Part four
Theoretical syntheses

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Chapter ten

Space is the machine

Forms and functions, buildings and societies

Common sense affirms, and the ordinary use of language confirms, that there is an association between the form and function of a building. If we name a kind of building – say 'school' or 'house' or 'church' – and try to disentangle what we mean, then we find at least two sets of ideas present in the word. One is the idea of a particular form of social organisation. The other is the idea of a particular form of building. Perhaps an organisation and a form is too specific. A family of possible organisations and a family of possible forms might convey more accurately what is in our minds. These seem in some way to be bound up with each other in the intuitions of 'school' or 'house' or 'church', so that we think we recognise one from the other. This association of ideas is not confined to cognition. It affects behaviour. By recognising types as form-function pairings, we anticipate how to behave in the kinds of spaces that we expect to find in a building. We are pre-programmed by our intuitions of building types to behave in ways appropriate to the form.

However, in spite of the apparent closeness of the association, the relation between form and function in buildings has always proved resistant to analysis. Although the relation seems intuitively clear on a case by case basis, and architects design buildings to fit different functions for the most part without too much difficulty, it is very hard to be explicit about what it is that distinguishes the form-function relation as it appears in one type of building from the way it appears in another. One might say that a designer will design a possible version of the form–function pairing for a certain purpose, but that does not mean that any aspect of what is designed is necessary for that purpose. Knowledge of what is necessary implies knowledge of the limits of possibility. Such limits are not at all well understood. In the present state of knowledge, it is not unreasonable to doubt their existence. The form-function relation may not be well defined enough to allow such knowledge. The fact that buildings so easily change their function support these doubts. The form-function relation may not be quite as specific as the uncritical use of the language of building types suggests.

To some extent this state of affairs may be due to failure to distinguish between the specific functions buildings perform, and 'generic function', as set out in the last two chapters. Generic function implies that what makes buildings functionally interchangeable is what buildings must have in common spatially in order to fulfil any function. The more generic function is sufficient to account for spatial organisation in any particular case, then the more we would expect functional flexibility. However, this does not solve the problem in hand. Intuition clearly anticipates, and language institutionalises, specific functions and warns us that in some important sense a school is a school, and a house a house. Are intuition and language then wrong in this affirmation?

There are two aspects to the problem. First, our ideas about buildings already come replete with social ideas. Second, our ideas about social institutions come with ideas about buildings attached to them. Each presents a problem for architectural theory. The first leads to the form-function question as we have described it. Does common sense deceive us in affirming a well-formed typological

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relation between the form a building takes and what it is for? If it does not, is this association contingent, in that it just happens that this function leads to this form and that function another? Or is there some more systematic sense in which variation in functions are associated with variations in form? If the latter is the case, then there can be a form-function theory in architecture. If not, there cannot be. The second leads to questions about buildings as social objects. Does it matter that our ideas about social institutions come with ideas about buildings attached to them? Is the building in some sense a part of the definition of the social entities we name as schools, monasteries, and so on? If so, is this simply an association of ideas, or is there some well-defined sense in which variations in social forms are expressed through variation in the forms of buildings?

On reflection, our reaction tends to be against the idea of systematic relations. At first sight, a social organisation – say a school – is a set of roles and relations that can be fully described without invoking a building. However, the matter is not so easily settled. The *idea* of a school, if not its organisational diagram, implies more than roles and relations in the abstract. It implies roles and relations realised in spatial form in some way. There must, for example, be spatial interfaces of some kind between teachers and taught. Such interfaces define a kind of minimal spatial content not simply to the building, but to an organisation and therefore to the building. These spatial dimensions of organisation arise not from the form of the organisation but from its functioning. An organisation can be described without reference to space, and therefore without reference to buildings, but the way in which the organisation works usually cannot.

The idea of a school does after all seems imply some type of realisation in space. It was a recognition of this minimal spatial context in organisations that gave rise to the theory of buildings as 'interfaces' between 'inhabitants' and 'visitors', (such as priests and congregations, teachers and taught, families and guests), and between different categories of inhabitant that was set out in *The Social Logic of Space*[1]. Interfaces seem to define the essential spatial 'genotypes' of the buildings we name as belonging to this or that functional type. However, this leads to a difficult question: If societies regularly produce spatial genotypes in buildings, then is there some sense in which these genotypes are necessary to, and even a part of, society? An even more difficult question follows. If we find it hard to conceptualise how a building can have necessary social dimension to it, is it even harder to conceptualise how a society can have a necessary built dimension to it?

Our puzzle is then two-fold. Buildings seem to be physical things, and societies and organisations seem to be abstractions. Yet our ideas of buildings seem to contain social abstractions, and our idea of social organisations seems to contain ideas of buildings. The common coin of both relations seems to be the idea of space. Space both gives the form to the social abstractions which we name in buildings, and space seems to be the content of the building that can be taken back to the more abstract conceptions of society and organisation. The first defines the form-function problem in architecture. In what sense is there a regular relation

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between the forms of buildings and the ways in which the bits of society that inhabit them work? The second is the problem of the building as a social object. Is there any real sense in societies needing buildings to make them work? These two related problems will be dealt with in turn, beginning with a little recent history.

Recent history

It is sad, but true, that the theoretical nature of the form-function relation in architecture mainly comes to public attention through failure. When an architectural scheme – say an inner city redevelopment or a large housing estate – goes wrong in a public way, it is common to blame architects for their crazy theories. It is a one-sided game. Buildings and places that work rarely attract such epistemological comment. Good buildings and places are taken to be as nature intended rather than as artificial products of thought. No one ever praises architecture for the excellence of its theories. Only failure, it seems, alerts the man or woman on the upper level walkway or in the empty piazza to the highly theoretical nature of architecture.

But what exactly is it about architecture that these theoretical critics are referring to? They seem not to be talking about construction, since that would be regarded, rightly or wrongly, as a matter of fact, of knowable technique, and therefore a matter of competence rather than theory. Nor do they seem to be talking about aesthetics or style, since that would be regarded as a matter of taste or of art, and therefore a matter of sensibility rather than theory. Theoretical criticism of architecture seems squarely aimed at the second term of the Vitruvian triad of 'firmness, commodity, and delight'.[1] It addresses the way in which the physical and spatial form of buildings impinges on the way we live our lives – that is, the form-function relation.

As we have seen, the form-function relation is easy to talk about in a generalised way, but difficult to talk about precisely. It is not even clear how we should talk about it. The form-function relation, unlike construction, does not seem to belong to architecture as science, since there seem to be no clear facts, let alone explicit and testable theories. Nor does it belong to architecture as art. We cannot seriously see the North Peckham estate or Pruitt Igoe as failures of art. Yet the form-function relation does seem to be what people expect architectural theories to be about. On reflection, we might find that both architects and their theoretical critics agree that this is right. Architecture is a technique and an art with social consequences which are intrinsic rather than extrinsic. They lie in the nature of the object itself, as well as in its associations and symbolic meanings. Architectural theories do not therefore in general take the form of propositions about construction or propositions about art: they are in essence propositions about the relation between architecture and life; that is, about what architecture is for in relation to what it is. This is perhaps the distinctive feature that makes architecture unlike anything else that human beings do. At least part of its social implications lie in its very form, and our notions of what a theory is reflect this.

A great deal more of the current public debate about architecture than we allow is aimed at the form-function relation. People are worried about places that seem not to work; about developments in cities that lack the life that is the source

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of urbanity; about housing estates that do not seem to generate the elementary decencies of community life. They believe, rightly or wrongly, that architecture is in some way implicated. This creates a problem between architecture and its public that is more than one of communication, because, in spite of the fact that designing forms to fit functions is one of the foundations of architectural practice, the fact is that most of our usable knowledge about it comes from precedent and individual experience. There is very little theoretical understanding of the form-function relation. We even find it difficult to talk about in a consistent and rational way. Fortunately, when push comes to shove, the theoretical critics on the upper level walkway share our incoherence, and need only a little encouragement to conspire with us in talking about the problem as though it could be reduced to construction or aesthetics, or maybe the lack of shops, or transport, or nursery facilities.

