







We are now ready to come to grips with the most basic problem of a building or a town: What is it made of? What is its structure? What is its physical essence? What are the building blocks of which its space is made?

We know, from chapter 4, that any town and any building gets its character from those events and patterns of events which keep on happening there the most; and that the patterns of events are linked, somehow, to space.

So far, though, we do not know just what aspect of the space it is that correlates with the events. We do not have a picture of a building or a town which shows us how its obvious outward structure—the way it looks, its physical geometry—is interlocked with these events.

Suppose I want to understand the “structure” of something. Just what exactly does this mean?

It means, of course, that I want to make a simple picture of it, which lets me grasp it as a whole.

And it means, too, that as far as possible, I want to paint this simple picture out of as few elements as possible. The fewer elements there are, the richer the relationships between them, and the more of the picture lies in the “structure” of these relationships.

And finally, of course, I want to paint a picture which allows me to understand the patterns of events which keep on happening in the thing whose structure I seek. In other words, I hope to find a picture, or a structure,

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which will, in some rather obvious and simple sense, account for the outward properties, for the pattern of events of the thing which I am studying.

What then, is the fundamental "structure" of a building or a town?

In the crudest sense, we know from the last chapter roughly what the structure of a town or building is.

It is made up of certain concrete elements, with every element associated with a certain pattern of events.

On the geometric level, we see certain physical elements repeating endlessly, combined in an almost endless variety of combinations.

A town is made of houses, gardens, streets, sidewalks, shopping centers, shops, workplaces, factories, perhaps a river, sportgrounds, parking . . .

A building is made up of walls, windows, doors, rooms, ceilings, nooks, stairs, staircase treads, doorhandles, terraces, counter tops, flowerpots . . . repeated over and over again.

A gothic cathedral is made of a nave, aisles, west door, transept, choir, apse, ambulatory, columns, windows, buttresses, vaults, ribs, window tracery.

A modern metropolitan region in the United States is made of industrial areas, freeways, central business districts, supermarkets, parks, single-family houses, gardens, high-rise housing, streets, arteries, traffic lights, sidewalks.

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And each of these elements has a specific pattern of events associated with it.

Families living in the houses, cars and buses driving in the streets, flowers growing in the flower pots, people walking through the doors, opening and closing them, traffic lights changing, people gathering for mass on Sundays in the nave of the cathedral, forces acting on the vaults, when the wind sways the building, light coming through the windows, people sitting at the windows in their living rooms and looking at the view . . .

But this picture of space does not explain how—or why—these elements associate themselves with definite and quite specific patterns of events.

What is the relation between a church, say, taken as an element—and the pattern of events which happens in the church? It is all very well to say that they are connected. But unless we can see some kind of common sense in the connection, it explains nothing.

It is certainly not enough merely to say glibly that every pattern of events resides in space. That is obvious, and not very interesting. What we want to know is just how the structure of the space supports the patterns of events it does, in such a way that if we change the structure of the space, we shall be able to predict what kinds of changes in the patterns of events this change will generate.

In short, we want a theory which presents the interaction

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of the space and the events, in a clear and unambiguous way.

Further, it is very puzzling to realize that the "elements," which seem like elementary building blocks, keep varying, and are different every time that they occur.

For among the endless repetition of elements we also see an almost endless variation. Each church has a slightly different nave, the aisles are different, the west door is different . . . and in the nave, the various bays are usually different, the individual columns are different; each vault has slightly different ribs; each window has a slightly different tracery and different glass.

And just so in an urban region. Each industrial area is different; each freeway is different; each park is different; each supermarket is different—even the smaller individual elements like traffic lights and stop signs, although very similar, are never quite the same—and there is always a variety of types.

If the elements are different every time that they occur, evidently then, it cannot be the elements themselves which are repeating in a building or a town: these so-called elements cannot be the ultimate "atomic" constituents of space.

Since every church is different, the so-called element we call "church" is not constant at all. Giving it a name

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only deepens the puzzle. If every church is different, what is it that remains the same, from church to church, that we call "church"?

