering resources for residents to document and secure tenure for their land. Use the COMMUNITY LAND TRUST (19.2) model when residents are unable to purchase their own land individually, but secure tenure is still needed…

[1] There is a growing body of research on the problem of land tenure and ownership for informal settlements. See for example Durand-Lasserve, A., & Royston, L. (Eds.). (2002). *Holding their ground: Secure land tenure for the urban poor in developing countries.* London: Routledge Earthscan.

14.2. UTILITIES FIRST



…for a new development, a SLUM UPGRADE (13.1) or SPRAWL RETROFIT (13.2), it is necessary to provide adequate utility services to guide growth.

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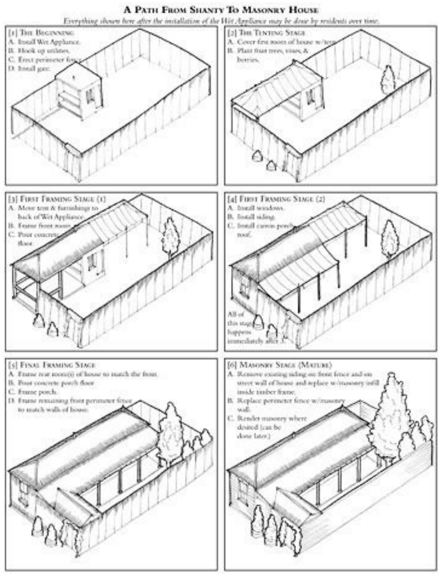
Problem-statement: It is very difficult to bring utilities to an informal settlement after it has already been developed. But it is very helpful to place utilities first into an area that is growing, in such a way that they will provide for more orderly development, sanitation and amenities.

Discussion: Basic utilities like water, electricity and sewer are among the most urgent needs for informal settlements, but often among the least available. The stopgap methods that residents employ are often dangerous, unsanitary, or both. Fires created by *ad hoc* wiring are common, and sanitation is often poor, while the purity of water delivered by pipe is low, if it is available at all.

So many of the elements of informal settlements can be built by the people themselves: the homes, businesses, streetscape furnishings, and other elements.[1] Indeed, these constructions often express an inventiveness and even a beauty that is hard to match. Yet the one area where the people are least able to provide for themselves is the delivery of utilities.[2]

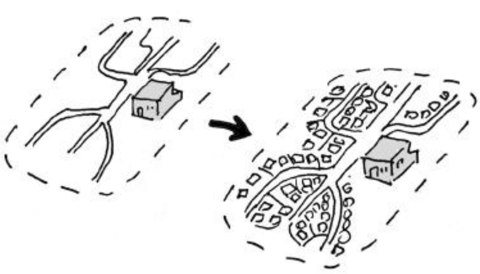
Therefore, it is imperative that local institutions be created to provide utilities to informal settlements.[3] Wherever possible, they need to be provided first, so that it is not necessary to tear out existing homes or streets, which can be disruptive and expensive. In addition, the utilities can be brought to points along the streets where homes may be built, so that individual owners can connect to them safely. One way of doing this is by providing a prefabricated hookup unit, containing the basic provisions for kitchen and bath plumbing as well as electric and other services. A version of this, known as a "wet appliance," is shown on the next page. It allows homeowners to build onto this module with their own construction over time.



A proposal to bring in a utility core containing kitchen and bath components, allowing residents to self-build around it. Developed by The Prince's Foundation and Steve Mouzon for an informal settlement in Jamaica.

Therefore:

Provide the basic utilities that are needed for an informal settlement: water, sewer, electricity. Provide them as a framework on which to grow the community in later stages.



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Provide information about utilities at the NEIGHBORHOOD PLANNING CENTER (16.3). Provide ENTITLEMENT STREAMLINING (16.2) to residents…

[1] The ability to safely create and repair elements of neighborhoods by people themselves, including utilities, is an important component of urban resilience, as noted in this report by the World Bank: https://www.worldbank.org/content/dam/photos/780x439/2016/oct-1/Urban-Resilience-Risks-738x440.png.

[2] For further discussion of the issues surrounding upgrading of informal settlements with utilities, see Del Mistro, R., & A. Hensher, D. (2009). Upgrading informal settlements in South Africa: Policy, rhetoric and what residents really value. *Housing Studies, 24*(3), 333-354.

[3] These institutions need to assure that utilities are coordinated with an overall "green and grey infrastructure" system (see also BLUE-GREEN NETWORK). See for example the World Bank report, "Integrating Green and Gray Infrastructure for Water Security and Climate Resilience", at https://www.worldbank.org/en/news/feature/2019/03/21/green-and-gray.

14.3. DATA WITH THE PEOPLE

…In SLUM UPGRADE (13.1) and URBAN REGENERATION (13.3), one of the most important capacities is the ability of local residents to generate and manage their own data and its technology.

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Problem-statement: Many people speak about the importance of data as a means to provide better services to residents of informal settlements. Too few people speak about the importance of data as a means to empower those residents.

Discussion: There is a basic distinction in all urban development work between "doing for" and "doing with." In the former approach, often government services provide services for residents in a top-down fashion In the latter, residents are given the power to do more, through partnerships and through technological resources.

This is certainly true when it comes to data technology. Beyond the need for governments to measure populations and services needed, there is a basic need for residents to have data capabilities in their own hands — for example, to be identifiable on email and the Web, to have a record of their physical address, and to have access to Web-based resources.[1]

Therefore:

Build the network of data resources within each neighborhood. Provide technology, training and support, especially to children.

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Use data resources to assist with INCREMENTAL SELF-BUILD (14.4). Provide support at the NEIGHBORHOOD PLANNING CENTER (16.3)…

[1] See e.g. Hachmann, S., Arsanjani, J. J., & Vaz, E. (2018). Spatial data for slum upgrading: Volunteered Geographic Information and the role of citizen science. *Habitat International*, *72*, 18-26.

Cover photo: Vgrigas via Wikimedia Commons.

14.4. INCREMENTAL SELF-BUILD

…In SLUM UPGRADE (13.1) and other forms of URBAN REGENERATION (13.3), it is often necessary as well as beneficial to harness the capacity of people to build for themselves.

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Problem-statement: Often residents of informal settlements do not have the capability to build all at once, or with the services of builders or contractors. Nor do they have the capability to buy existing homes.

Discussion: The simplest way to handle this challenge is a practice that goes on around the world every day: people build for themselves. There are many advantages to this practice. People know best what their own needs are, and know when they are able to devote the time and expense to construction. They also tend to produce more unique and creative results.

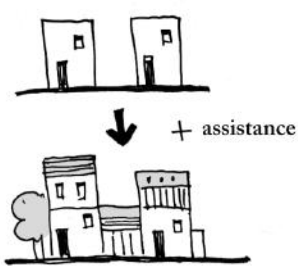
Of course, there are drawbacks too. One of the most important is simply that individual residents may not have the skill to produce a good quality building that is attractive, functional, or perhaps even safe. They may run afoul of many regulations designed to protect the life and safety of residents and visitors, as well as the interests of neighbors and the public in a supportive contribution to the public realm.

Yet there are many examples of self-build structures that are very beautiful and successful. What is needed is guidance, in the form of design resources, assistance, instruction, training and the like. This can be provided at the local level by those who today may be trying to stop self-build schemes: building inspectors, plans examiners, and other building authorities.

Self-build homes, businesses and public realm in Rose Town, Jamaica. Photos by Steve Mouzon.

Therefore:

Provide resources for people to self-build their own homes and other buildings incrementally, as they are able to afford the construction and have the time.



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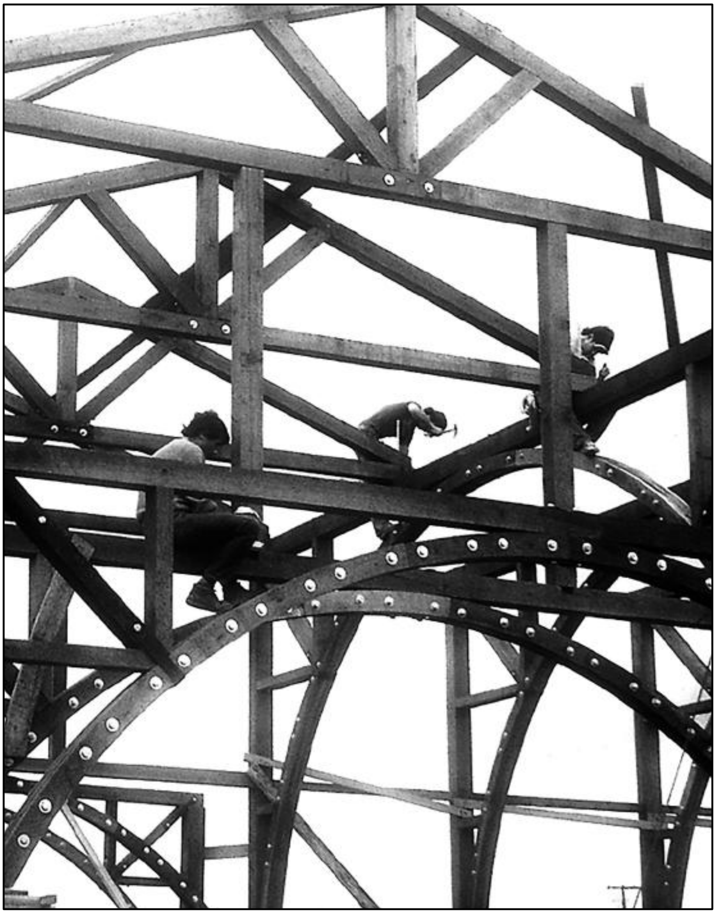
Provide for the skills needed in the NEIGHBORHOOD PLANNING CENTER (16.3), including pattern language resources and ENTITLEMENT STREAMLINING (16.2)…

[1] A further discussion of this topic is in Bredenoord, J., & van Lindert, P. (2010). Pro-poor housing policies: Rethinking the potential of assisted self-help housing. *Habitat International, 34*(3), 278-287.

15. CONSTRUCTION PATTERNS

Use the building process to enrich the result…

15.1. DESIGN-BUILD ADAPTATION



…In order to get the richest quality of BIOPHILIC URBANISM (2.4) and high quality buildings, assure that the construction process is be able to evolve and respond to context as it proceeds.

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Problem-statement: There is an important quality in buildings that respond to the evolutionary opportunities of their context during construction. Yet a design-build approach can introduce uncertainty, complexity and cost into the construction process.

Discussion: Some of the most beautiful and successful buildings in the world have been produced from a design-build process. The great medieval cathedrals are a case in point: often construction commenced with little more than a floorplan and an elevation of a single bay, drawn with ink on plaster. Many hundreds of shop drawings, models and mockups followed, and the beautiful results emerged out of that careful evolutionary process.

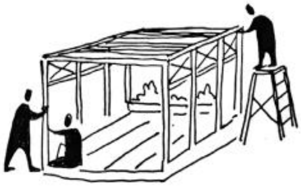
At the same time, design-build approaches can be expensive if they are not managed well. The critical issue is the governance of changes, in such a way that any change does not introduce additional cost and/or time, over what has been planned. This can be done if managed carefully.[1]

We are beginning to realize that there is a relationship between our most successful constructions — as measured by user health and satisfaction — and the processes of biology. In these biological systems, we learn a profound lesson from their process of growth with adaptation, where every step in development checks against the latent coherence of the emerging whole. In a "linear" or mechanistic process, by contrast, a structure is built strictly according to a blueprint. This makes it impossible to adjust a design by using feedback while it is being carried out. The result is that we lose a powerful capacity for adapting much more closely to human sensibilities. Yet as we can see from historical examples, this method has led to exquisite results. The challenge now is to make the extra effort to implement a procedure with greater feedback in shaping a better-quality built environment.

Therefore:

Incorporate a design-build methodology into construction processes. Use an interactive collaboration between designers,

builders and craftspeople, looking on site for emergent opportunities and combinations.



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Use COMMUNITY MOCKUPS (16.4) to judge the results of design changes in their actual contexts. . . .

[1] There is a great deal of literature on the design-build process — see for example Chan, A. P., Scott, D., & Lam, E. W. (2002). Framework of success criteria for design/build projects. *Journal of Management in Engineering, 18*(3), 120-128.

15.2. HUMAN-SCALE DETAIL

…Within the construction process of DESIGN-BUILD ADAPTATION (15.1), create elements that will reflect the scale of human beings.

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Problem-statement: People need to see their own human scale reflected throughout the environment. This is true at close distances and at long distances as well.

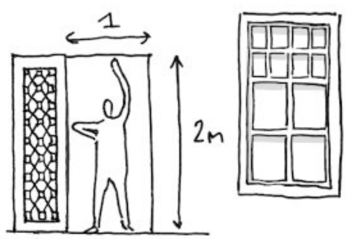
Discussion: At close distances, the incorporation of human-scale detail is obvious. We must simply create elements that are the size of human beings or smaller, and easily relatable by human beings: doorways, windows, door handles, and other details. At longer distances, the challenge is greater. It is necessary to use forms that are clearly human-scaled. For example, a window that is approximately 1 meter wide and 2 meters high (roughly 3 feet by 6 feet), extending up from the ground to upper levels of a building, will readily convey a human scale.

Even though the Hermitage in St Petersburg is a massive building, a human scale can be easily perceived within it, from the size of its roughly human-sized windows throughout.

The human scales range from 2 m down to ¼ mm, covering the height of a person to the thickness of an eyelash. Our evolution has programmed us to seek out those scales, and discern their interrelationships, in order to navigate and decide upon features in our environment. We subconsciously treat artificial structures in the same way, looking for the human scales at varying distances. If the built environment shows fractal scaling, just like the natural environment, it will include those human scales.[1] Then we feel more "at home" and can concentrate on perceiving attractions or threats directly. If the human range of scales is missing, however, then we cannot feel comfortable in our environments.

Therefore:

Create a generous number of elements that are human-scale, i.e. 1 meter by 2 meters or less. Make sure that many of these elements are structures that people are physically familiar with, e.g. roughly human-proportioned windows, hand-crafted patterns, etc.



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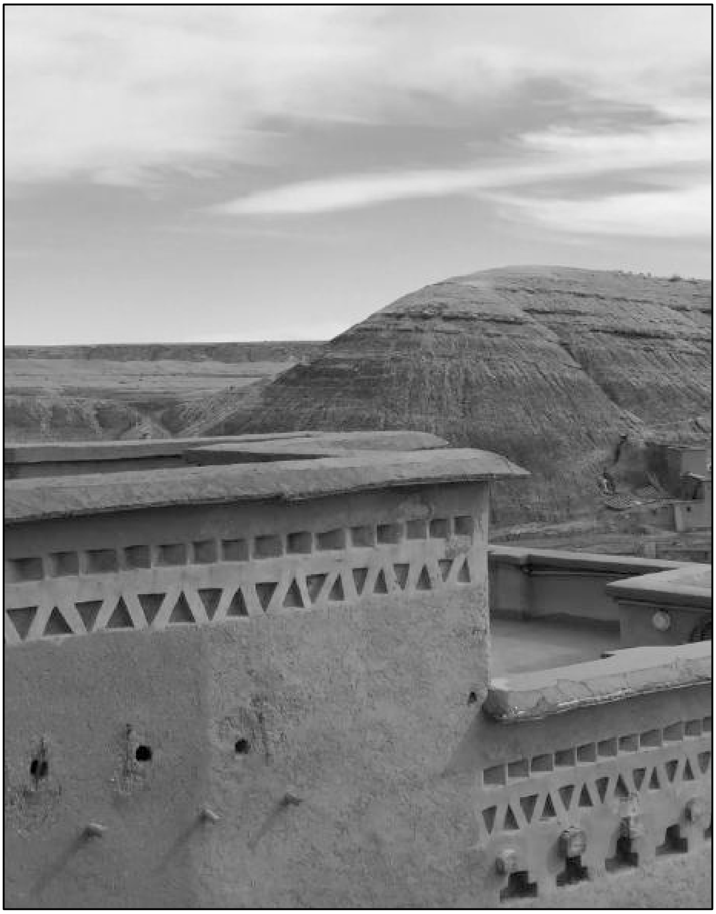
Use CONSTRUCTION ORNAMENT (15.3) and COMPLEX MATERIALS (15.4) to enrich the human scale. . . .

[1] See more at Salingaros, N. A. (1999). Architecture, Patterns, and Mathematics. *Nexus Network Journal, 1*(1-2), 75-86.