The idea that there is so little theoretical understanding of form and function in architecture may surprise many, since it is widely believed that the failures of twentieth-century architecture are largely to be laid at the door of a 'functionalist' theory.[2] The conventional wisdom is that modernism failed because it was more concerned with the relation between form and function than with the relation between form and meaning, and that this was so because architecture, under the peculiar social pressures of the post bellum decades, had become more preoccupied with social engineering through architecture than with architecture itself. The subsequent disillusion with functionalism as the normative basis of design also became a rejection of the form-function relation as the primary focus for a theory of architecture, in favour of the form-meaning relation. Modernist functionalism was rejected not only as a false theory, but as a theory aimed at the wrong problem.

In retrospect, it is far from obvious that the rejection should have been so thoroughgoing. It was always clear that the 'failures' of modernism were not simply failures of a functionalist philosophy, but also functional failures. The new housing forms simply did not work to meet the benign social engineering objectives – community, interaction, identity, and so on – that were written into their programmes. The proper inference from this would seem to be that the functionalist theories used by the designers were wrong, but that functional failure had confirmed the central importance of the form-function relation. There could, after all, be no functional failure if the relation between form and function were not powerful. The call should then follow for a new theory of function. Instead, there was a abandonment of functional theory in general and an intellectual abandonment of the form-function problem at exactly the moment when functional failure had brought it dramatically to public attention.

To understand this apparently perverse reaction – and also see that in a certain sense it was justified – we must understand exactly what it was that was rejected. What was rejected, it will be argued, was not the form-function relation *per se*, since that continued to play the same practical role in architectural practice that it has always played, but a specific formulation of the form function problem that provided the foundation for architecture as social engineering. This we will call the 'paradigm of the machine'. The paradigm of the machine was the necessary foundation for the

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practice of architecture as social engineering, and originated in a debate between architecture and the social sciences. As a result, certain theoretical problems in the social sciences pertaining to the relation between the social world and the material world, were transmitted into architecture. To the extent that architecture became social engineering, the paradigm of the machine invaded architectural thought, took over its language and its institutional structures, and became pervasive and destructive.

The metaphor of the machine and the paradigm of the machine
We must begin by making a clear distinction between the paradigm of the machine and the metaphor of the machine. The most famous – some would say infamous – proposition of architectural theory in the twentieth century is probably Le Corbusier's 'A house is a machine for living in'.[3] On the face of it, this seems to assert a direct analogy between buildings and machines. In fact, a closer reading quickly suggests this is not to be taken seriously. A machine is an organisation of matter that transforms other matter through its operation. Nothing like this conception is to be found in Le Corbusier's text. Translating from machines to buildings would have to centre on the plan as the organiser of the life that goes on in a building. If the building is to be seen as a machine, then this implies that relation between the plan and the life that takes place in the plan is in some sense mechanistic, and that the former is either determinative, or a strict expression, of the latter. This belief is not to be found in Le Corbusier's text. On the contrary, when in his 'Manual of the dwelling' he explains in more detail 'the house as a machine for living in', he describes rooms, and exhorts clients to demand a whole range of rooms for new functions, but he does not discuss the organisation of rooms into a plan in any way.[4] It is clear that his preoccupation is not with the machine as formal analogue for the organisation of the dwelling, but with the machine as the metaphor for a style uncluttered with the decorative detritus of the past.

This interpretation is confirmed when, later on in the book, Le Corbusier does talk of plans. His approach is passionate, historical, and preoccupied with the symbolic potential of space.[5] It is clear that Le Corbusier sees the plan as part of architecture, and the space that is organised by the plan as a prime expression of architectural creativity. His spatial philosophy is specific: the principle spatial element is the axis. The organisation of the building is the organisation of its axes, that is, of its sequences of experience. The axis is fundamental because the experience of architecture is an experience of movement. 'Arrangement is the grading of axes, and so it is the grading of aims, the classification of intentions'.[6] There is no determinism in this view, only a strict rationalism by which the mind imposes its geometric self on the geometric potential of the external world, and calls it architecture. One finds in Le Corbusier then the metaphor of the machine, but not the paradigm of the machine. In general we will find this is the case in high architecture. One scours the architectural manifestos of the twentieth century in vain for a thoroughgoing statement of the determinism from spatial form to function, or its inverse, that would be the true architectural embodiment of the paradigmatic, as opposed to metaphoric, idea of the building as machine.[7]

Where then do we find the notorious functional determinism for which twentieth-century architecture has become famous and for which modernism has

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been so commonly blamed? The answer is that it is to be found in the social and political theorising that increasingly became the intellectual context of the practice of architecture as architecture moved towards a social engineering practice. The central proposition of architecture as social engineering is that specific social outcomes can be engineered by manipulating architecture this way and that. In other words, the relation between form and function in architecture is analogous to similar problems dealt with by engineers. If architecture is indeed social engineering then it needs a theory to explain how it works. The paradigm of the machine filled this need. We should call this the paradigm of the machine, not the theory of the machine, because a paradigm is a set of model ideas and assumptions about the fundamental constitution of a field of phenomena which tell us what there is to theorise about. It functions as a framework for thought and for the setting of objectives, both theoretical and practical. It tells us in effect what kind of a problem we are dealing with. A theory tells us how phenomena work, and therefore suggests how we might solve problems[8.] The paradigm of the machine, it will be argued sets up the form-function problem in such a way that it could never generate a credible form-function theory.

The reader might object at this point that the possibility of pursuing social objectives through architecture has been reaffirmed throughout this book, since spatial form in architecture has been shown to have social determinants and social consequences. This is a correct accusation. But the substance of the proposal here is different. The central argument in this book is that the relation between form and function at all levels of the built environment, from the dwelling to the city, passes through the variable of spatial configurations. The effects of spatial configuration are not on individuals, but on collections of individuals and how they interrelate through space. All that is proposed, in effect, is that a pattern of space in a complex can affect the pattern of co-presence and co-awareness of collections of people who inhabit and visit that complex. This is a very obvious thing to say. The most likely answer is: 'Well of course ...' One is more likely to object to its triviality than to its metaphysics. All that has been done in earlier chapters is to show very carefully exactly how this occurs, and how these low-level effects link to more interesting, more obviously social effects.

Now the essence of the social engineering approach to the form-function relation in architecture was that it had no conception of spatial configuration, and without this the effects we will find ourselves looking for are not effects from one type of pattern to another, but from physical forms directly to individuals. The building itself is seen as the machine, and the physical form of the building the determinant of behaviour. Such relations do not exist, or at least not in any interesting sense. Belief in their existence really does violate common sense. How can a material object like a building impinge directly on human behaviour? Even so, it is exactly this that we are expected to believe if we abandon spatial configuration as the intervening variable. The paradigm of the machine in effect asks us to believe that the relation of form to function in architecture passes not, credibly, from a pattern of space created by the building to a pattern of co-awareness and co-presence, but, incredibly, directly from building to individual.

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There are many versions of this belief. Some assume that direct relation between building and behaviour should take the form of 'fitting' activities to spaces. Others stress the intervening role of cognition, for example, that the built environment acts as a series of 'clue and clues' to behaviour or as a kind of theatrical back cloth which is 'appropriate' for the activity happening in front of it. All have in common that they presuppose a relation between built form and behaviour unmediated by spatial configuration.[9] That such relations do not really exist in any systematic sense seems amply confirmed both by the lack of research results which show such relations, and by the fact that the only relations we can find are those that pass through spatial configuration. The effect of the paradigm of the machine on the theory and practice of architecture was therefore to base architectural practice on a theoretical foundation which generated no research results and could predict no outcomes from design. Architecture as social engineering was in effect founded on a postulate of a relation between built form and human function which could not be verified because it was not there.