When we say that matter is made of electrons, protons, and so forth, this is a satisfying way of understanding things, because these electrons seem, indeed, to be the same each time that they occur, and it therefore makes sense to show how matter can be built up from combinations of these "elements," because the elements are truly elementary.

But if the so-called elements of which a building or a town is made—the houses, streets, windows, doors—are merely names, and the underlying things which they refer to keep on changing, then we have no solidity at all in our picture, and we need to find some other elements which truly are invariant throughout the variation, in a way that we can understand a building or a town as a structure made up by combination of these elements.

Let us therefore look more carefully at the structure of the space from which a building or a town is made, to find out what it really is that is repeating there.

We may notice first that over and above the elements, there are relationships between the elements which keep repeating too, just as the elements themselves repeat. . . .

Beyond its elements each building is defined by certain patterns of relationships among the elements.

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In a gothic cathedral, the nave is *flanked by aisles* which run parallel to it. The transept is at *right angles* to the nave and aisles; the ambulatory is *wrapped around* the outside of the apse; the columns are *vertical, on the line separating* nave from aisle, *spaced at equal intervals*. Each vault connects *four* columns, and has a characteristic shape, *cross-like* in plan, *concave* in space. The buttresses are run down the outside of the aisles, on the same lines as the columns, supporting the load from the vaults. The nave is always a *long thin rectangle*—its ratio may vary between 1:3 and 1:6, but is never 1:2 or 1:20. The aisles are always narrower than the nave.

And each urban region, too, is defined by certain patterns of relationships among its elements.

Consider a typical mid-twentieth-century American metropolitan region. Somewhere *towards the center* of the region, there is a central business district, which contains a *very high density* office block; near these there are *high density* apartments. The overall density of the region *slopes off with distance from the center, according to an exponential law*; periodically there are again peaks of higher density, but smaller than the central ones; and *subsidiary* to these smaller peaks, there are still smaller peaks. Each of these peaks of density *contains* stores and offices *surrounded by* higher density housing. *Towards the outer fringe* of the metropolis there are large areas of freestanding one-family houses; *the farther out from the center they are, the larger* their gardens. The region is

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served by a *network* of freeways. These freeways are *closer together* at the center. Independent of the freeways, there is a *roughly regular two-dimensional network* of streets. *Every five or ten* streets, there is a larger one, which functions as an artery. A few of the arteries are even bigger than the others: these tend to be arranged *radially, branching out* from the center in a *star-shaped fashion*. Where an artery meets a freeway, there is a characteristic *cloverleaf arrangement of connecting lanes*. Where two arteries *intersect*, there is a traffic light; where a local street *meets* an artery, there is a stop sign. The major commercial areas, which *coincide with* the high density peaks in the density distribution, all fall on the major arteries. Industrial areas all fall *within half a mile* of a freeway; and the older ones are also *close to* at least one major artery.

Evidently, then, a large part of the "structure" of a building or a town consists of patterns of relationships.

For both the city of Los Angeles and the medieval church get their respective characters as much from these repeating patterns of relationships, as they do from the elements themselves

At first sight, it seems as though these patterns of relationships are separate from the elements.

Think of the aisle of the cathedral. It is parallel to the nave, and next to it, it shares columns with the nave, it

runs east-west, like the church itself, it contains columns, on its inner wall, and windows on its outer wall. At first sight, it seems that these relationships are "extra," over and above the fact of its being an aisle.

When we look closer, we realize that these relationships are not extra, but necessary to the elements, indeed a part of them.

We realize, for instance, that if an aisle were not parallel to the nave, were not next to it, were not narrower than the nave, did not share columns with the nave, did not run east to west, . . . that it would not be an "aisle" at all. It would be merely a rectangle of space, in gothic construction, floating free . . . and what makes it an aisle, specifically, is just the pattern of relationships which it has to the nave, and other elements around it.

When we look closer still, we realize that even this view is still not very accurate. For it is not merely true that the relationships are attached to the elements: the fact is that the elements themselves are patterns of relationships.

For, once we recognize that much of what we think of as an "element" in fact lies in the pattern of relationships between this thing and the things in the world around it, we then come to the second even greater realization, that the so-called element is itself nothing but a myth, and that indeed, the element itself is not just embedded in a

pattern of relationships, but is *itself* entirely a pattern of relationships, and nothing else.