15.3. CONSTRUCTION ORNAMENT



…HUMAN-SCALE DETAIL (15.2) needs to be beautiful and well-connected to the rest of the design.

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Problem-statement: Many people today assume that ornament in construction is a superfluous decoration, like little bits of icing added gratuitously to a cake. This view fails to understand that ornament is an essential cognitive need.

Discussion: In fact, as the pattern ORNAMENT (APL 249) argues in the original *A Pattern Language* book, ornament is a kind of "glue" that binds the environment together, psychologically speaking (and in a sense, physically speaking too). It helps to connect the different regions of space, and draws our attention to them, much as we are drawn to the ornamentation of a pair of earrings heightening our sense of the shape of a person's head. There is a natural reason that people have had a desire to create ornaments for their constructions from time immemorial.

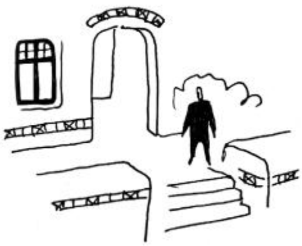
A widely influential doctrine was introduced in the early 20th century by the Austrian architect Adolf Loos, arguing that ornament was a "crime" in that it was a waste of resources. This was a terrible mistake, failing to understand the real value played by ornament in the human environment, and leading to an era of stripped-down, ugly buildings. Worse, in Loos' case it was borne of a racist doctrine, holding that Europeans were a superior race that, with their advanced mechanical technology, had outgrown the need for ornament.

This was a naive attitude at best — expressing a kind of "identity crisis" by early 20th century people. In effect they forced themselves to make a terrible decision, cutting themselves off from the past and its treasures — including the power of ornamentation. It was not understood until only recently that ornament, like biophilia, plays a key role in generating comfort and well-being in the built environment. Ornament employs the smallest articulated scales to generate organized complexity. We "feed visually" on this organized complexity, which makes it a necessary component of our environment, and not some aesthetic or philosophical ideal. This is why people all over the world and throughout history have consistently generated ornament.

Good ornament is coherent with all the intermediate and larger articulated scales, so we can perceive its "connectedness" to the large-scale structure. In turn, it helps us to feel the entire structure as internally more connected. We often don't even notice some ornament consciously, since it makes its positive psychological effect subconsciously. But we do notice poor examples that fail in connecting to other scales. Such applied decoration appears disconnected, or "pasted on," because it does not grow out of the structure of the whole, and express its connections.

Therefore:

Do not be afraid to use ornament, in a careful and disciplined way, and in a way that grows out of the construction. For example, allow rafter tails to express an ornamental repetition, or bricks to express an ornamental alternating pattern.



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Use unique local ornamentation to express ECONOMIES OF PLACE AND DIFFERENTIATION (17.4). Try out your ornament with a COMMUNITY MOCKUP (16.4), and adjust until it feels just right. . . .

[1] The original pattern ORNAMENT (APL 249) can be found in Alexander, C. et al., *A Pattern Language: Towns, Buildings, Construction.* London: Oxford University Press.

15.4. COMPLEX MATERIALS

…In creating a BIOPHILIC URBANISM (2.4), take care that the materials are not too simple and monolithic.

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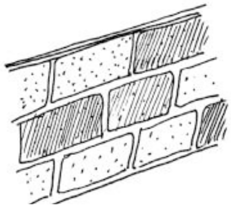
Problem-statement: Too many buildings are made with dull, simple expanses of metal and glass. Repeated endlessly, these materials are ugly.

Discussion: Often the most beautiful materials are also the most complex — that is, they have rich structural divisions within them that can be seen at human scales. Wood, stucco, brick, rusted metal, and other materials have this rich complexity. Perfectly smooth metal, glass, and painted wood panels do not.

In creating healing environments that show fractal scaling, the level smaller than ornament is defined by the microstructure of the materials. Natural materials such as wood and polished stone can reveal wonderful patterns from their former biological structure. Because of fractal scaling, we connect intimately to those smallest scales, from 1 cm down to less than 1 mm. This explains the universal love of expensive natural materials for construction, especially if used in indoor surfaces. But amorphous materials such as concrete, glass, and smooth metal show no organized substructure whatsoever. They don't satisfy the human craving for organized complexity on the smallest scales.[1] Formwork for concrete could be used towards this end, but good examples are very rare: much more common is a rather unattractive rough gray surface that doesn't satisfy our basic need for organized complexity.

Therefore:

Avoid large expanses of perfectly flat, smooth panels of metal and glass. Use complex materials that have subtle structural characteristics that can be perceived at human scales.



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Use materials like SOFT TILE AND BRICK (APL 248), and WARM COLORS (APL 250).

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[1] See Salingaros, N. A. (1999). Architecture, patterns, and mathematics. *Nexus Network Journal, 1*(1-2), 75-86.

SECTION III:
PATTERNS OF PROCESS

16. IMPLEMENTATION TOOL PATTERNS

Use tools to achieve successful results…

16.1. FORM-BASED CODE

…In order to make a WALKABLE STREETSCAPE (6.2) with STREET AS ROOM (8.1) and other cohesive elements, it is necessary to have a framework.

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Problem-statement: There is a need to guide the form of buildings so that the results are cohesive and supportive of the public realm. But too many zoning codes destroy the diversity and richness of the built environment.

Discussion: In the 20th century, a generation of zoning codes came into widespread use that segregated buildings into zones based upon their use. Residences of a certain kind were to go into one area, while other areas contained only residences of another kind, while other areas contained only retail, or workplaces, or civic districts, or other single uses. The result was that each area became a "monoculture" — a dead area, lacking diversity, interaction and dynamism.

To make matters worse, those zoning codes said little about how forms might work cohesively to support the public realm. They might require large setbacks from the street, or large lots — which only further damaged the vitality of the neighborhood. But these codes did not address the characteristics needed to define and support the public realm: enclosure, connection, visibility, pedestrian detail and so on. This practice is one of the key reasons that the public realm has disintegrated in too many cities.

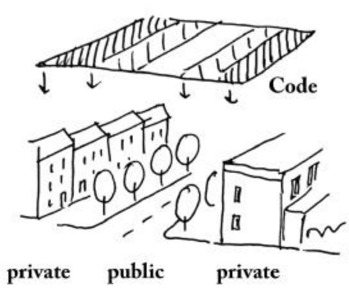
More recently, a form of urban code has become common that is based on form rather than use. Typically the code specifies the siting of buildings, their length of frontage, their volume, number and placement of doors and windows, and so on. Minimal regulations are placed on use, mainly to mitigate negative impacts from noise, odors and other problems.

Among the aspects often covered by a form-based code are siting, frontage coverage, fenestration, and building heights. Drawing by Steve Price.

At the same time, it is important to avoid a too-mechanical, "cookie-cutter" approach to codes. Some guidance is also needed to assure a locally distinctive, cohesive result without becoming too monotonous or restrictive. There are a number of design guidelines, preferred materials and details, and other elements that can be added to a form-based code. Indeed, the pattern language approach itself is a way of providing guidance and cohesion while maintaining the natural flexibility of language.

Therefore:

At either the project scale or neighborhood scale, develop a form-based code to guide the design and assure a cohesive support of the public realm. Regulate the form of buildings at the edges, and also provide flexible guidance on elements like materials, colors and details.



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Assure that the code takes into account local conditions and adaptations with ECONOMIES OF PLACE AND DIFFERENTIATION (17.4). . . .

[1] See Talen, E. (2009). Design by the rules: The historical underpinnings of form-based codes. *Journal of the American Planning Association*, 75(2), 144-160.

16.2. ENTITLEMENT STREAMLINING

…In order to complete URBAN REGENERATION (13.3) with DESIGN-BUILD ADAPTATION (15.1), a smooth process of entitlement is needed.

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Problem-statement: Too often the entitlement process for urban development is irrational, contradictory, confusing, uncertain — and too expensive.

Discussion: The contribution of the entitlement process — planning applications, design review, building permits, inspections and so on — to the increasing cost of development has been widely discussed. This regulatory framework is widely acknowledged to be essential to protect public health and welfare, by requiring better-quality development, and by frequently allowing public and judicial review of the design quality of projects.

Paradoxically, however, sometimes the result is lower quality, as builders and developers seek to cut corners and "game the system." Moreover, the uncertainty and delay introduced in to the process increases risk, which translates into increased cost — moving in exactly the wrong direction when it comes to the need for more affordable homes.

In response, some advocates of affordable housing have suggested that the answer is to force projects through over the objections of local residents. But residents have a stake in the quality of their public realm, and in how adjacent private development impacts their quality of life. In most cities, they are granted the right to participate in the "co-production" of their neighborhood and its public realm (see CO-PRODUCTION, 12.2). Moreover, a constructive, "win-win" approach between residents and developers can actually result in better projects — more popular with neighbors, buyers and renters, and more financially successful for the owners.

This leaves the problem of the jurisdictions, whose bureaucratic processes are often a bigger problem. One of the most common problems is regulatory mis-alignment, meaning that procedures in one department or jurisdiction are in conflict with those in another.

A more "agile" strategy would be to find already successful types and patterns that meet the regulatory standards, and are considered compatible and even desirable by the stakeholders. In process, the jurisdictions and stakeholders (including potential developers) would collaborate to identify essentially pre-entitled elements, models, types, and even entire plans (say, for a particularly popular kind of residence or shop building). These pre-entitled structures could still be customized with unique elements — see ECONOMIES OF PLACE AND DIFFERENTIATION (17.4) — but their essential patterns could be pre-accepted (even as part of a local pattern language just for that neighborhood).

In this way, the problem of residents objecting, and being stigmatized as NIMBYs — whose default position is "Not In My Back Yard" — can give way to residents who support QUIMBY — "Quality In My Back Yard." They would then be contributing to the positive growth of the neighborhood, instead of being able only to resist (perhaps in vain) its degradation.

Therefore:

Set up a process of entitlement streamlining, involving the stakeholders of each neighborhood and the members of the various bureaus who can help to simplify and streamline the process. After prototype design elements and plans are identified, work to review and pre-approve them, so that applicants can greatly reduce time — in some cases pulling permits over the counter.

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Use entitlement streamlining as part of the NEIGHBORHOOD PLANNING CENTER (16.3) and its work. Visualize the structures that are candidates for pre-entitlement with COMMUNITY MOCK-UP (16.4) and AUGMENTED REALITY DESIGN (20.3) tools. . . .

[1] See Pamela Blais' description of the "perverse" outcomes of these regulatory systems, in Blais, P. (2011). *Perverse Cities: Hidden subsidies, wonky policy, and urban sprawl.* Vancouver: UBC Press.

16.3. NEIGHBORHOOD PLANNING CENTER

…In order to accomplish neighborhood-scale improvements in SLUM UPGRADE (13.1), SPRAWL RETROFIT (13.2), URBAN REGENERATION (13.3) and URBAN CONSOLIDATION (13.4), it is necessary to work closely with residents, who will act as co-developers in almost all cases. An institutional framework is needed.

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Problem-statement: Many people participate in small-scale development at the neighborhood scale, in effect "co-producing" the city. They need neighborhood-scale resources to help them.

Discussion: Homeowners and business owners who are engaged in development of their properties face a bewildering environment of obscure and often contradictory requirements: technical demands for rebuilding based upon highly local conditions; financial requirements of insurance companies, mortgage lenders and government agencies (often in conflict); and planning and permitting requirements that present multiple options and multiple potential problems.

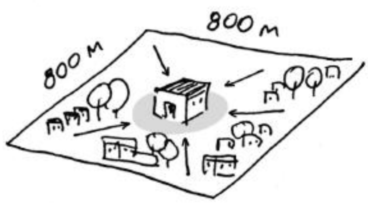
The neighborhood planning center is a way to bring resources to where they are needed — the neighborhood scale. The centers are places where informal discussion and peer-to-peer exchange of information can take place — both physically, and through a web-based component. They are also venues for periodic community meetings on timely topics of city-wide and local planning issues. No less importantly, they are places for the efficient distribution of knowledge and expertise on topics like construction systems, historic preservation, green building and other topics.[1]

The centers also give residents the opportunity to participate in planning of their own neighborhoods, and development of planning regulations such as zoning, coding and enforcement provisions. The residents can also develop versions of their own pattern language (both individually and as a neighborhood) to help to coordinate the growth of their neighborhood in a beautiful and diverse way.

Such a center goes to the heart of subsidiary self-governance, which has been unfortunately undermined by an "age of experts." In traditional societies the world over, neighbors made (and still make) collective decisions about the shape of their environment and the governance issues posed there. With the coming of industrialization, this authority increasingly passed into the hands of governments, which (as history shows) often made catastrophic planning mistakes. Today we are struggling to restore a healthy balance between local and central decision-making. All over the world, this process is newly emerging, sometimes called "peer-to-peer urbanism".

Therefore:

Create a series of neighborhood planning centers, one for each walkable neighborhood area (roughly 800 x 800 meters or ½ mile x ½ mile).



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Provide digital resources for the centers, including AUGMENTED REALITY DESIGN (20.3) tools and CITIZEN DATA (20.4) tools, including community wikis and other resources tools. . . .

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[1] A neighborhood planning center scheme was proposed for New Orleans by our team at Sustasis Foundation and Sustasis Press, with the participation of Christopher Alexander, Ward Cunningham and others. A limited version of the scheme was implemented by the Neighborhoods Partnership Network. See Mehaffy, M. et al. (2007), *Neighborhood Renaissance Centers: Information and Resources Where They're Needed For Rebuilding After Hurricane Katrina.* Portland OR: Sustasis Foundation. Available on the Web at Sustasis.org/NRCs.pdf.

16.4. COMMUNITY MOCKUP

…In making urban changes to the WALKABLE STREETSCAPE (6.2) or other features, it is helpful to be able to do temporary structures that help to mock up the results.

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Problem-statement: How can changes to the neighborhood design be tested and accepted by stakeholders before commitments are made and significant expenditures are committed?

Discussion: An approach that has proved successful is to create mockups of the changes that are proposed. These can be done with large stakes, flags, styrofoam panels, colored string stretched on the ground, or temporary paint on the surface of pavement areas.

One example is known as the Better Block project. Where changes are proposed to the streetscape to enhance pedestrian quality, proponents come in and make temporary and reversible changes, using paint, planters, seating, and other temporary changes. These can then be viewed and assessed — often with enthusiastic results, and commitment to more permanent changes.

This is more than just a tactical way to persuade stakeholders of the benefits of a proposed design — though it is that too. It is actually a sophisticated method of collective intelligence in design. The results of rapid trial and error in a community mockup can lead the way to the most adaptive new structures that could be erected, far better than any professional design carried out on a remote computer screen. Designs checked and adjusted on site by such simple methods will work best in actual use after they are built, because an enormous number of factors have already been tested.[1]

A related approach is to use augmented reality to create images that are visible on smartphones and other GPS-sensitive devices — see AUGMENTED REALITY DESIGN (20.3). In the same way, different design ideas can be generated and tested very quickly, allowing a group of stakeholders to view them in real time.

Community residents create a mockup of streetscape improvements in Kansas City.

Therefore:

Use community mockups to simulate the changes that are proposed, using temporary materials such as stakes, fabric, washable paint, and movable elements, or using augmented-reality technology.

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Use AUGMENTED REALITY DESIGN (20.3) tools to assist residents with visualization and collaboration in developing design ideas. . . .

[1] An example of this process in practice is given in Radywyl, N., & Biggs, C. (2013). Reclaiming the commons for urban transformation. *Journal of Cleaner Production*, 50, 159-170.