It was this naïve formulation of the form-function relation in architecture that was rejected with the demise of modernism. Unfortunately, by then it had become, through its normative role in design, so fully enmeshed with the whole idea of the form-function problem in architecture, that the rejection of the paradigm became, for a while at least, the rejection of the problem, and consequently of the need for a form function theory in architecture at all. This chain of events is evidence of the ability of paradigms to exert covert power on human thought. The paradigm of the machine was always strange to architects, but it became the foundation for modernism in action, through its role in the programmes of social engineering that architecture was enjoined to carry out in the post-war decades. The paradigm of the machine was an idea about architecture that never became a properly architectural idea, for the simple reason that the relations on which the paradigm were posited simply do not exist. Their hypothetical existence was an illusion of the paradigm.

Once we have located the paradigm of the machine as the necessary belief system of architecture as social engineering, we can begin to trace its origins and understand its true nature. Its origins turn out to be a great deal older than we might think, and link up to a much wider spectrum of ideas that began to prevail in intellectual life towards the end of the eighteenth and in the early part of the nineteenth century. This broader underlying scheme of thought that gave rise to the paradigm of the machine constitutes what I will call the 'organism-environment paradigm'. To understand its nature we must understand the origins of its key conceptual constituent: the idea of 'environment'.

The origins of the environment
'Environment' is one of those curious words which we assume have always been around, but which are in fact quite recent additions to our vocabulary, and to our system of common concepts. It is an interestingly complex idea. It implies not only the milieu in which we exist, but a milieu which surrounds us. Environing means to surround, so an environment is not only a physical milieu but one which actively

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and significantly surrounds, so that the environed thing in some way is aware of, or affected by, its 'environment'. Environment as a surrounding thing implies an experiencing subject at its centre. In the late twentieth century, we confirm this complexity in the term environment by using it to express not only a new awareness of the importance of our milieu, but also of our relation to it.

In this form, the idea was barely present in common consciousness until well past the turn of the century, and it is only in the past three decades that it has become a dominant element in our view of ourselves and our place in the world. Because of the importance of the concept in current thinking, the argument that is about to be proposed needs very careful definition. In being critical of the effects of the concept of environment in the formation of certain paradigmatic schemes, there is no implied criticism of the change in our awareness of our surroundings that the idea of environment has helped to bring about. There are however, hidden dangers in the concept. In particular, we must investigate the origins and meanings of the word if we are to fully understand the origins, and the malign effects of the paradigm of the machine in architecture.

According to Canguihem[10], we must look for the origins of the concept of environment in its modern sense in the eighteenth century, and some very significant developments that took place then in the development of scientific thinking about the natural world. To understand the scientific developments, we must know the problem to which they were addressed, and for this we must go all the way back to Aristotle. In looking at the natural world, especially those areas which are covered by such modern sciences as biology and zoology (but also including the areas now covered by physics and chemistry), what Aristotle saw in nature was a general form-function problem: how was it that the forms of species (or other natural forms) were so well adapted to how they functioned? We might say that for this reason Aristotle saw nature as a design problem, and sought an answer which would explain how nature managed to design such successful form-function relations.

Aristotle answered by making an analogy with architecture. This analogy is so pervasive in Aristotle's accounts of nature that it should be thought of as Aristotle's paradigm. The form of a house, Aristotle argued cannot be explained by a purely material process of laying stone on stone. This 'material' process had to be guided by a pre-existing idea of the form the house was to take. What is the nature of such ideas and where do they come from? They are, according to Aristotle, purposes. The form of a house arises from human purposes. Forms are therefore expressions of purposes and indeed, in a sense, are purposes. As it is in architecture, Aristotle argues, so it must be in nature, since we find the same agreement between form and apparent purpose. Aristotle then generalises. Material causes explain little. Final causes are purposes. The source of order in nature must therefore be purposeful design. It would not be too much of an exaggeration to say that the entire Aristotelian system of nature was erected on this architectural foundation.[11] Its flaws are well known. From a scientific point of view, arguing from design explains nothing. It does no more than remove one mystery by invoking another, and explain one kind of order by assuming another anterior to it.

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Now the reason these ideas are an important background in the eighteenth century is that in key areas of science, such as physics, theories had arisen which seemed not only to be true, but also showed how it was possible to explain order without the assumption of anterior order. How surprising this apparent emancipation of human thought seemed can best be explained by a contrast with Aristotelian physics. The fundamental assumptions of Aristotelian physics were common sense. If something moved, it was because something else had moved it. All our experience confirms this. Yet it leads to an impossible physics. For example, according to these assumptions, it was self evident that the forces that impelled movement could not work in a void. From this it followed that space was a plenum, rather than a vacuum. In such a universe, the chain of movement must be endless. Whatever moves, something else must itself be moved. What then is at the end of the line? Aristotle answers with a verbal conjuring trick: the unmoved mover.

Newton's solution to the paradoxes of Aristotelian physics is as well known as it is extraordinary. Following earlier incomplete formulations by Galileo and Descartes, he proposes a principle which contradicts all experience available at the time, the 'principle of inertia' which states that all bodies move 'in a right line' forever until impelled by some external force to change their course.[12] This reformulation puts motion 'on the same level of being as rest',[13] so that motion is no longer a change, as it was in Aristotle, but a state. This is why it can continue forever, and this is why the principle of inertia can be used as the fundamental assumption of a mathematical physics, whose task was then to describe how forces work on inert bodies to produce the patterns that we see in the universe.

Of course, some of Newton's contemporaries objected that in eliminating common sense Newton had also eliminated physics, and was offering a mathematical description but not a physical theory.[14] On the other hand, Newton's theory, with the minimum of assumptions and with the greatest simplicity, gave an astonishingly accurate account of a vast range of previously disparate phenomena, and permitted a uncanny accuracy of prediction across many fields. In other words, although it did not show why the world worked the way it did in any way which satisfied common sense intuition, it showed how it worked with unprecedented precision. Most important of all, Newton's theory showed how there could be observable order in the universe without invoking some pregiven order which gave rise to it. To accept that the universe worked mathematically needed no stronger presupposition than that a soap bubble is spherical because that represents the most probable distribution of forces.

It was this discovery of order without anterior order that provided the conceptual model for the attempts in the century following Newton to make a parallel emancipation in our understanding of other natural phenomena. From this point of view, the problem that had originally motivated Aristotle, the forms of species in nature and their relation to function, seemed intractable. How could there be a theory of the origination of order in natural species without anterior order, or design in some guise, the more so in view of the fact that in this vastly rich and diverse area of forms Aristotle's original objection that mathematics could not be the language of science because it was too precise and

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abstract, seemed still to hold force, despite the conquest of physics by mathematics.

The modern concept of 'environment' took its form essentially as the first attempt to formulate a solution to this problem: namely, the environmental determination of species. In different parts of the world – and therefore in different ambient conditions – very different patterns of speciation had occurred. The idea of the environmental determination of the forms of species quite simply turned the problem into the solution. If different speciation was to be found in different regions, what more natural proposition was there than that it was the conditions prevailing in these regions that had led to differential speciation in the first place? There were many variants on this underlying scheme of environmental determination, and no clear idea was proposed of how the mechanism of environment determining form might actually work.[15] But since Newton we did not need to be sure of mechanism before we believed in a theory, and the idea of environmental determination had great force because it showed for the first time how in the perplexing world of natural forms order could, in principle, arise from a natural process without the existence of pregiven order. In that sense, the epistemological force of environmental determinism captured something of the glamour that surrounded the theories of the physicists. It is within this scheme of thought that our modern notion of 'environment' originates. An environment not only surrounds: it affects and influences. The idea of environment is closely bound up with the idea of a being or organism at its centre drawing in to itself these effects and influences, and also creative contributing from its own interior nature to the interactive process by which its form, and hence the relationship between its form and its behaviour, is developed.