In short, the aisle, which needs the pattern of relationships to the nave and the east window to define it, is *itself* also a pattern of relationships between its length, its width, the columns which lie on the boundary with the nave, the windows which lie on the outer boundary . . .

And finally, the things which seem like elements dissolve, and leave a fabric of relationships behind, which is the stuff that actually repeats itself, and gives the structure to a building or a town.

In short, we may forget about the idea that the building is made up of elements entirely, and recognize instead, the deeper fact that all these so-called elements are only labels for the patterns of relationships which really do repeat.

The freeway, as a whole, does not repeat. But the fact that there are cloverleaves which connect the freeway to roads at certain intervals—that *does* repeat. There is a certain relationship between the freeway and its crossing arteries and cloverleaves, which does repeat.

But once again, the cloverleaf *itself* does not repeat. Each cloverleaf is different. What does repeat is that each lane forms a continuously curving off ramp to the right—there is a relationship between its radius, its tangency, the fact that it is banked, which does repeat.

Yet once again the "lane" which figures in this pattern of relationships does not repeat. What we call a lane is itself

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a relationship among still smaller so-called elements—the edges of the road, the surface, the lines which form the edge . . . and these again, although they function temporarily as elements, in order to make these relations clear, themselves evaporate when we look closely at them.

Each one of these patterns is a morphological law, which establishes a set of relationships in space.

This morphological law can always be expressed in the same general form:

$X \rightarrow r(A, B, \dots)$, which means:

Within a context of type X , the parts A, B, \dots are related by the relationship r .

Thus, for example:

Within a gothic cathedral \rightarrow the nave is flanked on both sides by parallel aisles.

or:

Where a freeway meets an artery \rightarrow the access ramps of the interchange take the rough form of a clover-leaf.

And each law or pattern is itself a pattern of relationships among still other laws, which are themselves just patterns of relationships again.

For though each pattern is itself apparently composed of smaller things which look like parts, of course, when we look closely at them, we see that these apparent "parts" are patterns too.

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Consider, for example, the pattern we call a door. This pattern is a relationship among the frame, the hinges, and the door itself: and these parts in turn are made of smaller parts: the frame is made of uprights, a crosspiece, and cover mouldings over joints; the door is made of uprights, crosspieces and panels; the hinge is made of leaves and a pin. Yet any one of these things we call its "parts" are themselves in fact also patterns, each one of which may take an almost infinite variety of shapes, and color and exact size—without once losing the essential field of relationships which make it what it is.

The patterns are not just patterns of relationships, but patterns of relationships among other smaller patterns, which themselves have still other patterns hooking them together—and we see finally, that the world is entirely made of all these interhooking, interlocking nonmaterial patterns.

Further, each pattern in the space has a pattern of events associated with it.

For instance, the pattern of the freeway contains a certain fabric of events, defined by rules: drivers drive at certain speeds; there are rules governing the way that people may change lanes; the cars all face the same way; there are certain kinds of overtaking; people drive a little slower on the entrances and exits

And the pattern of a kitchen, in any given culture, also contains a very definite pattern of events: the way that people use the kitchen, the way that food is prepared, the

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fact that people eat there, or don't eat there, the fact that they wash the dishes standing at the sink . . . and on and on . . .

Of course, the pattern of space, does not "cause" the pattern of events.

Neither does the pattern of events "cause" the pattern in the space. The total pattern, space and events together, is an element of people's culture. It is invented by culture, transmitted by culture, and merely anchored in space.

But there is a fundamental inner connection between each pattern of events, and the pattern of space in which it happens.

For the pattern in the space is, precisely, the precondition, the requirement, which allows the pattern of events to happen. In this sense, it plays a fundamental role in making sure that just this pattern of events keeps on repeating over and over again, throughout the space, and that it is, therefore, one of the things which gives a certain building, or a certain town, its character.

Go back, for example, to the porch of chapter 4, and the pattern of events we may call "sitting on the porch, watching the world go by."