17. PROJECT ECONOMICS PATTERNS

Create flows of money that support urban quality…

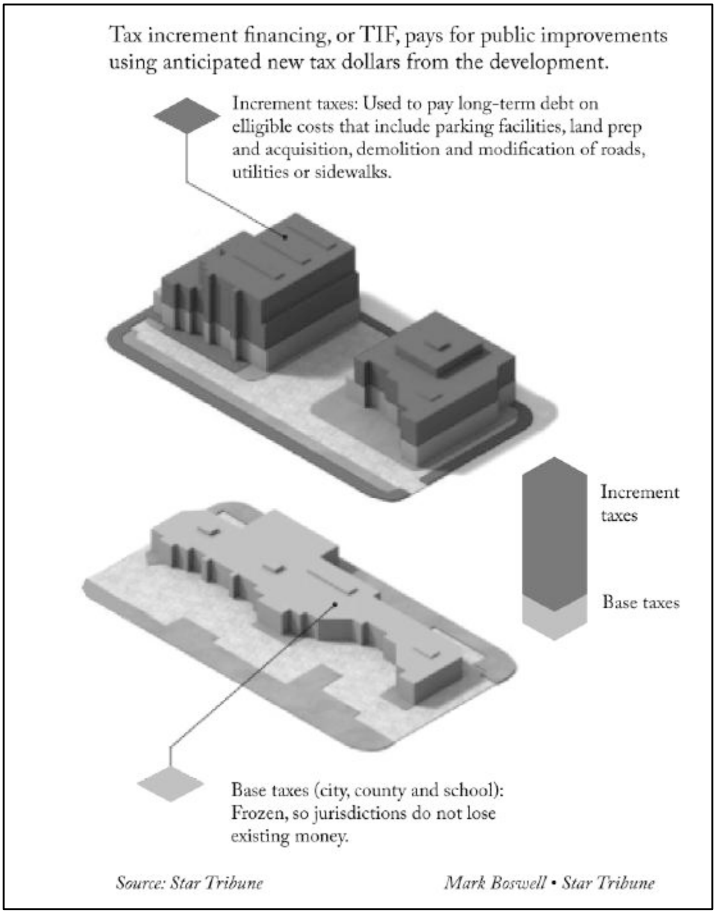
17.1. Tax-Increment Financing

17.2. Land Value Capture

17.3. Externality Valuation

17.4. Economies of Place and Differentiation

17.1. TAX-INCREMENT FINANCING



…Redevelopment and new development projects like URBAN REGENERATION (13.3) and SPRAWL RETROFIT (13.2) need sources of revenue.

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Problem-statement: How can the benefits of future improvements be transmitted financially to the present day, so that they are economically viable in the period before they generate profit?

Discussion: One of the most common mechanisms to accomplish this goal is known as tax increment finance. In essence the government entity with taxing power recognizes that the improvements will generate an increment of increased taxes (through sales tax, income tax, property tax or other means) and this increased revenue can be used to service a bond or pay back a revenue expenditure to the taxpayers.

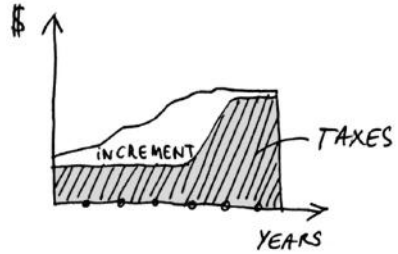
Care must be taken in tax increment finance projects to avoid commingling the public sector with its interests and priorities, with the private sector with its own distinct interests and priorities. This is best done by focusing expenditures on public improvements, including utilities, transportation infrastructure, and especially, public space improvements.[1]

We also have to be careful in how we allocate money raised by such taxes. Spending money optimally has to be done using a "fractal cost distribution" — many small budgets for small projects, a few large budgets for large projects, and a moderate number of budgets for medium projects. When each project competes with the others for funding, it is easy to concentrate on the largest projects, because those need the most money. But this top-heavy mindset too often ignores the intermediate and small-scale projects. A systemic imbalance towards the largest scale will shape the built environment in undesirable ways, and this bias can be overcome by explicitly supporting the more numerous smaller funding parcels.

Therefore:

Use tax increment finance to fund a project early in its life, before it has generated revenue. Take care that the risk of financial failure is mitigated with private forms of insurance, rather than public financial risk. Make sure that the funding priorities are

not skewed towards the largest projects, and are targeted to a mix of small and medium projects as well.



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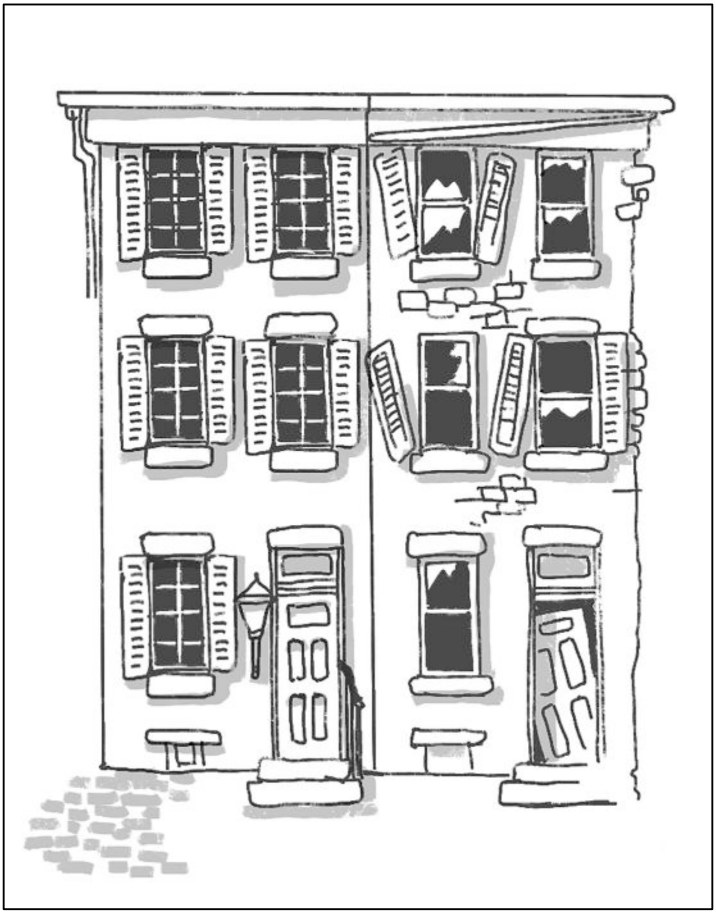
Use tax increment finance carefully with LAND VALUE CAPTURE (17.2), since they can operate at cross purposes. For example, a dependence on property value tax to service debt of tax increment finance can make it difficult to implement land value tax. Therefore, it is better to rely on other streams of revenue than property tax to service tax increment finance. . . .

[1] For more see e.g. Johnson, C. L., & Kriz, K. A. (Eds.). (2019). *Tax Increment Financing and Economic Development: Uses, structures, and impact.* Albany NY: SUNY Press.

17.2. LAND VALUE CAPTURE



…In creating funding mechanisms for the PUBLIC SPACE SYSTEM (2.3), and accomplishing the other important goals of URBAN REGENERATION (13.3) and other improvements, it is necessary to reform the taxation system, among other systemic reforms.

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Problem-statement: Land and other resources represent shared assets within our commonwealth. We need to maximize their efficient use and productivity by capturing value from their use, not by capturing value gained from the creativity with which they are put to use.

Discussion: There are two separate but related ideas in the notion of land value capture.

One is the idea that at least some of the growth in value of improvements on land needs to be captured so that it can be redirected to public benefit, including the benefit to the public of the improvement itself. For example, a private shop offering services to the public might require public infrastructure before it can be developed. In turn, the private business can pay tax on the land to help to pay back the public debt on the infrastructure.

The other idea is that land itself is a "commons" — a shared resource — that is limited, and the community has an interest in maximizing its capacity to benefit the community economically and culturally. Therefore, we ought to reward those who use such resources sparingly and creatively, over those who use them wastefully.

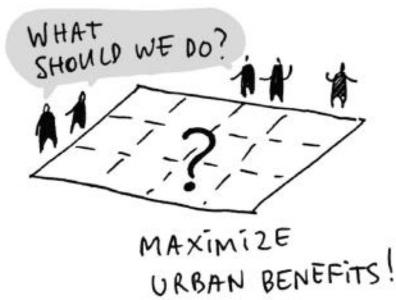
Both ideas incorporate the tool of land value taxation (among other strategies) to focus on the taxation of the resource, not its creative improvements, as a way of providing relative reward for the efficient use of resources.

Unfortunately, too often the opposite approach is taken, and taxation is made on "improvements" with only a low residual taxation on land (if any). That creates a disincentive to use land and other resources efficiently.

The first major proponent of land value tax was the 19th century economist Henry George. In his landmark book *Progress and Poverty* (1879), he argued that economic rent of land was a more desirable source of tax revenue, more able to incentivize so-called "progressive" goals. (This and related work inspired the Progressive movement of the late 19th and early 20th Centuries.) The book also significantly influenced land taxation policy in the United States and other countries, including Denmark, where 'grundskyld' (Ground Duty) became a major component of its taxation. The principle that natural resource rents should be captured by society is now often known as Georgism.[1]

Therefore:

Implement a land-value tax, carefully coordinated with other taxes to create a maximum incentive to conserve land and other resources, and to maximize urban benefits per unit of urban land.



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Use land value tax to fund a NEIGHBORHOOD PLANNING CENTER (16.3) and other community resources for better-quality urban development. Create exceptions or rebates for affordable housing projects, and projects that utilize the COMMUNITY LAND TRUST (19.2). . . .

[1] There is a great deal of research literature available on land value capture mechanisms, including land value taxation. See for example Batt, H. W. (2001). Value capture as a policy tool in transportation economics: an exploration in public finance in the tradition of Henry George. *American Journal of Economics and Sociology, 60*(1), 195-228.

17.3. EXTERNALITY VALUATION

…In promoting a healthy POLYCENTRIC REGION (1.1) with healthy PUBLIC SPACE SYSTEMS (2.3), it is necessary to create healthy financial feedback systems.

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Problem-statement: If we do not learn to value "externalities" — costs and benefits that are not normally included in economic transactions — we cannot have a sustainable future.

Discussion: One of the most important lines in Jane Jacobs' groundbreaking *The Death and Life of Great American Cities* — and also one of its least noted — was this one:

> *"In creating city success, we human beings have created marvels, but we left out feedback. What can we do with cities to make up for this omission?"* [1]

Jacobs was referring specifically to feedback mechanisms to create more geographic diversity, and avoid over-concentration and "the self-destruction of diversity" — as discussed for example in the pattern URBAN REGENERATION (13.3). But in a wider sense, Jacobs had her finger on a central problem of all economic processes. A given transaction will quite possibly include impacts in the future, or felt by others today, that are not reflected in the transaction itself. A new suburb might damage the water quality of the surrounding ecosystem, or a new town center might improve the walkability, exercise and quality of life of residents. The former case is an example of a "negative externality" and the latter of a "positive externality."

Of course, it is difficult to know what these externalities are in advance, or how they should be valued in the simple scale of a single currency. But governments and companies already do try to value externalities, when governments impose taxes (or use TAX-INCREMENT FINANCING, 17.1) and when companies bring externality costs (like, say, lost employee time) into transactions through contractual agreements (say, requiring payments for the lost time).

We need to do this kind of externality valuation more explicitly, so that we can identify future costs and benefits, and so that we can incentivize and disincentivize the transactions today that will most likely bring them about. This is an imprecise process. But many imprecise processes are made more precise through the pooling of transactions, and through the phenomenon known as "the wisdom of crowds."

Various mechanisms have been developed to take advantage of these dynamics. For example, so-called "Tradable Energy Quotas" function as a way to reduce energy use and greenhouse gas emissions (a major negative externality generated by many energy systems). In effect this is a way of valuing the negative future externality in the present as a cost to be reduced by traders. TAX-INCREMENT FINANCING (17.1) is a way of valuing the positive externality of a new development and redirecting it as an incentive to finance the development. Other mechanisms and tools are in development along similar lines.

Therefore:

Work to create mechanisms that provide externality valuation for both positive and negative impacts.

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Enhance ECONOMIES OF PLACE AND DIFFERENTIATION (17.4) … Use taxation mechanisms where needed, including SPECULATION TAX (19.4), but also other mechanisms of value transfer such as TAX-INCREMENT FINANCING (17.1). . . .

[1] Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Random House.

17.4. ECONOMIES OF PLACE AND DIFFERENTIATION

…In CO-PRODUCTION (12.2) and ENTITLEMENT STREAMLINING (16.2), it is important to reward locally well-adapted and differentiated projects.

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Problem-statement: Our contemporary development system is very good at producing economies of *scale* and *standardization*. But it is deficient at producing economies of *place* and *differentiation*. In a healthy system, all four are needed in balance.

Discussion: Economies of scale (very large structures produced more efficiently) and economies of standardization (identical structures produced with automated processes) are crowning achievements of human societies in our time. But they also threaten disaster, by encouraging the runaway production of poorly adapted, undifferentiated "throwaway" structures.

By contrast, living systems maintain a balance between these four economies. They do gain economies from standardized structures, including genetic processes (producing many billions of seeds for example). They also gain economies from creating very large-scale structures, such as the enormous diameter of some trees allowing them to grow very tall. But living systems also gain from economies of place, creating powerful networks of exchange within local ecologies. They also gain from economies of differentiation, allowing better diversification and adaptation to fit changing conditions.

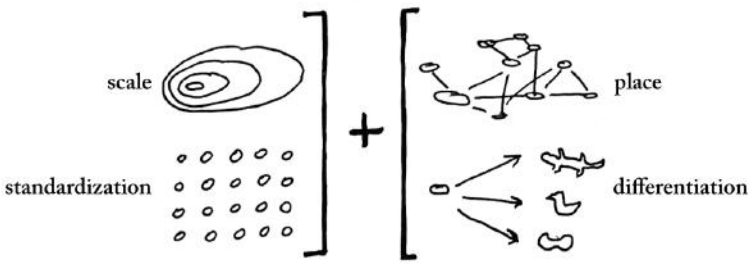
We need the same capacities in our development systems, and in their underlying economic systems. We cannot continue to treat human environments as crude machines made of standardized parts, scaled large to achieve affordable price. It is producing a poorly-differentiated, poorly-adapted environment, and an environment that is increasingly non-resilient and unsustainable.

In practice, of course, this goal is very difficult to achieve. We are "locked in" to our current "operating system for growth," and we find it very difficult to make changes to its elements that so heavily reward economies of scale and standardization, and penalize economies of place and differentiation. These include existing zoning and building codes; financial instruments and incentives; engineering standards; taxation and property laws; planning and design models; and all the other sub-systems.

We are a little like passengers on a very complex aircraft, who recognize that we must overhaul it in mid-flight. How can we do so without crashing? Luckily, history provides good models of these kinds of economic and technological transitions. They are not overnight changes, but slow, piecemeal reforms, replacing one after another of the elements of the system: zoning codes with FORM-BASED CODES (16.1); taxation on improvements with LAND VALUE CAPTURE (17.2); rigidly master-planned projects with DESIGN-BUILD ADAPTATION (15.1); and of course, so many of the other deficient planning models that exist today, replaced with the models found in the research for this book.[1]

Therefore:

Wherever possible, and at whatever scale possible, make changes to your local "operating system for growth" to embrace economies of place and differentiation *as well as* scale and standardization. Slowly change out the systems that rely too much on the latter: the codes, laws, standards, models and other elements that are taking us on an unsustainable path.



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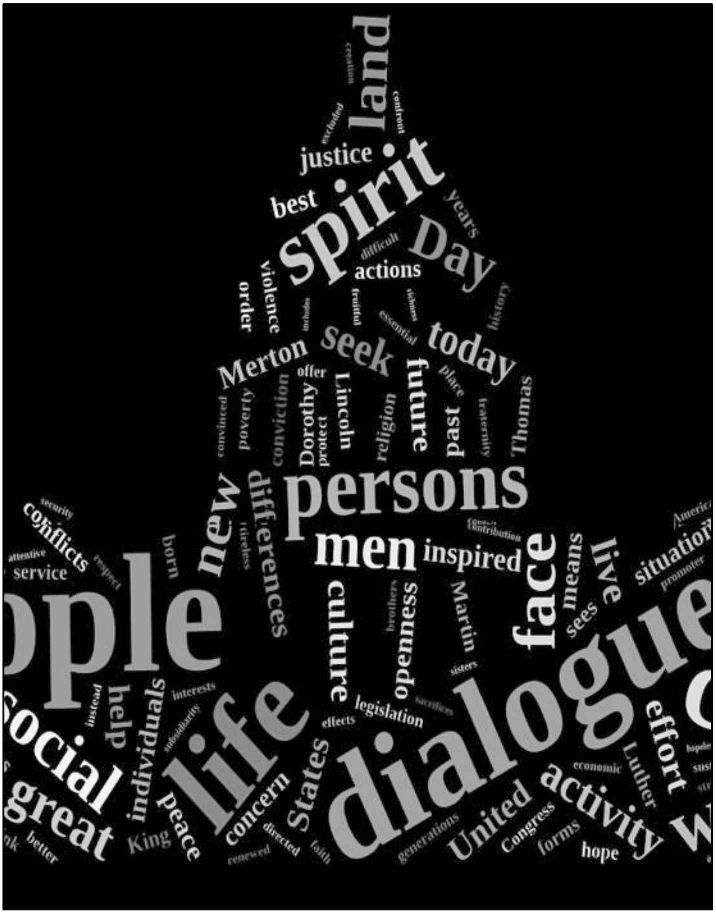
Use the many economic tools that are proliferating, such as the COMMUNITY LAND TRUST (19.2) and the SPECULATION TAX (19.4). . . .