The organism-environment paradigm
This scheme of thought is so important in the history of western cultures that it deserves a name – perhaps the 'organism-environment paradigm'.[16] By this is meant not simply the idea of environmental determination but also the vitalistic and subjectivistic objections to it which sought to involve the organism itself in the process of the evolution of its form,[17] since these ideas are virtually called into existence by environmental determinism. The organism-environment paradigm is the scheme of ideas that forces us to choose between objective determination by the 'environment' and the subjective objections to this. It is an intellectual framework which still influences certain fields of scholarship much more than it ought, since within a century of its inception, the whole scheme of thought had been replaced in the field where it has originated by the far more sophisticated paradigm of evolution theory, in which the environment was no longer seen as mould, but as a selector, and the relation of organism to environment not as a direct physical relation of cause and effect, but as an indirect relation, mediated by what we would now call genetic information structures, passed from one generation to the next, and gradually evolving, but not on the timescale of individuals. The Darwinian scheme is not an adjustment within the organism-environment paradigm, but a replacement of it by another paradigm, one in which the dominant process is not an interaction between the physical organism and its environment but an abstract statistical mechanism in which informational structures built into organisms diffuse and decay in

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the evolving population according to the probability of randomly generated mutations leading to greater success in leaving progeny.[18] The substitution of random variation of forms for the environmental determination of forms has, we may note, exactly the same epistemological function as the substitution of inertia for caused movement in Newton's theory. Through this it shows the way to order without pregiven order in nature, and to an emancipation of the study of nature on to the level of physics.

From the point of view of the origins of the machine analogy in architecture, we have to understand that the organism-environment paradigm, while showing little scientific explanatory power in the late eighteenth and early nineteenth centuries, had great metaphorical power. Well before Darwin, through that little understood process by which scientific ideas become absorbed into culture, we find the organism-environment idea diffusing with paradigmatic force well beyond the bounds of 'natural history' (as it was then called). Balzac, for example, used it explicitly as one of the guiding ideas in his *Comedie Humaine*, seeing social species as products of milieu, and his novels as their natural history. 'The idea (for his *Comedie Humaine*)' wrote Balzac 'originated in a comparison between humanity and animality...As we read the writing of the mystics who studied the sciences in their relation to the infinite, and the works of the greatest authors on Natural History...we detect in the monads of Leibnitz, in the organic molecules of Buffon, in the vegetative force of Needham, in the correlation of similar organs of Charles Bonnet...we detect I say the rudiments of the great law of Self for Self, which lies at the root of Unity of Structure. There is but one animal. The creator works on a single model for every organised being. 'The Animal' is elementary, and takes its external form, or to be accurate the differences in its external form, from the environment in which it is obliged to develop. Zoological species are the result of these differences...I for my part, convinced of this scheme of nature long before the discussion to which it has given rise, perceived that in this respect society resembled nature. For does not society modify Man, according to the conditions in which he lives and acts, into men as manifold as the species in Zoology?...If Buffon could produce a magnificent work by attempting to represent in a book the whole realm of zoology, was there not room for a work of the same kind on society?'[19]

It is in Balzac's novels that we find some of the earliest examples of that exact, atmospheric description of physical environments, presaging personages and their misfortunes, and creating in the reader's mind a quasi-naturalistic association between environment and human being, which is so characteristic of the technique of the nineteenth-century novel.[20] More significantly for our present theme, environmental determinism provided the intellectual spark for the late eighteenth and early nineteenth-century fashion for 'architectural determinism': the mechanistic idea that architectural design could, if handled right, directly cause beneficial effects on the moral and social lives of people. This became a pervasive influence on social reformers of the period, as well as on the builders of prisons and asylums.[21] It was this that established the paradigmatic idea that architecture could be both understood and exploited by direct analogy to machines, a reconciliation attractive and understandable to early nineteenth-century thought. Architectural determinism

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seemed to normalise the problems of architecture by making them look like problems of engineering. Through its association with the expanding social engineering purposes of early nineteenth-century architecture, and the increasing sponsorship of the state, architectural determinism came to be seen as a powerful, scientific and action-orientated reformulation of the form-function relation in architecture.

Architectural determinism, of course, is no more true than environmental determinism had been, nor should we expect it to be. As with Lamarkism, no results have been produced which even begin to compel our belief. However, unlike environmental determinism, architectural determinism survived Darwin. There were probably three reasons for this improper survival. First, environmental determinism was a scientific error, and therefore refutable, whilst architectural determinism was a more diffuse cultural paradigm, often below the level of conscious thought, and not exposed therefore to direct refutation. Second, because it was a cultural belief, it tended to become institutionalised. If you spent money on architecture as moral engineering, then you had to believe in it. Third, the Darwinian revolution left many of the cultural by-products of environmental determinism behind because the metaphorical impact of Darwinism on culture lay elsewhere, in the survival of the fittest and the descent from monkeys, with the reformulation of the form-function problem in nature only in the small print read by the specialist.

For whatever reason, the organism-environment paradigm survived into the twentieth century. Partly through its association with the determinism associated with architecture as social engineering, it became the default position for the formulation of all problems dealing with the relation of human beings and their built environment. This default survival takes many forms; the study of human 'response' to the built environment; the study of cognitive schemes by which we represent the built environment to ourselves; the study of built environments as theatrical sets or back cloths providing cues and clues for the activity that is intended to take place in the foreground; the study of 'territory', that is, the study of the space exterior to the individual insofar as it is constructed and interpreted through drives emanating from inside the individual – all these use the same underlying paradigmatic scheme of an individual surrounded by an environment which that individual seeks to interpret or affect.

It is through engagement with this default intellectualisation of the form-function problem that architecture, as it engages in social engineering, also engages the paradigm of the machine, and the assumption it implies of the direct and mechanistic relation between an individual and that individual's immediate environment. The metaphor of the machine, we might say, met the paradigm of the machine, and the prison of ideas was complete. Through the powerful effects of customary language on our habitual patterns of thought, this has become the natural and inevitable formulation of a whole class of problems, so much so that the appeal of writers like Giddens[22] to bring space and time back into the 'constitution of society' are in effect largely forbidden by the continuing invisible effects of this paradigmatic background, because they make it appear as a return to nineteenth-century mechansim.

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The covert power of the paradigm is reinforced by the ease with which the organism-environment scheme ingests and reinterprets more ancient dualities. For example, the Cartesian duality of *res cogitans*, the thing that thinks, and *res extensa*, the thing that is, is re-expressed as the relation between abstract, individual minds and concrete surrounding environments. Similarly the distinction between subject and object becomes the experiencing mind and the experienced environmental object. Even the rival historical speculations of rationalism and empiricism find a resting place in the superordinate, apparently empirical concept of an individual mind, receptive and constructive, surrounded by a material environment, emanating and malleable. A history of errors is, it seems, confirmed as a progressive orthodoxy by the new formulation.

However, the worst outcome of the paradigm of the machine, and its intellectual parent the organism-environment paradigm, is that by representing the human subject as the object of concern at the centre of an influencing and influenced environment, the appearance is set up of a humane science concerned with understanding the effects of built environment on the social, cognitive and emotional life of people. But within this formulation no such effects are discoverable, other than those that do arise from the simple physical presence of an individual in an environment, such as the effects of air pollution on health, or the effect of sun on diseases of the skin. The appearance of the humane science is, in the last analysis, an inhumane deception.

At root, these consequences follow from the fact that the paradigm of the machine sets up the built environment as no more than an inert physical background to the behaviour and experiences of people. In effect, the artificial environment is being treated as a natural environment. This blinds the inquirer to the most significant single fact about the built environment: that it is not simply a background to social behaviour – it is itself a social behaviour. Prior to being experienced by subjects, it is already imbued with patterns which reflect its origin in the behaviours though which it is created. These patterns are reflected first and foremost as spatial configurations. As we have seen in earlier chapters, it is only when we understand the configurational nature of space and the origins of spatial configuration in the built environment in social behaviour, that we can begin to understand its effects on social behaviour. Both of these fundamental facts – the fact of spatial configuration and the fact of the social construction – the paradigm of the machine renders invisible.

What the paradigm of the machine defines instead is a quest for material, cognitive or symbolic influences that, as it were, emanate from the built environment surrounding individuals, and somehow 'cause' behaviour or response in those individuals. Yet the built environment that is expected to do this has no history, no immanent social content and no relation to the larger-scale society. The relation of people to environment is thus reduced to one that is both localised in physical space and decontextualised in logical space. The effects sought are for those individuals in that space at that time, free of spatial or social context. There is no evidence that any such systematic effects are anything but imaginary.

