Architecture as a discipline

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Is the study of the built environment a subject in its own right, or is it simply the meeting ground for a number of disciplines? Should environmental studies be a loose faculty arrangement in the university with architecture as one of a number of 'related disciplines' grouped around a problem area? Or is there some sense in which the study of the built environment can arise naturally from the activity of architecture? The aim of this paper is to sketch a view of architecture as a discipline which looks into the nature of architecture itself for the disciplines and theory on which the academic study of the built environment is based.

The paper argues that it is possible to organize an approach to architectural and environmental problems based on the requirements of designers rather than on the academic structure we have inherited. This shifts the focus of research from the methodology of design to the nature of the building itself, while also making the connections between science and design much less of a problem.

IS ARCHITECTURE A DISCIPLINE?

Is the study of the built environment a subject in its own right or is it simply the 'meeting ground for a number of disciplines'? Should 'environmental studies' be a loose faculty arrangement in the university, with architecture as one of a number of 'related disciplines' grouped round a problem area? Or is there some sense in which the study of built environment can arise naturally from the activity of architecture, in such a way as to reconstitute and perpetually renew the intellectual bases on which environmental action and design must be founded? The 'sixties opted for the most part for the 'meeting ground' philosophy. We believe the 'seventies are turning towards the second answer, and looking into the nature of architecture itself for the disciplines and theory on which the academic study of the built environment can be based. The aim of this paper is to sketch this latter view of architecture as a discipline, not to undervalue the growing interest and involvement of other disciplines in the study of the built environment, but to acknowledge that these contributions will depend for their effectiveness on the evolution of a body of theory and research at the heart of the subject, that is in the nature of architecture itself and the society that produces it.

The 'meeting ground' philosophy is usually supported by a number of apparently powerful arguments. It is pointed out that any breakdown of the study of the environment is inevitably interdisciplinary (as though current disciplinary demarcations and 'cognitive styles' in the academic world were pre-ordained); a distinction is often drawn between those disciplines whose outcome is intended to be 'knowledge' (sciences) and those whose outcome is 'action' (professions); and as a consequence, a clear distinction is made between 'science' and 'design' which strongly preserves the identity of each. This convincing paradigm has penalties. In particular, the design or action disciplines tend to remain intellectually weak while the existence of increasing sources of supposed 'knowledge' relevant to design makes their activity more difficult to accomplish.[1] The academic study of design and planning, as well as its practice, becomes subject to every wind that blows in the academic world. Compounded with its subservience to economics, politics and technology it is not surprising that environmental design does not appear to be guided by a powerful and humane theory as an optimistic society appears to expect.

The disciplinary complexity of environmental studies certainly constitutes a major problem in the development of any uniquely 'environmental' or 'archietectural' theory in the sense discussed. It is relatively easy to construct long lists of established disciplines and subject areas which appear to contribute in some way or another to environmental and architectural concerns. Attempts to make sense of the diversity of the subject matter run through architectural discourse from Vitrivius's first chapter on the education of the architect[2] through to some of the most recent 'systems-based' descriptions of the subject area. In fact it is difficult to avoid the conclusion that environmental studies, at whatever scale of concern, is a 'science of everything'.

SCIENCES OF EVERYTHING

But environmental design is really not quite so complex as this view suggests. The possibility that this extraordinary total complexity is to some extent a product of our particular way of seeing it—or in other words an artifact—should at least be considered. This may be investigated by looking for analogies.

It turns out that sciences of everything—which are sciences which by this analysis turn out to be connected with everything else in the world—are not so uncommon. A hypothetical example illustrates the point. Imagine a society which had every science we have today except economics, but which had become aware of the need for such a science. How would this society go about constructing the science of economics? It would, of course, construct it out of the disciplines it already had, both for empire building reasons and intellectual reasons. Sociology, for example, would see the new subject as an aspect of itself, probably as a sub-specialism. Psychology would argue its fundamental contribution because all economic behaviour emanated from the motivation of the individual. Anthropology would argue its foundational role in comparing societies from the point of view of systems of exchange... and so on.

All would be justified in their claims. All these disciplines are to some extent represented in this way in the modern science of economics. But none of these contributions would make sense without the existence of economic theory and method to make up the core of the whole subject area. It is probable that our imaginary society would spend much time trying to construct economic theory out of extensions of other disciplines but then would realize that economic phenomena existed in their own right and that it was possible to have a theory about economic phenomena which was relatively independent of other disciplines—perhaps using basic ideas from these disciplines in a rather simplistic way as assumptions to form part of tentative theories, as might be said of economics today. Economics is more or less co-extensive with sociology in terms of the field it covers but it has a particular way of looking at the phenomena of society. By viewing them in this special way it turns out that the phenomena can be treated as a systematically connected set possessing systemic attributes which may be represented in theory and convincingly related to real life events. But it is of course economic theory which makes economics independent. This defines its selection of relevent phenomena and a way of interpreting them in a field which may otherwise appear undifferentiated as a general quarry for all-comers. Economics is a 'route through' social phenomena.