[1] A further discussion of this pattern can be found in Mehaffy, M. and Salingaros, N.A. (2017), *Design for a Living Planet,* pp. 13, 56-58. Portland: Sustasis Press.

18. PLACE GOVERNANCE PATTERNS

Processes for making and managing places…

18.1. SUBSIDIARITY



… In developing urban projects, it is important to keep the scale appropriate to the project, and as local and distributed as possible — for example in the NEIGHBORHOOD PLANNING CENTER (16.3), and in applying ECONOMIES OF PLACE AND DIFFERENTIATION (17.4).

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Problem-statement: The best-quality adaptive urbanism occurs at the most locally distributed scale possible.

Discussion: We know from the dynamics of highly-adapted complex systems that they often require adaptive actions at small scales, often at the smallest scale possible. In the political realm, this same idea is known as subsidiarity.

The Oxford English Dictionary defines subsidiarity as "(in politics) the principle that a central authority should have a subsidiary function, performing only those tasks which cannot be performed at a more local level."[1] Wikipedia describes "a principle of social organization that holds that social and political issues should be dealt with at the most immediate (or local) level that is consistent with their resolution."[2] The goal is therefore the decentralization of problem-solving to the most distributed scale that is effective. The concept has been developed within and applied to a number of institutions including the European Union, and is stated as a goal of the New Urban Agenda.

What is at stake is not just a working principle of political decentralization, but the ability to solve problems in the most effective way possible. There are indeed times when this requires a centralized response — for example, in creating large-scale infrastructure systems. But very often, a far more powerful approach is to distribute the problem-solving among many decentralized agents within a "complex adaptive system." In the case of urban systems, those agents are the various smaller-scale institutions and individuals that carry out so much of the actual creative work of building settlements.

This is not, however, a prescription for a solely *laissez-faire* approach. On the contrary, the role of both the more centralized and the more decentralized units is to work together to establish and maintain cooperative governance structures (see POLYCENTRIC GOVERNANCE, 18.2).

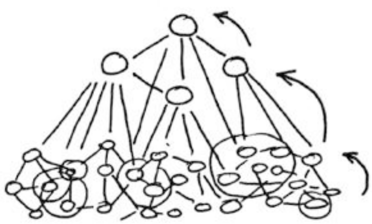
This process is dynamic, sometimes messy, but at the same time essential for optimum problem-solving and adaptive quality.

This approach must also be mindful of the pursuit of justice in human affairs. Subsidiarity must not be a license to deprive people of a just opportunity for access to resources and quality of life. In such a case, by definition, the resolution of the injustice must occur on a more centralized scale.

Finally, it is critical to provide mechanisms for monitoring at the smallest scales, to ensure that they actually produce results — not in order to suppress local actions "from above", but instead to provide resources as needed to improve results, using POLYCENTRIC GOVERNANCE (18.2).

Therefore:

Do not centralize decision-making and problem-solving too much in cities and towns — but do not decentralize them too much either. Instead, aim for the distribution of tasks to the smallest possible scale that will be effective in resolving them. Refine and adjust the scales based on results.



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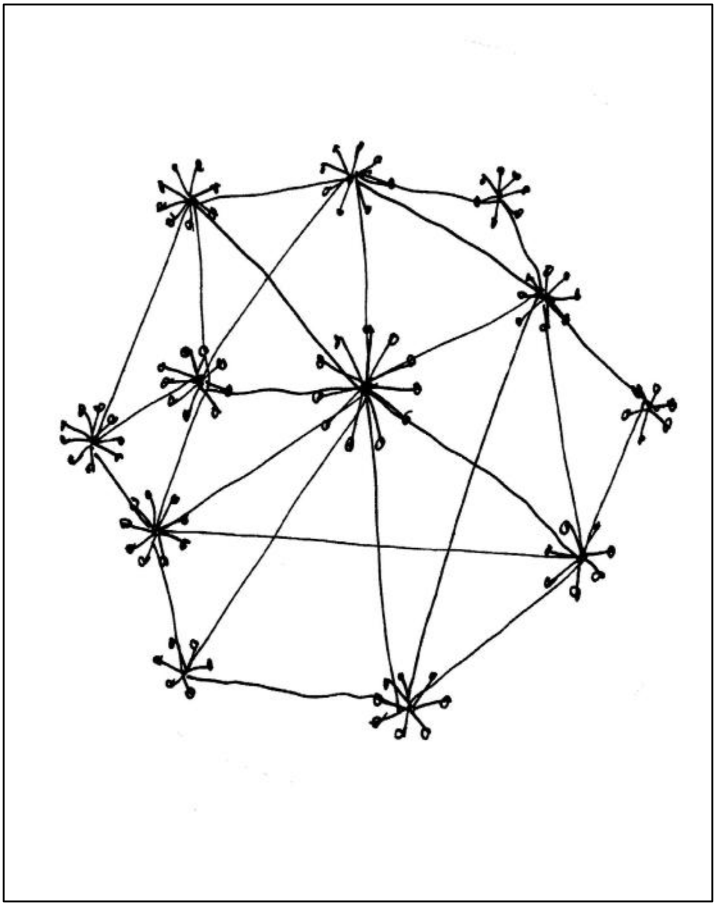
Structure subsidiary institutions according to POLYCENTRIC GOVERNANCE (18.2). Use PUBLIC-PRIVATE PLACE MANAGEMENT (18.3) carefully, without allowing local problem-solving to become too centralized within either public or private entities. . . .

[1] See https://en.oxforddictionaries.com/definition/subsidiarity.

[2] See https://en.wikipedia.org/wiki/Subsidiarity

18.2. POLYCENTRIC GOVERNANCE



…The governance of POLYCENTRIC REGIONS (1.1) and all of their components also needs a corresponding polycentric (many-centered) structure…

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Problem-statement: Most of the problems of cities and towns are embedded within inter-connected networks of partly overlapping sub-systems. To be effective, the governance systems of cities and towns need a similar structure.

Discussion: It is crucial for each unit of governance to see itself as embedded within a larger cooperative system which is partly formal, and partly informal. The business of governance of public spaces is thus a matter of continuously negotiating agreements, identifying and resolving problems, working through conflicts (including with other units of governance) and promoting the best interest of the public realm as much as is possible within the constraints of the moment. This is the nature of "polycentric governance."

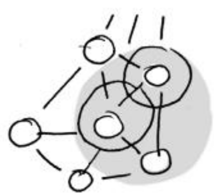
The idea of polycentric governance was developed most thoroughly by the political economist Eleanor Ostrom[1], who described a series of partly overlapping institutions (including governments, businesses, NGOs and individuals) working within a cooperative structure defined by agreements and basic rules. The concept goes back at least to the work of Michael Polanyi, and, as discussed more recently by Aligicka and Tarko[2], is defined as "a social system of many decision centers having limited and autonomous prerogatives and operating under an overarching set of rules". These rules include formal laws, contractual agreements, and informal or even tacit agreements between the polycentric entities.

Consider for example a restaurant with a sidewalk café. The restaurant does not own the sidewalk area, and in fact may not even own its building. It may have a lease with the building owner, and a permit with the city authority controlling the sidewalk. At the same time, the city may have authority over the cleanliness of the restaurant, as well as the fire safety of the building and its owner. In addition, a business association may have less formal control over the kind of signage and street furniture allowed on the sidewalk café. Finally, restaurant staff may have informal control over people who use the seating area, with the right to ask non-customers to leave — even though the staff does not own the sidewalk, does not own the building, and may not own the restaurant! Many overlapping layers of formal and informal governance come together in a network of relationships.

It is important therefore to respect and support these multiple levels of governance. Too often, however, centralized institutions (especially governments) suppress polycentric governance networks, often because they are simply more difficult to manage. This tendency must be resisted, in order to tap the superior problem-solving power of self-organizing and distributed networks.

Therefore:

Structure the governance of place in your city, town or neighborhood as a series of many overlapping formal and informal institutions, a system of "polycentric governance." Various institutions will have formal control over specific defined parts of a structure, but many other institutions will have overlapping and informal controls. Work to cooperate with these various entities from your own position or, very often, multiple positions.



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Recognize and support the least structured forms of place governance, including INFORMAL STEWARDSHIP (18.4). Assure that PUBLIC-PRIVATE PLACE MANAGEMENT (18.3) is balanced, and does not serve the interest of private over public interests.

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[1] See Ostrom, E. (2010). Beyond markets and states: Polycentric governance of complex economic systems. *American Economic Review, 100*(3), 641-72.

[2] See Aligika, P. and Tarko, V. (2012). Polycentricity: From Polanyi to Ostrom, and Beyond. *Governance: An International Journal of Policy, Administration, and Institutions, 25*(2), April 2012 (pp. 237–262).

18.3. PUBLIC-PRIVATE PLACE MANAGEMENT

… A PUBLIC SPACE SYSTEM (2.3) must be cared for by a variety of entities, often including a mix of public and private institutions…

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Problem-statement: There are many advantages to involving private as well as public entities in the management of urban spaces, including the construction, improvement and ongoing care of public spaces. But there are important dangers too that must be avoided.

Discussion: A familiar vehicle for the co-management and/or co-development of public places is the public-private partnership. Often these partnerships include private structures as well, forming the ensemble of a neighborhood center or commercial district. At a smaller scale, private entities often become involved in managing the public spaces around their properties.

There are many advantages in engaging private businesses, non-profit institutions and individuals in these formal collaborations. They can often generate the financial and personnel resources needed, they often have expertise about how to address market dynamics, and — perhaps most important — they are often best situated at the more local and distributed scales of public spaces.

At the same time, there are considerable dangers in such an arrangement. Private entities have financial interests which might be in conflict with the interests of the public and its public realm. There may be a slow erosion of true public access in favor of only those members of the public who might become customers of the private entities, or who are perceived to be less "trouble" for the private entities — thereby excluding, say, young people, ethnic minorities, or others who should have access especially to the public realm (with all the normal responsibilities and conditions thereof). In some cases, the exclusion can be tacit or even unintended — perhaps as the result of exclusive symbols or characteristics that remind some of a painful past.[1] In addition, there are requirements in many places for "public accommodation" within private businesses open to the public, and this access must be safeguarded as well.

It should also be recognized that private entities can be allies in making public spaces more accessible to all — for example, by providing "eyes on the street" and other forms of INFORMAL STEWARDSHIP (18.4), thereby making them safer for women, children, and other groups.

It is therefore important to determine which entity is most appropriate to take responsibility of different aspects of place. For example, a win-win strategy may be to divide construction and upkeep so that larger scales are taken care of by public-sector institutions, whereas smaller scales are taken care of by more nimble and more local private entities.

Therefore:

Structure agreements carefully between public and private entities to provide for the development and management of urban spaces, especially public spaces. Provide ongoing public reviews and social surveys, to assure that groups are not being unduly excluded from the public realm. Do not let private entities usurp the proper access to and enjoyment of public spaces — but at the same time, use the distributed capabilities of private entities to improve urban space.

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Provide for INFORMAL STEWARDSHIP (18.4) of public spaces within a structure of POLYCENTRIC GOVERNANCE (18.2). . . .

[1] Our colleague Setha Low has written extensively about this challenge. See for example, Low, S. M. (2011). Claiming space for an engaged anthropology: Spatial inequality and social exclusion. *American Anthropologist, 113*(3), 389-407.

18.4. INFORMAL STEWARDSHIP

… Within POLYCENTRIC GOVERNANCE (18.2), and especially within PUBLIC-PRIVATE PLACE MANAGEMENT (18.3), provide for informal kinds of governance.

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Problem-statement: One of the most important forms of governance of urban spaces is often one of the least recognized: the informal stewardship of individuals and institutions located within the neighborhood.

Discussion: The urbanist Jane Jacobs famously described "eyes on the street" as a form of stewardship of the public realm[1]. Residents, business employees, owners, members of civic institutions, and even visitors, all provide an informal network of governance, able to sense and react to problems as they occur. These can include responses to control criminal behavior, prevention or repair of damage to public structures, and mutual support during natural events like storms. Positive stewardship acts can include small repairs, beautification projects, artwork, and other improvements.

Care must be taken, however, to ensure that these informal governance acts are themselves monitored to assure that the rights of others are not unduly infringed — for example, populations within the public realm who should not be made to feel unwelcome without cause.

Therefore:

Support the informal governance of urban space, and particularly the public realm of streets, squares and parks, by encouraging the informal stewardship of adjacent residents, businesses and civic institutions. Invite and encourage local stakeholders to participate in informal governance, providing resources as needed. But remind them also of the limits of their authority.

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Review and encourage informal stewardship of the neighborhood within the NEIGHBORHOOD PLANNING CENTER (16.3). . . .

[1] Jacobs also wrote about retail owners and employees providing numerous services within the neighborhood, for example by holding residents' keys for others to pick up later. See Jacobs, J. (1961). *The Death and Life of Great American Cities.* New York: Random House.

19. AFFORDABILITY PATTERNS

Build in affordability for all incomes…

19.1. Integrated Affordability
19.2. Community Land Trust
19.3. Multi-Family Infill
19.4. Speculation Tax

19.1. INTEGRATED AFFORDABILITY

…One way to maintain ECONOMIES OF PLACE AND DIFFERENTIATION (17.4) in balance is to avoid clustering affordable housing projects into gigantic "complexes".

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Problem-statement: Large, institutional "affordable housing" buildings — owned by governments or by non-profit companies — have a deeply problematic history. Rather than subsidizing entire buildings or complexes, it is often better to subsidize individual scattered units, or even the people themselves, and allow them to mix into different neighborhoods.

Discussion: The urban extension of Dorchester, UK, known as Poundbury (seen at the start of this pattern) currently maintains an impressive 35% of subsidized, permanently affordable housing — yet it is impossible to tell which unit is affordable and which is "market rate." Poundbury also offers remarkable diversity of incomes, including wealthy business owners and retirees, all living together with those requiring affordable homes. It supports 2,000 jobs in 80 businesses, meaning that many people have employment opportunities within walking distance of their homes.[1]

The practice of scattering affordable homes throughout a neighborhood is known as "pepper-potting," and it has several clear advantages. First, families requiring affordable homes are not stigmatized by having to live in an identifiable subsidized residence. Second, poverty is not concentrated, avoiding the problem known in the UK as the "sink estate" — an affordable complex where people tend to become trapped, lacking in opportunity. Third, as a result, objections by surrounding neighborhood stakeholders to affordable housing and its perceived impacts is likely to be vastly reduced or nonexistent. Fourth, it is easier to maintain a finer grain and greater variety of dwelling, including different sizes, types and locations to suit different people at different stages of life. This is also beneficial for the variety and complexity of the neighborhood fabric, which is not dominated by large monolithic "social-housing" buildings.

However, there are challenges to this model. First, there are diseconomies of scale in location that have to be managed with careful planning, and met with economies of scale in management procedures. For example, a single agency may "bundle" many units, and consolidate the servicing of the buildings, management, and other functions. Second, the units themselves need to be protected from speculative gains in price. If not, they may become unaffordable even to those with vouchers. There are a number of ways to create these affordability protections, including single agency ownership, a COMMUNITY LAND TRUST (19.2), a land covenant restricting sales price increases, and similar mechanisms.

In addition, of course, it is essential to remove barriers to affordability from the construction and permitting process itself, including ENTITLEMENT STREAMLINING (16.2), and other forms of cost reductions. It is also important to recognize the dynamics of property markets and the need for adequate housing supply, not focused only in the expensive cores but well-distributed across a POLYCENTRIC REGION (1.1).

Therefore:

When providing affordable housing, avoid single-income complexes. Instead, "pepper-pot" units throughout neighborhoods — either managed by non-profit agencies, or sold with controls over the value of the land. Also provide specific targeted subsidies to individuals as needed, and include mechanisms for housing cost reductions.