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Wherever architecture sought interaction with the social sciences – that is, to the extent that architecture sought social engineering objectives – this was the dominant paradigm within which questions were formulated, and research initiated. It is this mechanistic formulation of the form-function problem as one of a mechanistic relation between an experiencing subject and an objective environment, unmediated by spatial configuration, that was decisively rejected with the fall of modernism. It was rejected because it had led architectural practice and theory into an impasse in which the form-function relation seems paradoxical. The paradox is that if architectural determinism is true then effects should follow from design that simply do not follow in reality. Yet if architectural determinism is untrue, then design does not seem to matter since no adverse or beneficial social consequences can follow whatever we do. This paradox was eventually crystallised by the architecture that most thoroughly embodies the idea of architecture as social engineering: the innovative housing estates of modernism. These estates were the embodiment of the benign intentions of architecture as social engineering. Yet it was exactly as social engineering that they seemed to fail. Architectural determinism had failed. Yet architecture it seemed had determined the failure.

Unfortunately, by the time this became clear, the invisible effects of paradigms to take over language, and guide thought by unconscious constraint, had made this seem the only possible formulation of the form-function problem. The abandonment of form and function as the central problematic of architectural theory, and its substitution by the form-meaning problem, was the result. In architectural polemic, the metaphor of the machine was succeeded by the metaphor of language, and in research the fallacious paradigm of the machine was succeeded by the – as we will see in a future text – equally fallacious paradigm of language. The paradigm of the machine had effectively 'structurally excluded from thought' exactly the pattern relations between space and people that are the essence of the form-function relation in architecture.

Let us then review the idea we wish to dispense with. Architectural determinism, the paradigm of the machine, and the organism-environment paradigm are all different names for the same underlying scheme of thought whose foundations we have hopefully now fatally undermined. Architectural determinism is the way in which the scheme of ideas appears within architecture, and confront its practice and its theory. The paradigm of the machine is the invisible scheme of thought which history implanted in architectural discourse as the framework within which the form-function relation, seen as social engineering, should be defined. The organism-environment paradigm is the broader and older master scheme of quasi-scientific ideas on which the whole fallacious structure was erected. The three-level scheme constructs an apparatus of thought within which neither the form-function relation in architecture, nor the role of space in society, can be formulated in such a way that research can be defined and progress made in understanding.

This whole tripartite edifice of thought is dissolved by the proposition that the form-function relation in architecture, and the relation of space to society, is mediated by spatial configuration. Spatial configuration proposes a theory in which we find

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pattern effects from space to people and from people to space that in no way invokes mechanistic determinism. At the same time, the configuration paradigm saves the idea that architecture has social effects. By changing the design of a building or complex we do change outcomes. There is after all some kind of mechanism between the built world and people. But the machine is not the building. Space is the machine.

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We saw in Chapter 2 that every theory must exist within a broader paradigmatic scheme of ideas that defines the nature of the field and what types of problems are to be opened up to research. How then should a general paradigmatic scheme for this redefinition of the relation between buildings and people be formulated? One thing is clear. Previous definitions of the relation have been based on analogy with fields other than architecture. The redefinition proposed here has no external analogue. It is, shall we say, the paradigm of architecture and, if we are right, the paradigm of architecture is a configuration paradigm. How may the configurational paradigm of architecture then be formulated as a general scheme of ideas? Let me suggest what may seem at first an odd manoeuvre: a thoroughgoing comparison between buildings and machines. It turns out that this may after all be illuminating, especially in the light of the research results reported in earlier chapters.

If we think of form and function in a machine, then it is clear that a description of the form would be a state description of a system of differentiated parts that make up the machine, and a description of function would be a dynamic description of how the parts move in a co-ordinated way to impel and process some material. Conceptually, we might say a machine has three aspects: what it is, how it works, and what it does to something else. If we try to apply this to built forms (obviously leaving aside the building's mechanical plant, which is a normal machine) then we encounter difficulties in all three aspects. First, as spatial elements the parts of a building tend to be weakly differentiated. There is a more or less universal list of space types – rooms, corridors, courts and so on – which vary in their size and shape but not in their basic nature. In Chapter 8 we saw how this came about, and that these spatial types were essentially configurational strategies. Even so, for practical purposes, this also shows why the apparent lexicon of spatial types is so limited. This, we saw, was one of the reasons why buildings designed for one set of activities are often easily adapted for others. Second, the parts of buildings don't move. There is only a state description of them. Third, people, the hypothetical processed material, do move, but not under any impulse from the buildings. On the contrary they move independently and under their own motivation. To caricature Aristotle, in buildings people are unmoved movers. As we will see in a moment, this reference back to Aristotelian physics is not idle.

However, through configurational analysis and empirical investigations we now know a number of things about buildings which bear directly on the differences between them and machines. First, although the types of space in a building are fairly universal, they differ significantly when seen from the point of view of configuration. How the rest of the building is available as a configuration

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from a space, as shown by an 'integration value' is one of the most marked types of differentiation between spaces. Configuration, it seems, does after all turn the building into a system of differentiated parts, not in a machine-like sense, but in a quite unique, architectural sense.

Now, we also know that there are two ways in which these differences relate to function. First, function can use configurational differences to give a picture of itself in the spatial form of the building, so that the building comes to embody social and cultural information in its form. The building thus is no longer a mere physical object, any more than (after Darwin) an organism was a mere physical object. Through configurations, buildings, like organisms, both contain and transmit information. Second, we know that although the parts of a building do not move, through their configurational differences they do affect the pattern of movement, in that, other things being equal, the degree to which spaces are used for movement is a function of their configurational position. This is not an effect of the building on individuals, but a system effect from the space structure of the building to the probabilistic distribution of people. We do not therefore need hypotheses about how the building enters the mental state of individuals and compels them in this or that direction, as would be required by architectural determinism. We have transformed the mechanism from the Aristotelian to the Newtonian mode. Natural movement is a kind of inertia theory: it says not how individuals are impelled by buildings to move in this or that direction, but that, given that they move, then their distribution in a spatial configuration will follow certain mathematical and morphological laws, given only that movement is from all – or at least, most – parts to all others, and follows some principle of economy in route selection.

Now in the first, Darwinian, sense that buildings are, through their spatial configurations, embodiments of social information governing what must happen and where, we can then say that the building is a dependent variable in a social process. Its spatial form is, in a well-defined though limited sense, a product of its social function. However, in the second, Newtonian, sense that spatial configuration is generative of movement configuration, and thus of potential co-presences among people, then we can also see that the building as an independent variable is a social process. Its function is, in an equally well-defined sense, created by its spatial form. In other words, buildings can both receive information from society through spatial configuration, and also transmit effects back to society through configuration.

How do these bifurcating tendencies relate to each other? There are two aspects to the answer. The first is that, the two tendencies are dynamically interrelated. A functional genotype in a building is a temporary fixation of cultural rules in configurational form. But its expression has already been constructed within the laws of 'generic function' as discussed in Chapter 8, that is, on the one hand, by local-to-global laws by which local physical changes have, both in themselves and when applied successively, global effects on spatial configuration; and, on the other, laws which link these local-to-global effects to generic function, that is, the properties of intelligibility and functionality that permit a spatial complex

to be adapted in principle for human occupation and movement. In other words, the building in its 'Darwinian' mode as a spatial complex embodying social information already embodies the 'Newtonian' laws by which a building already constitutes, in itself, a field of potential movement and co-presence. For example, an integrated space for everyday living is one in which generated movement is natural to its function, while a segregated space for use only on special occasions is one where generated movement is not.