What aspect of the space is it which is connected to this pattern of events? Certainly it is not the whole porch,

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in its entirety: it is instead, just certain specific relationships.

For instance, in order for the pattern of events "watching the world go by" to happen, it is essential that the porch should be a little raised above the level of the street; it is essential that the porch be deep enough, to let a group of people sit there comfortably; and it is essential, of course, that the front of the porch be open, pierced with openings, and that the roof is therefore supported on columns.

could be contemplated, but columns may give the bit of remove which allows one to observe & not be brought into participation
It is this bundle of relationships which is essential, because these are the ones which are directly congruent with the pattern of events. *columns as picture frames.*

By contrast, the length of the porch, its height, its color, the materials of which it is made, the height of the side walls, the way the porch connects up with the inside of the house, are less essential—so they can vary, without altering the fundamental and essential nature of the porch.

And in this same sense, each pattern of relationships in space is congruent with some specific pattern of events.

The pattern of relationships we call a "freeway" is just that pattern of relationships required by the process of driving fast with limited access to and from side roads: in short the pattern of events.

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The pattern of relationships we call a Chinese "kitchen" is just that pattern of relationships required for cooking Chinese food: again the underlying pattern of events.

And insofar as there are different "kinds" of kitchens, there are different patterns of relationships, responsible for slightly different patterns of events, in different cultures, which have different patterns of cooking.

In every case the pattern of relationships in space is that invariant which must repeat itself with some pattern of events, because it is exactly these relationships which are required to sustain that pattern of events.

We realize then that it is just the patterns of events in space which are repeating in the building or the town: and nothing else.

Nothing of any importance happens in a building or a town except what is defined within the patterns which repeat themselves.

For what the patterns do is at the same time seize the outward physical geometry, and also seize what happens there.

They account entirely for its geometrical structure: they are the visible, coherent stuff that is repeating, and coherent there: they are the background of the variation, which makes each concrete element a little different.

And, at the same time, they are also responsible for those events which keep repeating there, and therefore do the most to give the building or a town its character . . .

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Each building gets its character from just the patterns which keep on repeating there.

This is not only true of general patterns; it is true of the entire building: all its details; the shape of rooms, the character of ornament, the kind of windowpanes it has, the boards of which the floor is made, the handles on the doors, the light, the height, the way the ceilings vary, the relationship of windows to the ceiling, the connection of the building to the garden and the street, and to the spaces and the paths and to the detailed seats, and walls which are around it. . . .

Each neighborhood is defined, too, in everything that matters, by the patterns which keep on repeating there.

Again, it is just those details which give the neighborhood a "character" which are defined by patterns: the kind of streets which it has, the kind of lots the houses are; the typical size of houses, the way that the houses are connected or distinct. . . .

Isn't it true that the features which you remember in a place are not so much peculiarities, but rather the typical, the recurrent, the characteristic features: the canals of Venice, the flat roofs of a Moroccan town, the even spacing of the fruit trees in an orchard, the slope of a beach towards the sea, the umbrellas of an Italian beach, the wide sidewalks, sidewalk cafés, cylindrical poster board-

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ings and pissoirs of Paris, the porch which goes all the way around a plantation house in Louisiana. . . .

The qualities which make Paris a special place, which make Broadway and Times Square exciting, the qualities which make Venice special, the qualities which make an eighteenth-century London square so peaceful and refreshing—indeed, the qualities in any environment which give it the character you like it for—are its patterns.

A barn gets its structure from its patterns.

It has a certain overall shape, roughly a long rectangle; there is a central portion where the hay is stored, with aisles along the sides where the cows stand; there is a row of columns between the center and the aisle; along these columns are the feeding troughs where the cows feed; there are great doors or double doors at one end; perhaps smaller doors at the other end, in the aisle, for cattle to pass in and out. . . .

And an expensive restaurant gets its structure and character from its peculiar patterns too.

Small tables, each one with a few chairs; small individual lights at the tables; the head waiter's desk at the entrance, with a light and a place for his reception book. Dark perhaps inside, reds, deep colors, often no windows. A swinging door leading to the kitchen . . .

Venice gets its life and structure from its patterns.