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Use the COMMUNITY LAND TRUST (19.2) and MULTI-FAMILY INFILL (19.3) to provide additional sites for affordable homes. . . .

[1] See https://duchyofcornwall.org/poundbury.html

19.2. COMMUNITY LAND TRUST

…When seeking to support informal growth patterns, or patterns of affordability, and seeking to apply principles of LAND VALUE CAPTURE (17.2), use legal instruments to protect land from excesses of market dynamics, gentrification and displacement.

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Problem-statement: One of the biggest drivers of housing cost is often land. This problem is especially acute in urban areas that offer the best opportunities for employment and cultural amenities. For this very reason, however, land for affordable housing often becomes unavailable, or too expensive.

Discussion: The community land trust is a mechanism that allows land to be set aside for housing, preserving a mix of more affordable housing.

One example is The Caño Martín Peña Community Land Trust in Barrio Santurce, a neighborhood of San Juan, Puerto Rico. (It is shown at the start of this pattern.) When market pressures to displace and redevelop their land became enormous, approximately 2,000 families in this poor neighborhood were invited to join a community land trust (CLT) of 80 hectares (200 acres). The CLT protected their homes from displacement, and other public and private programs brought utilities and other necessary upgrades.

Therefore:

When seeking to provide urban land for affordable housing, use the community land trust model where appropriate.

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Do not create giant monolithic "affordable" projects, but create neighborhoods of a mix of incomes with "pepper-potting," maintaining INTEGRATED AFFORDABILITY (19.1)…

[1] Examples are discussed in Meehan, J. (2014). Reinventing real estate: The community land trust as a social invention in affordable housing. *Journal of Applied Social Science, 8*(2), 113-133.

19.3. MULTI-FAMILY INFILL

…Following the goals of URBAN REGENERATION (13.3) and SPRAWL RETROFIT (13.2), provide places for additional residences at low impact.

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Problem-statement: One of the most effective ways of providing affordable housing units is to add units within existing lots, either by dividing existing houses, adding to them, or building free-standing accessory dwelling units. But there are many potential issues that must be addressed.

Discussion: The process of infilling existing neighborhoods and creating multiple units on individual lots is a time-honored strategy for the creation of affordable residences. Examples include widows who let out rooms to lodgers; single homes converted to multiple apartments; homes enlarged to create separate units; additional residences created over garages or as free-standing units at the rear; and multiple-unit buildings designed to be compatible with an existing residential neighborhood.

However, there are challenges and dangers in taking this strategy of infill.[1] First, the ability to add units to a property might incentivize the demolition of a relatively affordable home that already exists, and replace it with even more expensive homes, with only a negligible gain of units. That would be moving away from affordability.

Second, there will of course be impacts from the additional residents, and these must be managed carefully. There may be more cars and traffic; there may be more noise; and there may be ugly or out-scale structures added to an existing residential fabric that serves to degrade it, from the perspective of the residents who live there.

These residents have the right to participate in the shaping of their public realm, and in assuring that impacts are mitigated. It is therefore imperative that they be brought in to a respectful collaborative process, to help to evaluate mitigation measures. Among them are transportation demand management programs to manage parking and traffic; ordinances to control noise and other problems; and careful planning and design review to assure that projects are a good fit with the neighborhood, and are seen as a "win-win" addition by residents. This is not an automatic "Yes In My Back Yard" approach — YIMBY — but rather, as we described previously, QUIMBY — "Quality In My Back Yard."

Therefore:

Provide for an orderly process of "gentle densification" with multi-family infill projects, involving the neighborhood, mitigating impacts, and assuring quality. On no account force neighbors to accept degradations to their quality of life and their shared public realm, without their respectful involvement.

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Use the NEIGHBORHOOD PLANNING CENTER (16.3) to encourage streamlined participation by the adjacent stakeholders. Use streamlining and pre-entitlement tools to lower costs and increase certainty and confidence by all stakeholders. . . .

[1] See Infranca, J. (2014). Housing changing households: Regulatory challenges for micro-units and accessory dwelling units. *Stanford Law & Policy Review, 25*, 53.

19.4. SPECULATION TAX

…In addition to MULTI-FAMILY INFILL (19.3) and other affordability tool patterns, taxation incentives and disincentives are needed,

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Problem-statement: Speculative investment in real estate can fuel financial bubbles, hurting an entire economy and everyone in it. But a healthy return on real estate investments is necessary to ensure a vibrant and livable city.

Discussion: Examples of real estate speculative bubbles and the damage they can cause are common throughout history, but perhaps nowhere more conspicuous than the 2008 global financial crisis. Lending and tax rules allowed (and helped to fuel) irrational increases in prices, decreasing affordability for neighboring residents — until the entire system collapsed, leaving many homes empty and many lives irreparably damaged.

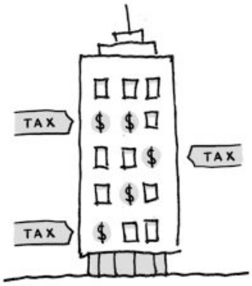
More recently many cities have seen surges in speculative investments in their urban cores, fueling a sharp rise in prices. Vancouver, British Columbia has seen such a rise, and has sought tools to dampen the speculation that fuels it. In many cases, foreign investors are seeking assets in order to "park" their capital, and they are often drawn to tall residential buildings — sometimes dubbed "safety deposit boxes in the sky." In other cases, investors seek to purchase rental properties and force renters to pay significantly more, thereby contributing to overall rises in rent prices.

To dampen these forms of speculation, both Vancouver and the province of British Columbia have introduced new forms of taxation. In British Columbia, empty residences owned by foreign nationals, and other "satellite families" based primarily in other countries and not paying local taxes, are subject to a "speculation and vacancy tax" of 2% of assessed value.[1] In addition, non-primary residences in Vancouver, British Columbia that sit empty for more than six months are charged an "empty homes tax" equal to 1% of their assessed value.[2] These taxes create a strong disincentive against "parking" and speculating on local real estate.

A tax of this kind must not be seen as a "silver bullet," but rather, part of a system of incentives and disincentives that reward positive "externalities" to promote the common good — like a more affordable housing market (see EXTERNALITY VALUATION, 17.3).

Therefore:

Change taxation policy to disincentivize speculative investments in real estate, particularly for empty units.



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Use this tool in conjunction with a suite of other tools and strategies. . . .

[1] See https://www2.gov.bc.ca/gov/content/taxes/property-taxes/speculation-and-vacancy-tax

[2] See https://vancouver.ca/home-property-development/empty-homes-tax.aspx

Image: Bobanny via Wikimedia Commons.

20. NEW TECHNOLOGY PATTERNS

Integrate new systems without damaging old ones…

20.1. SMART AV SYSTEM

…Within the POLYCENTRIC REGION (1.1), policies and designs are needed to plan for autonomous vehicles.

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Problem-statement: The future of autonomous vehicles is unclear. If they are widely adopted, they could be a boon to cities — in effect serving as driverless taxis that are more numerous, close-by and convenient. But they could also become nightmares for cities.

Discussion: The worst case scenario for AVs is that they are used as roving living rooms — roaming around the city, entering drive-through lanes at the whim of their occupants, adding enormously to congestion — which is of little concern to occupants, since the vehicles find their own way around impasses. In this scenario, the number of vehicles on the road would expand enormously, greatly adding to drive times and creating delays for those who do need to get to destinations quickly. This would be an example of the phenomenon of "induced demand" — the appeal of riding in a driverless AV would increase demand, requiring even more traffic infrastructure.

An opposite scenario is that these vehicles are used much more sparingly, more like carshares without the need to drive them — or even go to them. In this scenario, residents might well choose not to own a vehicle, since one would always be available close by, and there would be no need to park the vehicle. This could translate into a significant reduction in the number of vehicles on the road.

Which scenario will become the reality — or will it be something in between? This is the choice we have now, and the answer will depend on the mix of design and policy changes. For example, will we reduce the number of parking spaces, on the basis that fewer cars will require parking? How will that change the design of street sections, especially where parked cars are used as a buffer to protect pedestrians? Will we use AVs for larger groups and fixed routes — for example, multiple-destination shuttle buses and rapid transit vehicles? How will these pathways be accommodated? These and other issues must be addressed.[1]

Therefore:

Do not allow autonomous vehicles to be used as "roving living rooms" by occupants. Institute progressive congestion charges that make it increasingly expensive to remain in a vehicle for more than a reasonable amount of time (with a hardship exception for those who must travel long distances, or travel frequently). Instead, encourage AVs to be used as shared vehicles on a timeshare rental basis. Provide in addition for lower-cost, multiple-passenger AVs such as shuttle buses and fixed-route rapid transit vehicles. In every case, do not allow AVs to degrade the urban fabric, but employ them to protect and enhance existing environments.

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AVs can be used by RESPONSIVE TRANSPORTATION NETWORK COMPANIES (20.2). . . .

[1] Research on autonomous vehicles and their impacts on pedestrians and other modes is ongoing, and it is by no means clear yet that this technology will be reliable or helpful. See for example Millard-Ball, A. (2018). Pedestrians, autonomous vehicles, and cities. *Journal of Planning Education and Research, 38*(1), 6-12.

Image: Bram van Oost via Unsplash

20.2. RESPONSIVE TRANSPORTATION NETWORK COMPANY

…WALKABLE MULTI-MOBILITY (2.1) can benefit from including transportation network companies as well as other transportation choices.

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Problem-statement: Transportation network companies (TNCs) like Uber and Lyft have the capacity to be beneficial, since their digital capabilities are sophisticated and flexible. But these companies also have a number of important drawbacks. At worst they are simply ways to deregulate taxicab companies, and put many people out of work.

Discussion: We must remember that the precedent for transportation network companies (TNCs) has existed for many years, though often ignored in the developed world. A parallel, unregulated fleet of private part-time taxis and minivans, often called "pirates", functions throughout the world, most notably in developing countries. The fact that it exists reflects a clear market demand for this kind of service. Attempts by governments to prevent these illegal services from operating have been ineffective at best. Yet this phenomenon reveals that informal transport networks do tend to arise whenever there is a need for them. It is therefore better to plan with these informal forces in mind and to regulate the problems that may occur, rather than to insist on one rigid model of transportation.

One of the most important problems is that these companies are in competition with existing taxi companies, which often have fairer employee pay and benefits, and other superior employee rights. The local governments have an obligation to "level the playing field" and make certain that all employees are treated with minimum standards of fairness.

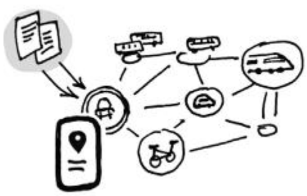
A further problem looms ahead as these and other companies pursue a path toward autonomous vehicles — meaning that many more drivers may be out of work. Of course, technology often displaces many people, and this is not a new problem. But it is one that requires careful management and transition, assuring that those displaced have other opportunities.

There is also some troubling evidence that TNCs might actually contribute to traffic congestion, since their drivers are eager to "prowl" certain areas in order to get customers. Because TNC services are also more convenient and less expensive, they may contribute to "induced demand" for automobile travel that might otherwise occur via other modes.[1]

Of particular importance is that the TNCs integrate into the regional transportation system, and have data that responds to the system's needs. For example, TNC services can be coordinated with existing fixed transit, and even supplement it with multiple-passenger AVs (not unlike today's shuttle vans). In addition, existing taxi companies might still employ driver-escorts to assist those who need special attention or assistance (for example, assisting the elderly or the infirm, or those with baggage). In such a system, TNCs could enhance, and not disrupt, existing transportation networks.[2]

Therefore:

Do not allow a free-for-all with transportation network companies. Instead, require them — through thoughtful regulation and incentives — to be responsive to the regional transportation system, and to offer a complementary choice of travel for those who need it.



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Integrate transportation network companies into the urban system using CITIZEN DATA (20.4). . . .

[1] See Erhardt, G. D., Roy, S., Cooper, D., Sana, B., Chen, M., & Castiglione, J. (2019). Do transportation network companies decrease or increase congestion?. *Science Advances, 5*(5), eaau2670.

[2] See for example Schaller, B. (2018). *The new automobility: Lyft, Uber and the future of American cities.* Washington, D.C.: Transportation Research Board.

20.3. AUGMENTED REALITY DESIGN

…When doing COMMUNITY MOCKUPS (16.4), or as part of a NEIGHBORHOOD PLANNING CENTER (16.3), provide digital tools that help residents to assess the character of proposed designs, and participate in their development.

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Problem-statement: It can be difficult for residents to visualize how a new design proposal will fit into their neighborhood.

Discussion: New augmented reality tools are increasingly being used in design projects.[1] Evolving tools can now provide the capability for anyone with a smartphone device to see a model of a new design as if it were in front of them, by looking at their smartphone (or VR headset if they have one) as if it were a window, with the new design superimposed on the existing scene. This makes it possible for stakeholders to visualize the form and approximate character of a proposed new structure, and even to participate in the design of the structure.

For project design teams, this technology offers a potent tool for public participation, and for gathering feedback and research on evolving design ideas. The technology can also reassure stakeholders that the project is producing a desirable result. Of course, it is crucial that the design team maintain the most honest possible photo-realistic representation of the design, and not falsify it with appealing characteristics that may not be present in the actual built project.

The coming design revolution could well make architecture far more adaptive to human sensibilities. Critics of architectural education condemn how it has focused for one century on making tiny cardboard models and judging aesthetics based on them. Practitioners interested in adaptation have long argued for re-introducing real-world experience into design. This could be done through full-scale mockups, as suggested in COMMUNITY MOCKUP (16.4). Now, with virtual reality methods finally reaching a high level of sophistication and low enough cost to be used by everyone, the situation is changing. Any individual can participate in modeling the sensory experience of a proposed design, which no longer depends upon "experts" imposing an unproven design top-down. We need no longer ignore the users' emotional and psychological reactions in order to focus exclusively on the designers' own aesthetic judgments.

Therefore:

Develop augmented reality tools so that they can simulate proposed designs for stakeholders.

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Use design with augmented reality in conjunction with CITIZEN DATA (20.4) projects. . . .

[1] See for example Nee, A. Y., Ong, S. K., Chryssolouris, G., & Mourtzis, D. (2012). Augmented reality applications in design and manufacturing. *CIRP Annals, 61*(2), 657-679.

20.4. CITIZEN DATA

…In SLUM UPGRADE (13.1) and URBAN REGENERATION (13.3), it is especially important that citizens have access to digital technology to be able to manage their own local issues.

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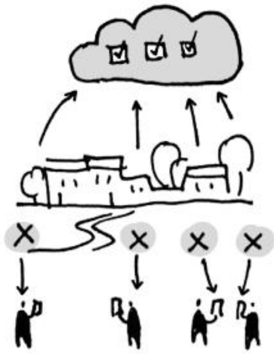
Problem-statement: Many urban problems are known only to the citizens who live there, and reporting is often cumbersome and ineffective.

Discussion: A new generation of citizen data is being used to gather information about neighborhood-scale issues and to identify resources that can be brought to bear to address these issues. They include relatively small-scale problems like potholes, graffiti, vandalism, garbage and the like. Citizens armed with a new generation of digital reporting tools can notify agencies, who are able to take this information in an efficient and aggregated form, and develop a response that is locally calibrated to be effective.[1] For example, a community worker can respond to a series of individual reports in sequence, avoiding the need to respond to each report individually (or more often, to simply ignore the reports).

At the same time, we must be aware of worrying trends that create an imperative need for vigilance. Data is being gathered by private entities, to be used (and abused) in surveillance and in manipulating consumers. Since this collection of big data on such a large scale is unprecedented, it is not yet clear how we can prevent it from becoming a tool for manipulation and even oppression. The endless possibilities of using such data towards a positive goal need to be protected from an equally possible abuse.

Therefore:

Use the new digital reporting technologies to respond to neighborhood-scale challenges where they occur, without the need for individual time-consuming and expensive responses by staff.



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Work with a local NEIGHBORHOOD PLANNING CENTER (16.3) to make citizen data available at the grass roots. . . .

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[1] There are a number of groups developing citizen data initiatives, including the Citizen Data Lab at the Amsterdam University of Applied Sciences, faculty of Digital Media and Creative Industries. See citizendatalab.org.

Image: Curtis MacNewton via Unsplash.