Thus the genotypes which order cultural patterns of space use already tend to reflect the generative laws of space. Where they do not, it may be a failure of design, or it may simply be a reflection of the fact that cultural patterns tend to be more complex than the possibilities offered by space, and it may not be possible to give a spatial form to all the social rules that operate in a situation. In either case, we find that the shortcomings of space tend to be compensated by reinforced behaviours of individuals to ensure that the cultural pattern survives. In spite of the lawfulness of space, and its relation to human life in space, there is still some degree of interchange between the structure of space itself and human activity realised in space, in that if space does not provide adequately for the realisation of some set of rules for social relations in space, then this lack may be compensated for by special behaviours. For example, as Justin de Syllas showed in a pioneering study[23] (which still remains unpublished because of the reluctance of professional journals to allow serious analytic criticisms of architects' buildings), in a children's assessment centre the failure of the building to provide for natural surveillance of the children by the staff through everyday patterns of activity, combined with the excessively complex and permissive layout of the building, created a situation in which staff had to compensate for the lack of spatial controls by behaving like gaolers themselves, continually locking doors, and attempting to police restrictive rules.

The second aspect of the answer is that the two contrary tendencies are unequal, in the sense that the 'Newtonian', or generative, properties of the building will always operate unless there are social rules and practises to restrict their operation, whereas the 'Darwinian', or informational, properties of buildings usually require the support of social rules and practices. In other words, spatial configurations will naturally tend to follow the generative laws except insofar as they are restricted by social rules. We thus find that, as discussed in Chapter 7, buildings vary between those which tend to express and restrict social relations and those which tend to generate social relations. Where we find strong genotypes, we find them associated with strong rules of behaviour, because the form of the building is already a mapping of that behaviour. But when the social rules decay, or are no longer enforced, then the spatial configuration reverts to the generative mode. Its spatial patterns will generate only the patterns of co-presence that would be expected by the theory of natural movement. Thus a courtroom stripped of judges and judged, and set in a funfair, ceases to be a courtroom and becomes a pure expression of the generative laws of space. The relation of spatial configuration to people is unmediated by social rules. The only effect of that space will be the effect

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of those patterns on patterns of movement even though they were originally created to express social rules. The system is, as it were, reduced to its own inertia. This inertia, however, is still lawful.

Buildings are thus probabilistic space machines, able to absorb as well as generate social information through their configuration. In a very restricted sense then, we can say that buildings are machine-like, in that they are physical systems which through their spatial properties produce well-defined functional outcomes. In another, equally restricted sense, buildings are language-like, in that they embody, impart and transmit social information. But we would not understand either of these restricted truths unless we had first understood that, in their essential nature and dynamics, buildings are neither machine nor language. In that they are probabilistic space machines, buildings resemble nothing else.

As probabilistic space machines, buildings are subject to three types of law. First, there are the self-contained 'laws of space', which take the form of implications from local physical design moves to global spatial configurational effects. Second, there are laws which link the field of possibility created by the first type of law to 'generic function', that is, to basic intelligibility and functionality, especially natural movement. Third, there are laws by which social formations, and the patterns of rule-governed spatial activity they give rise to, make use of these two types of law to give a picture of themselves in space-time, and through this to give rise to the sense that buildings are in some far-reaching sense, social objects, and as such important to society, and even, in some sense, part of it. This points us to our second question.

Buildings as social objects

Through the mechanism of the form-function relation, as it has just been described, it has been shown how, starting from the building as physical objects and society as abstraction, through the intermediary of space, social abstractions become embedded in buildings and can also be influenced by buildings. This led to an answer to the question: how is it that buildings are replete with social ideas? We will now consider the reverse question: how is it that social institutions contain ideas about buildings, and does it matter that they do? What, in short, is the role of buildings in society?

We may begin by reminding ourselves of a basic distinction made in Chapter 1, a distinction that was the foundation on which the whole configurational theory was erected. This is the simple proposition that human beings inhabit two types of co-existent world; a continuous material world of objects and spaces which we occupy and move about in physically; and a discontinuous world of expressive forms, signs and symbols which we occupy cognitively. The former is 'real' space, the latter logical space. The act of building, through the creation of configuration in space and form, converts these into a single world. A configurational world is a continuous spatial world constructed so that expressivity also has become continuous. Building is the meeting point of the two worlds, where real space is converted into logical space.

Through their combination of the real and expressive worlds, buildings convert the material world which we inhabit into a non-discursive world of culture,

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indeed into culture's densest locus. Through this conversion, the material world becomes for us information and idea rather than thing. Because culture functions non-discursively, and makes the artificial appear natural, the built world we have made into information and idea comes to appear natural to us. We become less and less aware of it precisely because it supports our cultural identity by acting as its embodied basis. The building becomes seemingly dematerialised into non-discursivity and therefore into culture, while remaining at the same time the physical and spatial milieu in which we live bodily.

Through this assimilation of the material world in the cultural world, building becomes a puzzle for us. We become so used to its autonomic culturality that we are taken by surprise when we remember its physical nature. We begin to make distinctions between house and home, and between building and dwelling[24], protesting that building is 'mere material' while something else, some immaterial human stuff, is the essence of what appears at first to be a physical object. Underlying these distinctions is a serious philosophical difficulty: how can the material world be involved in our social and cultural lives when our experience of society and culture seem centred in our minds? We encounter the same difficulty when we try to separate social institutions from the buildings they occupy. It is clear that the centre of what we mean by a social institution is an arrangement among people. Such an arrangement can surely exist without a building. Thus we say that a church is 'mere bricks and mortar', nothing without priest and congregation. The truth of this seems affirmed by the abandoned church building without either.

But the fact that a church building without its social set up is no longer 'really a church' does not imply that with its social set up the building is a mere physical appendage.[25] The fact that the social set up 'gives a meaning' to the building is more than an association of ideas. Once a social set-up with its building exists, then the building is much more than a stage set or background. In itself it transmits through its spatial and physical form key aspects of the form of the social set up. The case of the church is particularly clear, since the entire form of the building is dedicated to the support of a spatialised ritual of some kind, and the provision of an audience for that ritual. By providing a spatial form adapted to a particular ritual the building becomes part of the means by which that ritual is enacted by its community. Since rituals only survive insofar as they are enacted in real space-time, the building becomes a powerful part of the means by which that ritual is perpetuated, and transmitted into the future.

However, the matter is yet more complicated. The difficulty in understanding how a house is an aspect of a home, and a building an aspect of an institution, reflects our inability to understand how what appear to naïve perception as abstractions and physical things – that is, social institution and buildings – can be genuinely interrelated. In fact, this is only one aspect of a more general difficulty. We have the same problem in trying to decide whether social institutions, or whole societies, actually exist, or are simply common ideas in the minds of collections of individuals. How can the abstraction we call society take on physical form, as it

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seems it must do if it is to be real in the normally accepted senses of the word? If society does exist, then in what sense does it exist? Clearly, there is a problem in assigning society a material existence in the same sense that we assign an individual a material existence. Yet if societies do not exist in a material sense, then in what sense can they be said to 'really exist'? This problem is a further obstruction in the way of understanding the relations between buildings and society. If we do not assign society some kind of material existence it seems unlikely that we can formulate answers to questions as to why and how spatialisation through the house as home and the church building as an aspect of the church institution should be so consistent an aspect of society. We may pose it as a question: if society does not require spatialisation, then why does it give itself spatial form in such consistent ways? If society is immaterial, then surely it would not require this consistency of materialisation.

Fortunately, the idea of society 'really existing' is not exhausted by the possibilities of existing in the same sense that individuals, or material objects, exist, that is, as continuous, finite entities occupying a well-defined region of space-time. Once again we find paradigmatic ideas obstructing the formulation of the problem, and indeed once again these ideas are essentially ideas which are overly mechanistic, and obscure the relation between the abstract and material world. At root our inability to conceptualise society as a thing has its origins in the most fundamental of our materialistic prejudices: the idea of a thing. Things, it will turn out, are not as simple as they seem.

We may begin with a famous problem in philosophy, allegedly originating with Heraclitus and discussed at length (and recently by philosophical standards) by Quine,[26] about the definition of rivers. How can we say that a river is a thing when its constitutive elements – water molecules – keep changing, and will be found now here, now elsewhere in the river, then in a nearby sea, then as falling rain? Once said, the difficulty ramifies. Perpetual elimination and replacement of parts is also true of human beings. We should see ourselves not as things, perhaps, but as processes. The common sense definition of individuals as things, and even of things in general, seems after all to be illusory, the result of a naïve perception of the world.