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A large number of islands, typically about 1000 feet across, packed together houses, 3-5 stories, built right up to the canals; each island with a small square in the middle of it, the square usually with a church; narrow, irregular paths cutting across the islands; hump-backed bridges where these paths cross canals; houses opening onto the canals and onto the streets; steps at the canal entrance (to take care of variations in water level) . . .

Venice is the special place it is, only because it has those patterns of events in it, which happen to be congruent with all these patterns in the space.

London gets its life and structure from its patterns too.

First at the regional scale: the characteristic conglomeration of boroughs, the characteristic location of major railway stations on an inner ring, with the railways radiating outwards, the characteristic location of industry at the periphery. Then at the next smaller scale there are the characteristic rows of semi-detached "villas," the characteristic inside details of the railway stations, the characteristic squares, with oval or rectangular green parks in the center, the use of roundabouts, traffic moving on the left. Then to more detail: the interior layout of a typical row house, the particular English character of "filling" stations, the London club, Lyons and Marks and Spencers, the shape and height and placing of advertisement boardings on bridges and outside railway stations, and their particular characteristic shape and height. Then to more detail: the special kind of staircase baluster, the

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use of two-inch bricks in Georgian houses, the ratio of bathroom area to house area, compared with that typical of an American house, the use of flagstones on the sidewalks. Then down to the tiniest details of all—the special shape of English faucets, the kinds of handles on an English metal window, the shape of the insulators on a telegraph pole.

Again, in each case the patterns define all the typical events which happen there. So "London," as a way of life, lies there completely in these patterns which the Londoners create, and fill with the events that are exactly congruent with them.

And, what is most remarkable of all, the number of the patterns out of which a building or a town is made is rather small.

One might imagine that a building has a thousand different patterns in it; or that a town has tens of thousands. . . .

But the fact is that a building is defined, in its essentials, by a few dozen patterns. And, a vast town like London, or Paris, is defined, in its essence, by a few hundred patterns at the most.

In short, the patterns have enormous power and depth; they have the power to create an almost endless variety, they are so deep, so general, that they can combine in millions upon millions of different ways, to such an extent, that when we walk through Paris we are mainly overwhelmed by the variety; and the fact that there are these deep invariants, lying behind the vast variety, and

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generating it, is really an amazing shock. . . .

In this sense, the patterns are perhaps still deeper and more powerful than the discussion has made clear so far. From a handful of patterns, a vast, almost incalculable variety can be made: and a building, with all of its complexity and variety, is generated, actually, by a small number of them.

They are the atoms of our man-made universe.

In chemistry we learn that the world, in all of its complexity, is made up from combinations of some 92 elements, or atoms. This is an extraordinary fact, amazing to a person who learns chemistry for the first time. It is true that our conception of these atoms has changed repeatedly—far from being the little billiard balls we once thought, we know that they are shifting patterns of particles and waves—and that even the most "elementary" particle—the electron—is itself a ripple in the stuff of the universe, not a "thing." However, all these changing views do not alter the fact that at the level of scale where atoms occur, they do occur, as identifiable recurrent entities. And even if vast changes occur in physics, and we one day recognize that these so-called atoms are also merely ripples in a deeper field, the fact that there are entities of some kind which correspond to the things we once called atoms will remain.

Just so, we realize now, that at the larger scale of towns and buildings, the world is also made of certain fundamental "atoms"—that each place is made from a

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few hundred patterns—and that all of its incredible complexity comes, in the end, simply from the combinations of these few patterns.

Of course the patterns vary from place to place, from culture to culture, from age to age; they are all man-made, they all depend on culture. But still, in every age and every place the structure of our world is given to it, essentially, by some collection of patterns which keeps on repeating over and over and over again.

These patterns are not concrete elements, like bricks and doors—they are much deeper and more fluid—and yet they are the solid substance, underneath the surface, out of which a building or a town is always made.

CHAPTER 6

PATTERNS WHICH ARE ALIVE

The specific patterns out of which a building or a town is made may be alive or dead. To the extent they are alive, they let our inner forces loose, and set us free; but when they are dead they keep us locked in inner conflict.