CASE STUDIES

A number of the patterns in this collection were common in cities prior to the mid-20th century — including many famous examples of growth and creativity, like 19th century New York. During the 20th century these older patterns were largely replaced, out of a belief that a modern, economically advanced civilization required new kinds of patterns. These patterns would be based on functional segregation and the accommodation of mechanized urbanism, and in particular, the dominance of the automobile. (See for example the famous Athens Charter of 1933.)

We have built our world around this more recent model of urbanization, and it has indeed been economically very successful in the short term. But it has also brought with it some alarmingly unsustainable trends, including the depletion of resources, the destruction of ecosystems, the emissions of toxic pollutants, and the accumulation of climate-altering greenhouse gases in the atmosphere. More subtly, it has brought profound social and economic impacts, many of them profoundly negative. They include changes to the patterns of interaction of people within cities, often with undesirable consequences.

A more recent era of science has raised our awareness of the nature of complex networks, including urban and economic networks. With that has come a recognition of the severe limitations, and often the profoundly negative impacts, of the over-simplified network patterns that were introduced in the 20th century. We can see the changes most clearly in street patterns, and comparisons between, say, fragmented cul-de-sac patterns of "modern" suburbs, and the tightly connected grid patterns of older city cores. We can also see the different impacts of varied kinds of networks in other realms too, like social interactions and economic exchanges.

When we over-simplify and over-regiment these networks, we constrain the processes that can happen there, often to the point of stifling their vitality. This was a point that *A Pattern Language* author Christopher Alexander made in another famous paper, "A City is Not a Tree" (1965). The "tree" of his title was an abstract model of network relationships, which was thought to be more sophisticated and "modern" — but as Alexander showed, this was not the case, particularly for cities. Urban networks, he said, required diversity of inter-connection and "overlap" to function optimally.

The structure to which he referred — which he called a "semi-lattice" — is today's familiar structure of the web-network, the basis of the Internet, social networking, peer-to-peer collaboration, and many other innovations. Though once they were thought to be "messy," disorderly and undesirable, these kinds of networks are now seen as richer and potentially more powerful. As Alexander put it in his paper:

> *It must be emphasized, lest the orderly mind shrink in horror from anything that is not clearly articulated and categorized in tree form, that the idea of overlap, ambiguity, multiplicity of aspect and the semi-lattice are not less orderly than the rigid tree, but more so. They represent a thicker, tougher, more subtle and more complex view of structure. (2015, p. 16)*

A brief perusal of this volume will reveal quite a few patterns that incorporate this overlap and diversity. WALKABLE MULTI-MOBILITY (2.1), PUBLIC SPACE SYSTEM (2.3), CAPILLARY PATHWAY (6.4), CIRCULATION NETWORK (10.2), LAYERED ZONES (10.3), and many other patterns, incorporate this new understanding of web-networks. Of course, while our understanding of them is relatively new, web-networks themselves are anything but new. They are ubiquitous in nature, and in human societies and cities — at least up to the "modern" age. A key part of the challenge of the future, then, is how we will build in again these more diverse kinds of web-networks, within our urban systems. That is very much a key theme of this book, and of pattern language methodology more broadly speaking. (This includes its further seminal development into wiki, leading to Extreme Programming, Agile, and other direct spinoffs.)

This discussion may seem abstract, and the evidence for the re-introduction of web-networks may seem lacking. Therefore, in this final section of the book, we look at several concrete examples. We will examine several "modern" cities that do incorporate many of these web-network patterns, or are beginning to do so. Far from hobbling their economic growth, this kind of web-network structure seems likely to promote their creativity, their resource efficiency, their dynamism, and indeed, their economic competitiveness in a changing world that increasingly thrives on innovative, diverse, livable places.

CHINA:
A National Shift Toward "Planning Cities for People"

Figure 1. China has been following the 20th century development model of the Congrès Internationaux d'Architecture Moderne, illustrated here by one of its most influential members, the architect Le Corbusier (above).

Like many countries around the world, China adopted many of the patterns of 20th century "modern" urban development, including superblocks, large undifferentiated buildings (often in large undifferentiated green spaces), and a dominant role for the automobile. Unfortunately, also like many other countries, China is experiencing enormous negative long-term consequences of this model, including loss of walkability, declining air quality, health impacts, social impacts, resource depletion and degradation, and loss of urban livability and quality of life.

Many people in China are deeply concerned, and are working to address the challenge. They include practitioners, activists and government officials, including many at the centers of government. In 2016, in fact, the State Council and the Communist Party Central Committee issued a decree changing the course of urbanization for the entire country. It featured pedestrian-friendly, narrower streets on smaller, more porous blocks, compact development around transit, preservation and regeneration of heritage, conservation of farmland, and other patterns also reflected in the New Urban Agenda. The next year, those patterns were codified in a planning manual for national use called *Emerald Cities*.

Many of those patterns were also reflected in the 1994 "Charter of the New Urbanism," a document shaped in part by the US architect and planner Peter Calthorpe. In fact, Calthorpe and his firm also wrote much of the *Emerald Cities* document.

As Calthorpe told Martin Pedersen, in an interview[1] for Archdaily.com in 2018:

> *The rapid growth [in China] has been phenomenal, but it is unsustainable. They're now looking for ways to slow that process down. Because they're developing so much land so quickly, they have a cookie cutter approach to urban design. This means superblocks, five hundred meters on the side, more than a quarter mile to the closest intersection…*

Figure 3. The revised plan of Chengdong in China, showing a much finer grid of streets, including an "urban network" of main streets, by Calthorpe | HDR.

Pedersen pointed out that this was the famous "towers in the park" model, developed by the enormously influential Congrès Internationaux d'Architecture Moderne, in a seminal 1933 document, the Venice Charter. Calthorpe noted:

> *This is a mistake we [in the United States] made, briefly, in public housing. We did high-rise towers in the park and super blocks, and we destroyed our urban grid. But it didn't become the ubiquitous pattern that upended us. The subdivision and suburban sprawl did that, not the superblock and towers in the park. So it's a different paradigm in China, equally as malignant as the subdivision and the mall, in terms of the environment and social well being and health. That said, they've developed these superblocks because they're quick and easy to bring to market. They can build streets on infrequent centers. Then they try to compensate by creating huge roads, so it's doubly bad for the pedestrian. You not only have a long way to get to an intersection, but once you're there it's a death-defying act to cross the street. And within these superblocks, they have single-use environments that are so large and alienating. There's no human-scale community implicit in this urban fabric. It's a deeply flawed environment that increases auto-dependence…*

Calthorpe points out that there is widespread support for an alternative model:

> *The idea is pretty simple. It's transit-oriented development. And the urban form is small blocks and small streets that are walkable and bikeable. It is a huge challenge to the status quo, what we're bringing, and yet the government on all levels is interested. They say, "This makes sense. The data lines up. We understand the rationale…" I've given speeches at all levels throughout China. Everyone gets it. They understand how deeply flawed what they're building is. In order to take the next step, they do pilot projects. They say, "OK, let's build a few of these walkable, mixed-use communities and see how they function. Then we can shift policy." They basically test drive ideas, and pick what works. We have six projects in construction throughout China. All of them are based on small blocks, with auto-free streets, dedicated to pedestrians, bikes, and transit.*

In 2011, the Energy Foundation China reported on the Calthorpe firm's work, in collaboration with other Chinese partners:[2]

> *"Every day authorities across China make hundreds of decisions about the course of urban development—mapping a new suburb, laying out a new road, or approving a developer's proposal for a residential complex.*

Taken together, what appear to be minor decisions in fact determine the blueprint of China's cities for decades and perhaps centuries to come.

"Increasingly, Chinese leaders at all levels are recognizing that given this blank slate, they can choose to do several things at once: improve mobility, reduce carbon emissions, boost economic activity, improve air quality, preserve arable land, and support a harmonious and prosperous society.

"One approach that is gaining traction is the "Planning Cities for People" set of design principles jointly created by the ClimateWorks Foundation, the Institute for Transportation and Development Policy, HDR | | Calthorpe, and the China Sustainable Energy Program (CSEP). These principles can be applied in almost any urban setting. When put into place, they combine international best practices with the best of China's urban traditions."

Figure 4. The regenerated neighborhood of Shikumen houses in the Xintiandi District of Shanghai, now a very popular shopping district. Photo by Raphael V via Flickr.

The Eight "Planning Cities for People" Principles are:

- Develop Neighborhoods that Promote Walking
- Prioritize Bicycle Networks
- Create Dense Networks of Streets and Paths
- Support High-Quality Transit

- Zone for Mixed-Use Neighborhoods
- Match Density to Transit Capacity
- Create Compact Regions with Short Commutes
- Increase Mobility by Regulating Parking and Road Use

These principles reflect many of the patterns in this book — for example, WALKABLE MULTI-MOBILITY (2.1); MOBILITY CORRIDOR (3.2); 400M THROUGH STREET NETWORK (1.4); POLYCENTRIC REGION (1.1); and others. They also reflect the language of the New Urban Agenda, as we described in the introduction. That document calls for

> *...the development of urban spatial frameworks, including urban planning and design instruments that support... appropriate compactness and density, polycentrism and mixed uses, through infill or planned urban extension strategies, as applicable, to trigger economies of scale and agglomeration, strengthen food system planning and enhance resource efficiency, urban resilience and environmental sustainability…*

And

> *...the provision of well-designed networks of safe, accessible, green and quality streets and other public spaces that are accessible to all and free from crime and violence, including sexual harassment and gender-based violence, considering the human scale, and measures that allow for the best possible commercial use of street-level floors, fostering both formal and informal local markets and commerce, as well as not-for-profit community initiatives, bringing people into public spaces and promoting walkability and cycling with the goal of improving health and well-being.*

It must be emphasized that these goals are not at odds with ending poverty and increasing prosperity and equitable economic development. On the contrary, the signatories pledge:

> *We commit ourselves to promoting safe, inclusive, accessible, green and quality public spaces as drivers of social and economic development, in order to sustainably leverage their potential to generate increased social and economic value, including property value, and to facilitate business and public and private investments and livelihood opportunities for all.*

Chinese officials, practitioners and citizens understand that there is an opportunity to shift their practices, to increase quality of life, and at the same time to serve as a leader for other countries. Recent projects have begun to reflect the transformation to a more fine-grained street network, more mixed use typologies, more human-scale places and "placemaking," and especially, more walkable multi-mobility. Projects have begun to build on intricate street patterns and heritage buildings, instead of sweeping them away, and to seek a more ecological form of development. Examples include Xintiandi district of Shanghai, composed of renovated traditional Shikumen stone houses renovated into an attractive shopping district, and Han Street in Wuhan, a new walkable "main street" along the Chu River, a new extension of Wuhan's Dadong River Ecological Water Network.

The case study of China certainly includes unique conditions that are not present in other parts of the world. The government has more control over the private sector than other national governments. The country is rapidly developing its technological capacity, including electrification (it recently passed a national law requiring electrification of all of its ubiquitous scooters). China's sheer size — with almost 1.4 billion people on roughly 10 million square kilometers of land area — translates into many unique characteristics of growth that cannot be replicated elsewhere.

Figure 5. Han Street, a new walkable, human-scale shopping street along the Chu River, a new extension of Wuhan's Dadong River Ecological Water Network in Wuhan, China. Photo by Howchou via Wikimedia Commons.

Still, Peter Calthorpe believes there are many lessons to share from the Chinese example, most notably the reversal of many of the failed models of 20th century planning, and the revival of well-adapted human-scale patterns. We can share the lessons from China, even as we understand there are many differences:

> *The biggest difference of course is that the government owns all of the land. There is no private property. And even when they move property into a developer's hands, it's on a long-term lease. They have absolute control. And as a corollary to that, the cities make all of their money by putting in the infrastructure and then leasing the land to developers. This is leading to a bubble, because they're flooding the market with land in almost all of the cities.*

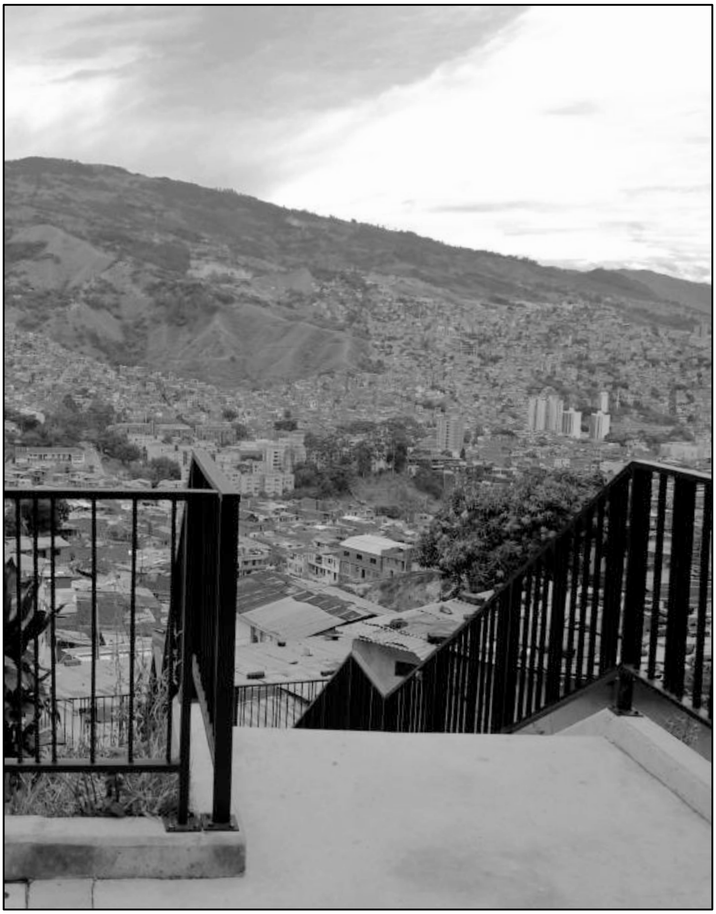
This is one of the key reasons that the government is acting now to put its urbanization — and its economic growth more broadly — on a more sustainable footing.

Of course, China is not the only nation that is contending with unsustainable economic conditions, and other unsustainable levels of resource use, air quality decline, health threats, ecological threats, and other challenges to well-being and quality of life. It is for this reason, Calthorpe says, that the national policy has shifted toward a "new urban agenda" — by any other name.

[1] ArchDaily.com, August 2, 2013. On the Web at https://www.archdaily.com/409612/does-china-s-urbanization-spell-doom-or-salvation-peter-calthorpe-weighs-in

[2] Energy Foundation China, 2011. On the Web at http://www.efchina.org/Attachments/Publication(%E5%88%8A%E7%89%A9)/annualreport2011-en/view

MEDELLÍN, COLOMBIA:
Urban Networks and "Cities For All"



Some material from this section was developed for a talk given at Habitat Norway in Oslo, February 2017, and from research for a case study article that appeared in Urban Land magazine. Some of the material was later used for a photo essay that appears in the book Cities Alive (Mehaffy, 2017). I am indebted to Kjersti Grut of Habitat Norway for the invitation to give the talk, and to Elizabeth Razzi, Editor-in-Chief of Urban Land magazine, for commissioning the research and development of the article.

We now understand, thanks to recent economic research, that cities generate economic growth through networks of proximity, encounters and casual exchanges, and what are called "economic spillovers." The phenomenal creativity and prosperity of cities is now understood as a dynamic interaction between web-like networks of individuals who exchange knowledge and information about creative ideas and opportunities. Many of these interactions are casual, and occur in networks of public and semi-public spaces— the urban web of sidewalks, plazas, parks and so on. More formal and electronic connections supplement, but do not replace, this primary network of spatial exchange. (They often do so only with large injections of resources, which often prove unsustainable.)

Just as important, cities perform best economically, and environmentally, when they feature pervasive human-scale connectivity. Like any network, cities benefit geometrically from their number of functional interconnections. To the extent that some urban populations are excluded or isolated, a city will under-perform economically and environmentally. This is key to the economic importance of the goal of "cities for all" as it has been described in the New Urban Agenda.

By the same logic, to the extent that the city's urban fabric is fragmented, privatized, sprawling, car-dependent or otherwise restrictive of diverse, open encounters and spillovers, that city will underperform — or, as we see in too many cities today, that city will require an unsustainable injection of resources to compensate.