But where does it end? Is all 'flux and change', and are all assertions of the 'thingness' of the world just temporary fixations? Or can we save the idea of thingness by a more careful definition? Consider three entities which seem to have different degrees of thingness: a one-metre cubed empty box lying on the ground below a tree on a warm summer evening with a light wind; a swarm of gnats three metres above the box; and a cubic metre of gnat-free air three metres to the east of the swarm. The box is clearly a thing, the cubic metre of air not, even though it is a finite physical entity in time and space. The swarm we instinctively name as a thing, even though it seems dubiously to satisfy common sense criteria. Can we then arrive at a general definition which clarifies what is and is not a thing?

First, what does the swarm have that the cubic metre of air does not? Let us reflect on how the swarm comes into existence. The swarm appears random

but it is not. It is a partially random system subject to at least one restriction: that individual gnats move randomly only until they see a field of vision empty of gnats, when they turn and fly back in the direction of gnats. This rule, followed by each individual gnat, is enough to convert a set of individuals into a swarm. Every now and then a gnat will be lost and another gained, but this does not affect the existence of the swarm because the swarm does not depend on any individual. It arises from certain consistencies in the behaviour of a collection of individuals, without any individual needing to have a conception of a swarm.[27]

However, we do have a conception of a swarm, and are inclined to call it a thing. Why? How can we conceptualise this sense of thingness? The answer requires two stages. First, the sense of thingness appears because we note through time relational persistences among gnats, that is, ways in which gnats relate to other gnats, that manifest themselves in space and persist through time. Because these relations are multiple and simultaneous we may call them configurational persistencies. Second, these configurational persistences have the quite objective effect that the thing we think we see, the swarm, offers some resistance to determination by forces external to itself, for example the light wind that we noted was blowing. In both these senses, the swarm differs from the cubic metre of air. There are no relational persistences arising from the air molecules such that these persistencies resist determination by external forces. The light wind blows away the air molecules and replaces them with others, but leaves the swarm of gnats. Of course if the wind were a strong wind, then both the cubic metre and the swarm might be blown away. But that does not eliminate our point. The configurational persistence of the swarm offers a certain resistance to externalities that manifests itself as a temporary stability in space-time, and this seems enough to call it a thing.

By these criteria, the cubic metre of air is clearly not a thing, but the box on the ground clearly is. Its configurational persistences are of a more durable and fixed kind than those of the swarm, but nevertheless it is clearly these persistences that lead us to call it a box rather than a collection of pieces of wood. As with the swarm, also, these configurational persistences, while stronger than the swarm do not offer endless resistance to externalities. A major explosion for example could disperse the box sufficiently for us to say that it no longer existed. The passage of sufficient time would have a similar effect. Taking the definition of things farther afield, it seems to work for rivers, which we can see as configurational persistencies amongst banks, water molecules and land gradients, rather than simply as water molecules. From here, it clearly works for less difficult cases such as human beings. If it has configurational persistencies, we might say, then it's a thing.

Now an interesting aspect of this definition of what we see and say is a thing is that what we are defining is a process, or, more precisely, a particular stage of a process, with the particular attributes of configurational persistence. In other words, we have made our problem in defining things – that what we see appears to be process rather than fixation – into the centrepiece of our definition. We can now see that the philosopher's problem arose in the first place because, believing

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that at any moment in time we see states, we form the naïve notion that states are primary, and that processes are interesting only in that they give rise to states. This is to misconceive what we see. When we see a universe, a human being, a box or a swarm, what we see is a constructive process unfolding in space-time under morphological necessity. It is from this conjunction that the appearance of the stable states arises that in turn gives rise to the notion of things.

Let us agree to call these configurational persistencies 'structures', noting that they are invariably stages of processes, and that named thingness seems to arise from such structures. How does this allow us to reformulate the question: does society 'really exist', that is, is it some kind of thing? We may begin as usual by noting what we see and experience in space-time. What we see of society in space-time – apart from its physical and spatial milieu – is individuals interacting, transacting, encountering and perhaps also seeking refuge from all these. Is society then the sum of the interactions that we see in space-time?

It cannot be so. Whatever society is, one thing about it is clear: it must persist through time. Whatever interactions are, they cannot in themselves be society since they do not persist. Even allowing for social change, societies relate not only individuals at one point in time, but also individuals across time. Even when all individuals currently alive in a society are dead and replaced by their descendants, something survives as a 'society' which is recognisably descended from the original society, even though it may have changed considerably. Society is, at the very least, something that outlasts individuals. In spite of the claimed realism of those who reduce society to individuals, this reduction is in fact the one thing we logically cannot do, since it fails to explain the primary property of society, namely its persistence beyond the lives of any collection of individuals who make it up at any point in time. It follows that we cannot reduce society to individual interactions.

If we are not talking about interactions in space-time when we say 'society' then what are we then talking about? On the basis of our reflections about things in general, the question can be better put: what persists under the myriad of human interactions that we observe in space-time? The answer is almost immediate from the formulation of the question. What persists is not interactions, but certain configurational patterns underlying the interactions. Individual interactions are endlessly replaced. But certain underlying petterns in these interactions persist. It is these patterns that we name as 'society'. The patterns can be the result of any number of different pattern formers: forms of production, social institutions, and so on. But it is the patterns themselves that we name as 'society'. Usefully, this distinction allows us to include the spatial form of society among the pattern formers. Space is one thing that can generate and restrict encounter and interaction probabilities, indeed this is how space becomes involved in society.

Society then is not the space-time manifestations of society as the interaction fields that continually occur in space-time, but the configurational persistences underlying interaction fields. There is an unavoidable inference from this: the entity which we name as 'society' is not a thing but an abstraction. Does this then mean

that society is imaginary, a virtual product of consensus among individuals, without physical affirmation in the world? It does not. It is real. Where then does this reality come from? The answer is stunningly simple: from being realised in space-time. The observable material world of interaction in which we live is not itself society but it is the means by which society, the abstraction, realises itself in space-time and thus projects itself from past to future. The realisation in space-time is the means by which society as a system of configurational persistence achieves this persistence and transmits itself across time.

Now the important thing about this definition of society from our present point of view is that it immediately allows us to see the role of buildings and physical environments. Our sense of being separated from our physical circumstances is founded in the very nature of our social existence whose nature is to overcome space, by forming this abstract configurational entity, society, whose existence seems not in itself spatial but beyond and above space. Society is in this sense an abstraction. It is the genotypes of social arrangements that are reproduced through time, and which are therefore recognisable in the relational complexes which are realised in a specific form at one point in time. Society is in this sense a dematerialised thing, and this is why we find it hard even to acknowledge its existence as a real thing.

However, although society is this dematerialised genotypical thing, the means by which it is projected through time is anything but dematerialised. On the contrary, while the material form of society at any moment of time is not that society, it *is the means by which that society is transmitted into the future*. The material form of a society as a system of relations at a point in time is not that society and certainly not its structure, but, by being a realisation of the underlying genotypes of society, the material form is the means by which the society as an abstraction is realised in space-time and then reproduced. Society is not in itself its material form, but even so only exists through its material form. This curious double-take is why all social practices take the form of abstract structures, like the grammars of languages, which are never seen as part of any material reality, but nevertheless dominate that reality by structuring what can happen in it, and by creating the real space-time events through which those structures are themselves perpetuated.

Buildings happen within this double-take. Like the social events which they contain, they themselves are space-time realisations of abstractions. They are less than social events, in that they are not made up of acting and thinking human beings, but they are also more in that they are long lasting, almost permanent, transformations of the real world in the image of the abstractions that govern their form. Buildings are not maps of human interaction. They are maps of the social genotypes, of human interaction. This is what makes them so powerful. Social interactions as spatial events are momentary realisations of abstractions, of which they are therefore the phenotypes. Buildings only contingently house the phenotypes of human interaction. The most fundamental error of the paradigm of the machine was to seek order in the relation of people to the built world precisely

Space is the machine

in these localised phenotypes. The built world fixes in stone not the phenotypes but the genotypes of social behaviour.