One of the most hopeful and instructive examples of the results of this approach is in the Colombian city of Medellín. Among the dangerous cities of the world, few have equaled the troubled reputation of that city. At its peak, the former base of narcoterrorist Pablo Escobar recorded over 3,000 murders per year, and many more robberies and assaults. For decades many of the city's public spaces were desolate and unsafe. Slum areas, swelling with refugees from political violence in the countryside, were overtaken by equally violent gangs.

But by almost all accounts, Medellín has seen one of the most remarkable urban turnarounds in modern history. Crime is markedly lower, and the city is graced with well-attended new civic spaces, libraries and art galleries. Business is good — indeed, the envy of many other cities across the globe. What's more remarkable is the unconventional path the City has taken to this recovery.

Part of the turnaround certainly began when Escobar was killed in 1993, the climax of a storied manhunt. A more general police crackdown followed, and the murder rate was cut by more than half. Even so, for years afterward the city languished as urban quality of life indicators remained stubbornly low. Many attribute the real transformation to a shift in urban policy that brought about a revitalization of the poorest parts of the city. That in turn has brought remarkable benefits for the rest of the city too.

Figure 1. *A steward on the new escalator system of Medellín's Comuna 13 chats with a young resident.*

Some of the biggest changes were managed by Medellín's charismatic former mayor, Sergio Fajardo, who is now governor of the province in which Medellín sits, Antioquía. A Ph.D. in mathematics, Fajardo is also an architecture fan — his father was a noted Medellín architect — and he has long had a fascination with the capacity of architectural and urban interventions to catalyze wider benefits. As mayor, Fajardo inaugurated a remarkably ambitious plan of "integral urban projects," as they are known locally.

Such projects are typically not in the wealthiest areas of town — on the contrary, they are in the poorest slums. "We are going to go to the spaces of the city where we know we have the most need, and we are going to come up with architecture as a social program," Fajardo told *Newsweek* magazine in 2010. "Some people say, 'Well, it's just a building.' It's not just a building. It's a public space, and the dignity of the space means the whole society has invested there. The whole society is present there."

Nor are the projects simply alluring examples of international "starchitecture" — rather, they are buildings by local firms that provide educational and recreational opportunities, like libraries, schools, and park pavilions. One notable example is the Parque Biblioteca España, a striking group of rustic black cubes set in a verdant hilltop of the once-notorious Santo Domingo neighborhood. Designed by Bogotá architect Giancarlo Mazzanti, the project is representative of Fajardo's "architecture as a social program."

Figure 2. *Left, a typical pathway in Comuna 13, which is steep, dangerous and unsanitary. Right, the residents opted, through the City's participatory budgeting program, to build an escalator system that is patrolled by unarmed community stewards.*

There are five such projects, and Fajardo sees them as key catalysts for the improvement of the city. These are, he says, a major example of his strategy for the city: "public space of the highest quality, at the site where the libraries belong, at the heart of the community," and where each community is thereby "enriched by the library, where all citizens have access to books, technology, entrepreneurship centers, all the tools needed for full development."

Another project, the renovation of the popular Jardín Botánico and Orquideorama, features a distinctive pavilion of geometric wooden hexagons and helixes by local Medellín architects Plan:B Arquitectos and JPRCR Arquitectos. Other projects include schools and community centers, also with striking architecture. Fajardo has made education a major priority, but has used architecture as a tool in that process. "People who say that a beautiful building doesn't improve education don't understand something critical," he told Newsweek. "The first step toward quality education is the quality of the space. When the poorest kid in Medellín arrives in the best classroom in the city, there is a powerful message of social inclusion."

Fajardo, along with his former Director of Urban Projects, Alejandro Echeverri, initiated not just building projects but also an innovative series of micro-lending and community-led investment programs. Some of the biggest investments were in transportation and public space infrastructure. For example, Fajardo's administration completed the Metrocable system — a series of aerial trams up into the steep hillsides — begun by the previous administration, and added new extensions.

Figure 3. *New sidewalks, stairs, planters and small public spaces along the new escalator line give residents new house frontages to improve and occupy. Some have opened stores and other businesses.*

One of the most dramatic, now a big tourist draw, takes visitors to the stunning Parque Arvi, an ecological park whose new wooden buildings complement the natural setting. Tourists ride the aerial tram alongside local slum residents, some of whom might be enjoying the park from their nearby neighborhood. Visitors can canoe along creeks, ride a zip line through the tree canopy, or go horseback-riding through the forest.

One of the most attention-getting projects was surely the outdoor escalator system introduced into one of the poorest and most dangerous favelas, Comuna 13. The escalators, stretching a quarter mile up a steep hillside, were requested by the residents themselves through a citizen-led appropriation process, and cost about $6.7 million US dollars. Extensive media coverage brought out the skeptics — how could such an unconventional, expensive system help to improve such a notorious slum? — but today, few can deny the remarkable changes that have come to the area since the escalators were installed.

Where once residents trudged up a dangerous sewage-laden path — a hike the equivalent of scaling a 28-story building — now they pass uniformed attendants as they step onto covered escalators, taking them up a steep, visually stunning axis through the neighborhood. Between and around the six escalator segments is a series of new small public plazas extending outward with steps and walkways. Around these plazas, new home-grown businesses have sprung up, and many nearby homes have been beautifully improved. A new series of concrete pathways has been extended from these spaces too, with more new businesses, remodeled homes and well-tended landscaping.

Figure 4. *Residents walk past street vendors on a narrow, pedestrian-friendly neighborhood street as the Metrocable passes overhead.*

Visitors frequently marvel at the livable appeal of the public spaces. Where once it might have been unthinkable, lush plants and public art remain undamaged. Graffiti is there, but largely confined to key walls, where its colorful patterns seem to actually animate the public spaces. The stunning setting, overlooking the valley below, brings a steady stream of visitors who come to take in the sights.

Fajardo likens such integral urban projects to what he calls "urban acupuncture" — a term popularized by former Curitiba, Brazil mayor Jaime Lerner. Under Lerner's administration, Curitiba became famous for a series of innovations that greatly improved urban quality of life. For example, a Bus Rapid Transit system made it easier to get around inexpensively, and a garbage-for-groceries exchange program solved the problem of waste disposal in the slums. Lerner was also an architect who was unsatisfied with architecture as a mere visual amenity; like Fajardo, he sought to use architectural and urban projects to catalyze wider improvements.

In the introduction to his 2003 book titled *Urban Acupuncture*, Lerner explained the idea this way: "As with the medicine needed in the interaction between doctor and patient, in urban planning it is also necessary to make the city react; to poke an area in such a way that it is able to help heal, improve, and create positive chain reactions." The goal, Lerner says, is to create "revitalizing interventions to make the organism work in a different way."

Lerner, Fajardo and others are quick to distinguish this approach from the "silver bullet" solutions that some urban planners promote — for example, recruiting an international "starchitect" to create an attention-getting building as a tourist destination. By contrast, Fajardo made a point of recruiting local architects for the design of anchor buildings. Medellín's success, Fajardo believes, has come from its successful repair and reconnection of the most damaged parts of the city's urban fabric. Handsome architecture is only a tool in that process — a signal that the surrounding neighborhood and its people have value, and are worthy of development opportunities.

Figure 5. *Residents relax in a new public space next to a store along the new escalator line. The store's name is "The Penny Less Shop."*

As Fajardo points out, this is not simply a matter of physical changes. The residents themselves have become involved in these projects — in their planning and operation, and in the other surrounding activities they have generated. This means a different relationship between the planning bureaucracy and the residents. Fajardo is known for the "civic pacts" he made with different constituencies, not merely "giving them a say," but giving them "co-responsibility" — that is, transparent responsibility for success or failure. Letting constituents take full credit for success was, Fajardo found, a powerful incentive for cooperation.

Fajardo's skill at making things happen in spite of the bureaucracy has become legendary, and his popularity rating on leaving office was at a historic high near ninety percent. While in office he seemed to combine a mathematician's mastery of game theory — the art of understanding and managing rules, incentives and likely outcomes — with a humanist's sense of open collaboration and trust. That winning formula has earned him admirers far beyond Medellín. Although he was focused on improving the well-being of the least well-off citizens, he earned the trust of the local business establishment too, demonstrating that his strategy offered strong wins for rich and poor alike.

Fajardo is quick to point out that the successes were not his alone. He came to office with an alliance of leaders with expertise in a broad range of relevant fields including finance, education and urban development — the so-called "Group of 50," which later grew to about 200, becoming Fajardo's "brain trust." The group created a series of intensive workgroups to tackle specific problems within the city and to develop effective strategies and tactics.

Figure 6. *The view from Medellín's new Metrocable as it approaches a new library, the Biblioteca España, in the neighborhood of Santo Domingo. Photo: Savio Albeiror, Wikimedia Commons.*

Fajardo's team replaced the old crony reward system with an emphasis on more transparent metrics. That immediately shifted the dynamic of rewards, says Federico Restrepo, Fajardo's director for planning. As he told researchers from Princeton University's Institute for Successful Societies in 2010, "discussion became objective and perfectly justifiable in terms of numbers and data. The level of subjectivity, which is usually associated with political negotiations, went down drastically."

Fajardo has been active in the International Association for Educative Cities, a network of cities begun in 1990 that fosters collaboration "on projects and activities for improving the quality of life of their inhabitants on the basis of their active involvement in the use and evolution of the city itself," as the Association's website puts it. This is clearly very close to Fajardo's thinking.

"A city is an educator," Fajardo told the Association in 2007. "Education in a broad sense, as a tool of social transformation that makes its citizens of the world and makes them equivalent in knowledge and development opportunities." Fajardo, the former university professor, came to see "the educated city" as the unifying theme of all his work. "Whatever we did, we explained it around this narrative about education understood in the broad sense," he told the Association. That means giving people lifelong learning opportunities from hands-on involvement with improvement projects in their own neighborhoods.

Figure 7. *The Metro light rail line now connects to formerly isolated, low-income parts of the city.*

"We must close the gap between the public administration and the citizen," Fajardo explained. This is not a nebulous goal, but a concrete plan of action. "For us it is basic to recognize and encourage new leadership; use our person to person interventions directly to reach the communities; share the processes of transformation step by step; generate working groups on projects; encourage and respect the work of the citizens groups; emphasize clarity in the processes; and hand over to the community the responsibility for caring for everything that has been achieved."

Fajardo's approach follows the principle of "subsidiarity" — the capability to work on neighborhood-scale projects, retained by the neighborhoods themselves, but with the capacity-building assistance and collaboration of the city as a whole. A similar strategy places "neighborhood resource centers" into the neighborhoods, to bring tools and resources for participatory planning and building. Similar trends are under way in other cities, variously known as Tactical Urbanism, Pragmatic Urbanism and Peer-to-Peer Urbanism. In this global movement for urban innovation, Medellín's successes are gaining fame.

It is not just livable public space that is a goal, Fajardo says, but also the reduction of violent crime — the ultimate threat to well-being and to urban vitality. In that essential goal, the conventional tools must be supplemented by the new tools of urban intervention. "You need the police, the justice system, the military, and all these things" he told *Newsweek* magazine. "And we have done those in Colombia. But we have to close that entrance door [to a life of crime]. It's a door that is very wide open in Medellín."

Integrated urban projects can open an alternative door, he thinks, by creating urban environments that offer opportunity and real participation. "We have to dedicate quite an effort to building hope," he told Newsweek. "Everyone, eventually, should see the possibility for success for themselves here. That means quality education, full public education—in science, technology, innovation, entrepreneurship, and culture." And, he says, it means a sense of responsibility for one's own home and neighborhood.

Figure 8. *In addition to the Metrocable and light rail line, bus, bike, walking, motorbike and car are viable transportation choices in Medellín's well-connected transportation system. The city also offers a bike-sharing system, being used here by the bicyclist at center left.*

Over a decade after Fajardo's term began, not all is rosy in Medellín, certainly. After Fajardo's term ended, crime has risen again and remains stubbornly high — in 2012, for example, there were still over 1,000 murders, though that's less than half of the 1990s peak. The new crimes are also those now common across much of Latin America, largely exchanges between small gangs of narcotraffickers. By most accounts, the city does feel much safer and more appealing. Tourists are coming in surging numbers, and once-desolate public spaces are now thriving with night life. But Fajardo and others recognize that there is much more to do.

Nor are all the urban interventions popular with everyone. Some comuna residents criticize the metrocables, arguing that they are much more expensive than the buses they replaced. Others feel that Fajardo should have spent more time ending corruption in the police force. Observers also caution against giving too much credit to the urban interventions for reducing crime: Fajardo's term happened to coincide with a truce negotiated by the national government and the city's violent paramilitary gangs.

But Fajardo is a strong advocate for the benefits of the participatory principles used in the city's urban interventions. "This formula, apparently simple but with a very deep sense of what participating democracy should be like, functions in Medellín, and anywhere in the world for that matter, because it rescues the true sense of politics," he told the International Association of Educating Cities.

Figure 9. *A biker rides along a new walking and biking path built into the hillside, which has allowed new stores and seating areas to spring up.*

How does he define this "true sense of politics?" It is, he says, "nothing more than working with people for people, where the general interest always prevails over private interest, where everyone is invited to get involved in the changes, where no favors are negotiated for bureaucratic office or contracts, and dignity and differences are respected."

For Fajardo, this is not just an equitable policy, it is an economic development strategy. In a region of the world where the population of such informal settlements is exploding — as it is in much of the developing world — there is a lot at stake, Fajardo believes. Cities with greater opportunity for all will be more competitive, and will be more successful in protecting and enhancing their natural resources, their economies and their quality of life.

Indeed, he says, he believes "this is the only way to achieve the social transformations being demanded in the 21st century."

PORTLAND, OREGON:
The "Continuous Carpet" of Walkable Urbanism

Figure 1. Downtown Portland in the 1960s, full of freeways and parking lots. The riverfront freeway to the left was later removed to create the much-loved Tom McCall Waterfront Park. Photo: Oregon Historical Society.

Portions of this case study appeared previously in Mehaffy (2017). Cities Alive. Portland: Sustasis Press.

In too many cases, the United States has influenced other cities around the world in negative ways. The USA has exported the car-centric lifestyle, the inward-turning shopping mall, the industrial supercampus, the low-density suburb, the fragmented unwalkable street pattern — in short, the very sprawl patterns that this volume proposes to replace with a more enlightened collection, more reflective of the "new paradigm" of the New Urban Agenda. (Many of these older patterns actually grew out of the Athens Charter and related early 20th century movements in Europe, but they saw their maturation in the United States.)

It is fitting, then, that we start with a US city that offers a hopeful counter-example. Portland offers an instructive American example of a "modern" city that incorporates many of the patterns in this book — and far from limiting its economic growth and prosperity, these characteristics have made Portland one of the most sought-after locations for growing companies, and the "knowledge economy" workers that are increasingly in demand for them.

Historically, Portland was a rather typical example of a formerly prosperous 19th century American industrial city that suffered the fate of many others in a late 20th century post-industrial era. From its founding in the mid-19th century, Portland had been built according to the then-common model of a tight walkable street grid, including a 400 meter (1/4 mile) network of principal through streets (which, in the latter part of the century, accommodated streetcars). This followed the pattern in this book called 400M MAIN STREET NETWORK (1.4). Its built form was much more continuous and even, as described in the pattern LEVEL CITY (2.2). The city as a whole was a well-connected "carpet" of streets and other public spaces, forming a PUBLIC SPACE SYSTEM (2.3). In the early part of the 20th century, the city saw a surge of shipbuilding and shipping commerce, and a surge of urban development that followed the walkable, mixed-use, mixed-transit pattern.

By 1960, that pattern had changed radically, as it had in many other cities. The city core was in marked decline, while the suburbs were growing according to the typical post-war model: auto-dependent, with fragmented street patterns, low-density strip development, and large separations between home, work and other uses. Meanwhile the downtown saw demolition of many of its historic buildings, replaced with an uneven mix of new tall buildings in the modernist style, and surrounded by open parking lots.

Figure 2. Pioneer Square, often described as the city's "living room," occupies the site of a former parking lot. It now has two light rail lines passing by it as well as a streetcar line nearby.

This familiar pattern was described well by Jane Jacobs in *The Death and Life of Great American Cities* (1961). The continuous urban fabric had been sliced up by freeways and mega-projects, resulting what she termed "border vacuums" — dead zones — around their edges. Whole neighborhoods then suffered precipitous declines, especially in the core. Many areas saw what she termed "the self-destruction of diversity" — economic declines in some areas, and concentration of wealthier enclaves in others, especially the suburbs.