The mystery of the social nature of the building now becomes clear. Manifestly a physical object, its essential nature is to give form to an abstraction, and through this to give that abstraction the realisation which enables it to be projected through time. Buildings do not reflect the particular materialisations of society that occur at any moment in time, but aspects of the generic abstractions which constitute society itself. It is these abstractions rather than any particular realisation of them, that need to be transmitted through time. Buildings make this doubly powerful by building these genotypes into the very materiality of our existence, and at the same time, through the omnipresence of configuration, rendering these same social 'things' non-discursive.

Buildings are thus among the most powerful means that a society has to constitute itself in space-time and through this to project itself into the future. In this sense, societies in spite of being in themselves a-spatial, are thoroughly dependent on space. The act of building is, as a consequence, inevitably a social act. As such it entails risks; risks that the forms will not be those that permit the society to reproduce its essential forms. In a modern society, these risks are carried between architecture and the social agencies through which architecture is legitimated and controlled. Architecture persists both because society changes and must change its built world in order to perpetuate itself in a slightly different way to its predecessor, and because the risks to society are not posed at the level of the individual buildings or particular projects. These must always experiment with the future. The real risk is in the persistence of error through time, so that forms inconsistent with the perpetuation of a good society become dominant. It is exactly from such high risks that we, in the late twentieth century, seem recently to have made our escape.

Notes

1 Or 'durability, convenience and beauty' in the translation by Morris Hickey Morgan as Vitruvius, *The Ten Books on Architecture*, Book 1, Chapter 3 originally Harvard University Press, 1914, Dover edition, 1960.

2 But for important comments on this view see Stanford Anderson, 'The fiction of function', *Assemblage* 2, February 1987; and also J. Habermas, 'Modern and post-modern architecture', 9h, no. 4, 1982; and A. Colquhoun, 'Typology and design method', in Meaning in Architecture, eds. C. Jencks and G. Baird; Barrie & Rockliff, 1969.

3 Le Corbusier, *Vers une architecture*, 1923; translated by Etchells F., *Towards a New Architecture*, Architectural Press, 1927; Version used: 1970 Paperback of 1946 edition, p. 89.

4 Le Corbusier pp. 114–5.

5 Ibid., p. 173 et seq.

6 Ibid., p. 173.

7 In fact, the clearest statement of the basic ideas behind the philosophy are probably retrospective. For example, Sir Leslie Martin's classic 'Architect's approach to

architecture' in the *RIBA Journal* of May 1967 is probably the most lucid account. However, even here there is a certain amount of confusion. Martin announces at the beginning of his text that he does not intend to talk about forms, but about the processes that give rise to them, then goes on to talk about little apart from forms. It may indeed be that one has to wait for the nineteen sixties when modernism was taking over the schools of architecture for a proper academic formulation of a modernist form-function theory, as set out for example in the *Notes on the Synthesis of Form* of Christopher Alexander, 1964, which will be discussed in detail in the next chapter.

8   For a post-Kuhn discussion of the nature of 'paradigms' see M. Masterman, 'The nature of a paradigm' in ed. I. Lakatos & A. Musgrave, *Criticism and the Growth of Knowledge*, Cambridge University Press 1970.

9   The most extensive treatment of this issue is in Necdet Teymur's complex and difficult, *Environmental Discourse*, ?uestion Press, London, 1982.

10   G. Canguilhem, 'Le vivant et son milieu', in *La Connaissance de la Vie*, 1971, Librairie Philosophique J. Vrin, Paris, 1971. See also 'Machine et organisme' in the same text.

11   The two most important references to the 'architectural analogy' in Aristotle are probably in the 'Physics', Book 2, Chapter 8 pp. 250–2 in the McKeon edition of 1941, and in the 'Parts of animals', Book 1, Chapter 5, pp. 657–9 in the same edition. But the idea is pervasive throughout Aristotle, as shown by the conceptual importance assigned to it in the references cited.

12   'The *vis insita*, or innate force of matter, is a power of resisting by which every body, as much as in it lies, continues in its present state, whether it be of rest, or of moving uniformly forward in a right line' I. Newton: Definition III from Definition & Scholium Book 1, *Principia Mathematica*, Version used: ed. H. Thayer, *Newton's Philosophy of Nature*, Haffer, New York and London, 1953.

13   Koyre's excellent formulation in 'Newton and Descartes', in A. Koyre, *Newtonian Studies*, Chapman & Hall, 1965 p. 67.

14   See A. Koyre, 'Huygens and Leibniz on universal attraction', Appendix, *'Attraction an occult quality?'* p. 140.

15   For a discussion on this see C. Gillispie, *The Edge of Objectivity*, Princeton University Press, 1958, Chapter 7, 'The history of nature'. For example, Gillispie discusses the highly developed version of the scheme of thought due to Lamarck who saw the organism as itself contributing to the evolution of its forms through the interaction between the creative forces emanating from the organism itself and the moulding effect of the environment, making an analogy to the geological processes of erosion that gave rise to rivers and valleys (p. 275).

16   See my earlier (with Leaman) 'The man-environment paradigm and its paradoxes'; Architectural Design August 1973. I see the earlier term for the paradigm as technically incorrect, rather than simply politically incorrect.

17   See Gillispie, *The Edge of Objectivity.*

18   Again, one of the best accounts of the history of this idea is to be found in Gillispie, Chapter 8, 'Biology comes of age'.

19   H. Balzac, Author's Introduction (to La Comedia Humaine) 1842; available in English as 'Author's Introduction' in *At the sign of the Cat and Racket and other stories,* Dent, London, 1908.

20   The best example is probably the opening pages of *Eugenie Grandet.*

21   See for example D. Rothman, *The Discovery of the Asylum*, Little, Brown & Co Boston-Toronto, 1971 – for example on p. 84: 'As a result of this thinking, prison architecture and arrangements became the central concern for reformers of the period. Unlike their predecessors, they turned all their attention inward. to the divisions of time and space within the institution. The layout of cells, the methods of labour, and the manner of eating and sleeping within the penitentiary were the crucial issues. The most influential benevolent organisation devoted to prison reform, the Boston Prison Discipline Society, appropriately considered architecture one of the most important of the moral sciences. 'There are', the society announced, 'principles in architecture, by the observation of which great moral changes can be more easily produced among the most abandoned of our race...There is such a thing as architecture adapted to morals; that other things being equal, the prospect of improvement, in morals, depends, in some degree, upon the construction of buildings'. Those who would rehabilitate the deviant had better cultivate this science...As with any other science, the advocates of moral architecture anticipated that the principles which emerged from the penitentiary experiment would have clear and important applications in the wider society. An arrangement which helped to reform vicious and depraved men would also be effective in regulating the behaviour of ordinary citizens in other situations. The penitentiary, by its example, by its discovery and verification of proper principles of social organisation, would serve as a model for the entire society'. Pessimists might be tempted to conclude that this is exactly what happened at least to public housing in the late nineteenth and twentieth centuries. See also the late Robin Evans, *The Fabrication of Virtue*, Cambridge University Press, 1983.

22   See A. Giddens, *A contemporary critique of historical materialism*, MacMillan, 1981, Chapter 1, 'The time-space constitution of social systems'.

23   J. de Syllas, *Aesthetic order and spatial disorder in a children's home*: *a case study of the Langtry Walk Children's Observation and Assessment Centre in the London Borough of Camden*, January, 1991; base on research carried out for an MSc thesis for the MSc in Advanced Architectural Studies in the Bartlett, ucl, 1981.

24   M. Heidegger, 'Building, dwelling, thinking' in: *Basic Writings*, Routledge & Kegan Paul, 1987, pp. 319–39. Originally in German.

25   This basic fact is now increasingly recognised through important new studies such as those reported by Tom Markus., *Buildings and Power; Freedom and Control in the Origin of Modern Building Types*, Routledge, 1993.

26   W. Quine, 'Identity, ostension, hypostasis' – in From a *Logical Point of View*, Harper and Row, New York, 1953, pp. 65–79.

27   See R. Thom, *Structural Stability and Morphogenesis*, Benjamin, 1972, pp.318–19.