By the early 1970s, a new generation came into city leadership positions, many of them fans of Jacobs. They pushed for regeneration of the historic areas in the cores, and for more mixed use development. They pushed also for more transportation choices, including walking and other modes. Perhaps most important, they pushed to re-connect the fragmented street grid.

For example, the city took down its Harbor Freeway, which fragmented the city, and put up a linear park, adding uses along it, so that it did not remain a "border vacuum" in Jacobs' terminology. They followed urbanist Kevin Lynch's formula for stitching together a seam across what would otherwise be a border and a barrier, thereby activating the areas around it. They exploited the fact that Portland has many regularly spaced bridges across the Willamette River (in fact one of Portland's nicknames is "Bridge City"). These bridges do help maintain the 400M MAIN

STREET NETWORK (1.4) that serves to knit the city together, across what would otherwise be a very fragmenting border.

One might well ask if the removal of this freeway, and the subsequent denial of other freeway projects, has compromised the city's mobility — an essential requirement for a "modern" and prosperous city. This has been the subject of debate, and yet Portland certainly has mobility on a par with (or better than) other cities that have built more freeways, like Seattle.

Figure 3. Portland's remarkably well-connected walkable grid, stretching continuously across the river, freeways and other obstructions. Principal through streets are spaced at roughly 1/4 mile, or 400 meters, which is a common pattern in walkable cities. The author's apartment building is at the circled dot on West Burnside, to the center left of the map. Image: Google Maps.

In fact, Portland has freeways that run right into and through the city — and of course that's another kind of structure that can cause great fragmentation and damage to urban fabric. Portland however has a very noteworthy feature: significant parts of the freeways through the center of town are actually submerged, and the walkable street grid continues above it, with pedestrian sidewalks, light rail and other modes of travel. This follows the pattern MOBILITY CORRIDOR (1.3).

Portland also demonstrates some other surprising examples of otherwise large uses that would typically create "border vacuums" that are in fact integrated into the walkable urban fabric to a surprising degree. These are discussed in the section on "Special Use Patterns," including SCHOOL CAMPUS (5.1), INDUSTRIAL AREA (5.3), MARKET CENTER (5.2) and HOSPITAL (5.4).

The campus of Portland State University is not in fact segregated in a typical isolated superblock campus setting, but instead is integrated right into the walkable urban grid of the downtown area. The same is true of many of Portland's inner-city industrial districts, also integrated into walkable urban fabric. These are quite appealing, walkable neighborhoods, and they support significant mixed use, including high tech and office. An example is the well-known Pearl District, also a former industrial district that still has industrial and office users (including Microsoft and Google), and it remains very walkable and appealing. This is exactly the kind of work environment that many of the most sought-after employees are demanding.

Figure 4. Portland's walkable grid stretches right across the 405 freeway in West Portland (at bottom of photo), with light rail, streetcar and bus lines, as well as bike pathways and wide walkable sidewalks. At right is the Northwest neighborhood, and at left is Goose Hollow. The author's apartment is at center top. Image: Google Maps.

What about shopping malls, "big boxes" and so on? In the very center of Portland is a shopping mall called Pioneer Place, and it is one of the most popular in the region. It spans over four blocks — but instead of taking out streets, it preserves the street grid and uses tunnels and bridges to spread into a larger complex, right over the walkable urban fabric, including the light rail line.

What about hospitals? Portland has a major hospital complex called Good Samaritan, again spanning over a number of blocks, and using bridges and tunnels to do so. Again the surrounding urbanism is very beautiful and walkable.

Indeed, Portland has managed to keep a kind of continuous carpet of walkable urbanism, right across the city. It maintains these walkable connections within a network of principal through streets that is about 1/4 mile, or 400 meters. That number seems to be closely related to the optimum balance between pedestrian mobility and vehicular mobility, or the scale at which pedestrian-dominated areas give way to vehicle-dominated areas. It is not that these larger through streets are not pedestrian-friendly — indeed they can be, and must be — but that this is the point where pedestrian-dominated streets (such as narrow lanes, "woonerfs" and the like) give way to longer, straighter avenues and boulevards where vehicles have more free movement.

Figure 5. Farmer's Market in Portland's Northwest neighborhood, a beautiful and functional place to live for the author and many others.

Our colleagues Sergio Porta and Ombretta Romice in the Urban Design Studies Unit of the University of Strathclyde, working with their students, have shown that this 400 meter number seems to be surprisingly invariant across many cities (again, as expressed in the pattern 400M THROUGH STREET NETWORK (1.4). We can see for example in Bologna, or Oslo, or Paris, or many other cities, where the major through streets average about 400 meters on center. We note how Paris, like Portland, has grade-depressed railways and motorways, and the urbanism continues very beautifully overhead. In fact London does the same thing, where a typical example is Oseney Crescent in Camden Town. This is part of the essential railway service to London. Notice again that the street level still offers a very walkable, attractive streetscape without "border vacuums".

Figure 6. Although Northwest Portland is one of the densest neighborhoods in Oregon, its diverse mix of housing, including single-family detached, duplexes, rowhouses and apartments, makes it remarkably livable and attractive.

So we can see that it is possible to build cities this way, and to maintain this walkable urban carpet, even in a thriving modern urban economy like London or Portland. It is not necessary to chop them up in the name of mobility, as we did in the United States — very much to our regret. In fact, if we've learned anything, it is that the more we try to build for mobility to the exclusion of other needs, the more we tend to lose it — the paradox of "induced demand."

Figure 7. The Portland Streetcar passes in front of Good Samaritan Hospital and a row of shops offering neighborhood services.

Another implication is that it is not necessary to push arterial highways out to the perimeters, where they too often become generators of sprawling "out of town" facilities. As we have seen in the United States, this kind of planning only serves to trigger the growth of even more low-density, low-connectivity, car-dependent urbanism. Instead we can take these important arterials, and all their movement and all their people, right into the heart of cities, as Portland shows, so long as we keep them grade-depressed, like railways. (Tunnels are also an option, though more expensive still.)

But one may ask, is vehicular mobility still accommodated at the finer scales? Yes, indeed, there is a remarkably effective permeable network, graduated in a progression from the local streets to the walkable avenues, like Portland's Hawthorne Boulevard. At the next level are multi-way boulevards, like the example of the Willamette District, just outside Portland — with slip lanes and accommodation transit. Notice also the significant on-street parking that is provided, with four lanes during peak periods, and additional on-street parking during other times. This avoids the urbanism-killing big parking lots of American urbanism. In this kind of boulevard layout, the travel lanes could be up to six or more lanes, as it is in Paris and other cities, and remain pedestrian-friendly with an additional median. And as the Portland example shows, the pedestrian realm here still has some generous features.

Figure 8. A number of former residences have been converted to retail uses at the ground floor along Portland's NW 23rd Avenue forming a complex and spatially attractive streetscape.

Going up the scale of street sizes and the vehicular mobility they provide, we finally arrive at the fastest kind of throughway, the grade-depressed freeway system that we discussed before. The result of this mobility, along with other factors, is that Portland’s inner core areas are remarkable success stories of regeneration over the last few decades.

It is notable that on greenhouse gas emissions metrics, Portland is also making notable reductions, relatively speaking. By a recent assessment, the city was more than 10 percent <u>below</u> its 1990-level emissions per capita, a distinctive achievement. There is certainly a long way to go, but this is an encouraging indicator.

Portland has also come a long way from its declining urban core of the 1960’s, and in that connection we can begin to see the importance of taking down the elevated freeway and re-establishing the other links. This seems to be confirmation of what Jane Jacobs observed, also confirmed by other research — that when urban areas are fragmented by freeways and other barriers, it creates other kinds of damage to the urban tissue around them for some distance. People become isolated, businesses shutter their doors, and a whole series of spiraling negative conditions kick in. At best, economic growth can only be maintained with a costly injection of resources, including energy resources — and this is increasingly an unsustainable strategy for cities.

Jacobs also suggests that it’s possible to reverse-engineer the declines, and “unslum” the damaged places, by reconnecting them to the wider urban fabric. That connectivity to the wider city and its diverse economy helps to diversify the neighborhood itself, and bring more opportunity. That’s a very hopeful prospect.

A PROJECT SAMPLER:
The Geometries of Place

The previous case studies featured a number of examples of patterns from this volume reflecting key provisions of the 2016 New Urban Agenda, including urban networks, street patterns, walkability, inclusive urbanization, and improvements to informal settlements.

In this, our final case study, we turn to patterns in the later part of the book, and especially patterns that demonstrate new kinds of pattern methodology, notably geometric and human-scale patterns. These include:

- LOCAL SYMMETRY (11.1),
- SMALL GROUPS OF ELEMENTS (11.2),
- FRACTAL PATTERN (11.3),
- FRAMING (11.4),
- HUMAN-SCALE DETAIL (15.2),
- CONSTRUCTION ORNAMENT (15.3),
- and COMPLEX MATERIALS (15.4), among others.

This part of the book also includes patterns of regeneration and slum upgrading, biophilic urbanism, and so-called "affordance" patterns.

Part of the problem with the original book *A Pattern Language,* and with environmental patterns written since — including some in this volume, to be honest — is that they have often turned to historical examples to illustrate their characteristics. While historical examples can often provide ideal illustrations, they can also convey a false impression that contemporary places don't have these qualities, and perhaps *cannot* have these qualities.

That assertion is false — as the images in this section demonstrate. Not only is it possible to re-incorporate these characteristics in cities, we believe the growing evidence shows that it is urgent that we do so. After all, these patterns contribute to environments that people will most likely find attractive, beautiful, supportive of walking and socializing, and worthy of use and care over time. These patterns provide, in other words, the important human-centered characteristics of successful and durable cities.

These are the characteristics that well-loved and durable places have always exhibited — places that are sustainable, because they *have* sustained — but that, for ideological or expedient rather than evidence-based reasons, have fallen out of favor in the almost century-old "modern" era — an era gripped by the unsupported belief that this stripping-down somehow represented advancement and "modernization". The catastrophic result has been a generation of environments that have been denuded of essential humanist characteristics, left only with excitement and novelty — qualities that are simply insufficient for the challenges of the future.

Of course, a similar stripping-down occurred in other aspects of cities — in their diversity, their complexity, their mix of modes of transportation including walkability, and other characteristics. Many people (including us) have therefore become persuaded that this stripping down is toxic wherever it occurs: and that the stripped-down *geometric* aspect of modern urban environments is inseparable from other unsustainable aspects. In a real sense, the ugliness we experience in our fragmented and denuded world is inseparable from its manifest unsustainability.

Many believe that, if we are to transition to a new generation of more sustainable places — more worthy of *being* sustained — then such patterns need to be allowed and encouraged, quite apart from any stylistic or ideological bias (for or against) and quite apart from their familiarity in historical forms. As we have argued throughout this volume, this is simply a matter of considering the best and most robust evidence of what *works* — what people love, what people care for, what makes them feel more at home. This human-centered approach to settlement-making and place-making (and art-making too) is what will prepare us best for the future.

Let us emphasize one more important point. All this is not to say that any particular geometry or group of geometries from the 20th century is inherently bad and should be rejected on that basis alone. Indeed, many eras of human history have included design features of minimalism and simplicity, and that is really not the issue. Human environments can absorb many different characteristics and variations within an open, eclectic language of form, so long as they offer an overall coherence and functional intelligibility to the people who must live there. Moreover, the problem is not that someone chose the wrong "style" or the wrong form of expression, and somehow that is inappropriate for human beings today. In fact, this is precisely the problem: a totalizing focus on the right "style" and "expressive meaning" for "our time" (an arrogation of a property that is highly variable and mutable, after all). This is nothing other than design malpractice. Instead we have a professional and civic responsibility to focus on human needs, notably the need for ordinary beauty, comfort and delight.

In that spirit, here is a photo essay, by no means exhaustive, but including a small sampling of such places — recently built, frequently successful, lively and well-loved.

As you look through these images, please consider the specific patterns they evoke from this volume:

- SMALL GROUPS OF ELEMENTS (11.2),
- LOCAL SYMMETRY (11.1),
- FRACTAL PATTERN (11.3),
- FRAMING (11.4),
- BIOPHILIC URBANISM (2.4),
- FRIENDLY SURFACES, HANDLES (12.1),
- MALLEABILITY (12.4),
- SLUM UPGRADE (13.1),
- HUMAN-SCALE DETAIL (15.2),
- CONSTRUCTION ORNAMENT (15.3),
- COMPLEX MATERIALS (15.4), and others.

Figure 1. A streetscape in the Dandora slum of Nairobi, with beautiful expressions of several of the patterns in the book.

Figure 2. A small shop has opened along a rustic streetscape in Rose-town, Jamaica. Photo by Steve Mouzon.

Figure 3. A small square on a narrow lane in Charleston, USA, called Catfiddle Street. Photo by Christopher Liberatos.

Figure 4. A view from the central park to the new town center of walkable Orenco Station, in a formerly sprawling suburban area near Portland, Oregon USA.

Figure 5. Pedestrians are treated to a variety of visual details at Orenco Station.

Figure 6. A gymnasium at the Eishin School near Tokyo, designed by Christopher Alexander and associates. Photo by Dan Klyn.

Figure 7. A gateway in Rosetown, Jamaica made from a salvaged door. Photo by Steve Mouzon.

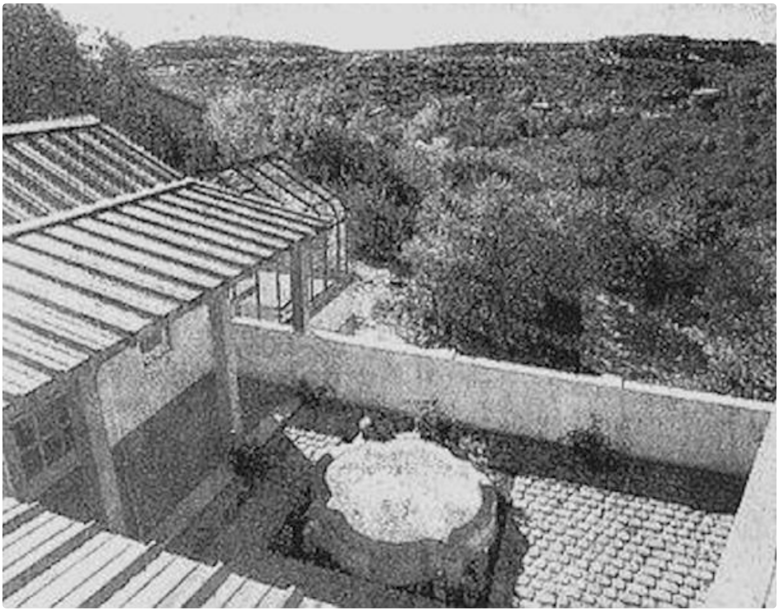


Figure 8. A courtyard view of the building shown in pattern 10.2 CIRCULATION NETWORK.

Figure 9. Porches in Rosetown, Jamaica. Photo by Steve Mouzon.

Figure 10. Courtyard of a small cottage in the Texas hill country.

Figure 11. Ornamental details greet visitors to a building at Catfiddle Street in Charleston, USA.

Figure 12. Residences above shops and cafes lining a beautiful square in Seaside, USA.

Figure 13. Visitors to a park in the Dandora slum of Nairobi enjoy a delightful sequence of planters and street furniture made from recycled materials by residents.

Figure 14. Small details frame the view from the building shown in pattern 10.2 CIRCULATION NETWORK.

Figure 15. Delightful details like this door pattern are found all along the streetscape of Alys Beach, USA.

Figure 16. An expressive truss detail greets visitors to the gymnasium of the Eishin School near Tokyo, designed by Christopher Alexander and associates. Photo by Dan Klyn.

Figure 17. A delightful planter made from discarded boots in a park of the Dandora slum in Nairobi.

Figure 18. Beautiful details line the walkable streets of Alys Beach, USA.

Figure 19. A new rowhouse project continues the century-old "Arts and Crafts" traditions of Portland, Oregon.

Figure 20. A new public market in Brandevoort, the Netherlands.

Figure 21. A public market regenerated from old industrial buildings at Granville Island, Vancouver.

Figure 22. A public market and hall in Poundbury, an urban extension of the city of Dorchester in the UK.

FURTHER READING

In addition to the research cited within each pattern, there is a large and growing body of literature about pattern languages and related topics, written by ourselves and other authors. Following is a small sampling of some of this literature, which may be of further interest to readers.

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