Such a situation actually did prevail in the nineteenth century in the scientific subject now called linguistics. According to Trnka the subject was 'psychologized and atomized' by being regarded 'as a conglomerate of psychology, physiology, sociology and other disciplines'.[3] Structural linguistics succeeded in establishing the study of language as a theoretically independent discipline to such good effect that it constitutes today probably the most powerful body of theory in the human sciences and is currently powerfully colonizing the disciplines of which it was previously thought to be an offshoot. All these disciplines are still part of linguistics and we call them psycholinguistics, sociolinguistics and so on, but *not* linguistic psychology or linguistic sociology. (Compare this with the recently established environmental psychology as opposed to a possible psycho-environmentalism). The difference is subtle but important. The focus is linguistics; these are aspects of linguistic theory and not vice versa.

THE CONCEPT OF AN ENVIRONMENTAL DISCIPLINE

The linguistic analogy may be used in other ways to discuss the possibility of an environmental discipline. The extraordinary and commonplace thing about language is that everyone can speak. Everyone can produce highly complex series of sounds within complex rule structures to convey complex meaning without *explicitly* knowing the rule structure which governs language. In fact no one understands the rule structure. The essential structure of a language as a form of rule-using behaviour is still the major mystery in linguistic theory. Nevertheless, we all speak without making many mistakes. (This is, of course, not only a relatively simple question of grammar, but a question of what grammars are and how they may be scientifically described.) The difference between being able to speak and being a linguistic scientist or theoretician is a useful analogy. It is parallel to the difference between learning to use a language-like rule structure in design and making the man-made environment the object of science and theory.

This may be made more explicit. In language we know that a complex, generative and open-ended rule structure must exist between the domain of structured sounds (phonetic production) and the domain of structured meanings, or to put it another way between the physical and abstract aspects of language. Using the term crudely, this structure may be thought of as a kind of code, comparable to a code which turns speech into electronic impulses and back again in an information channel. Those who have been trained as designers will be using just such a code (although it was probably never taught explicitly, it was learnt by just being in a school of architecture) which enables the designer to effect a translation from individual, organizational and social needs to physical artifacts. This code which has been learned is supposed to express and contain actual connections which exist between human needs and their artificial environment. In effect, the designer learns to 'speak' a language—to make a useful transition between domains which are unlike each other (sounds and meanings in language, artifacts and needs in design) by means of a code or system of codes which structure that connection. Just as a man who can speak can realize the various functions of language necessary to existence—communication, thinking, ordering, classifying and so on—because he can relate sound to meaning, so designers can realize the functions that society requires of building—climate modification, symbolic expression, resource modification, activity containment—because they can relate needs to artifacts through the code.

A designer uses a code that expresses the connectivity between needs and artifacts in order to make useful and viable links between the two domains. An architectural theorist is concerned to *study that connectivity as it really is and as it expresses itself in the designer's coding structure and in other coding structures used in the interpretation and use of the environment*. It is important to internalize this distinction. It is the difference between being a speaker and being a student of language. It expresses why the preoccupations of the architectural theorist are co-extensive with, and in a sense the same as those of a designer, and at the same time quite different. Instead of using the code to achieve real objectives in the world, we have stepped back to study the code as a social phenomenon and its relation to the real world as it is.

It is on this foundation that a science of environment can be conceived which is based on what designers actually do rather than on the structure of the 'related disciplines'. But this requires a further important distinction, which once again can be introduced by analogy with linguistics. This is the difference between studying a language as a whole and studying the use that individuals make of language in speaking. The environmental equivalent is the morphological history of artificial space and social process on the one hand, and the particular appropriation of it by individuals, groups, organizations and cultures on the other. The environment as a morphological set exists over and above any individual use of it. It exists at any time as a historical 'given'. Those who experience it had no hand in its making, but they will pass it on to the next generation as a 'given' in modified form. These modifications will be the result of

particular appropriations; the modified environment will express both these and the previously given structure. Thus although the overall morphology of the environment and the individual appropriation of it must be considered to some extent separately, they are also interconnected. One of the objects here is to find out how.

Let us summarize this and try to find some useful generalizations. It is usual to represent man and environment as an *interface* touching at all points, but some being more significant than others. It is suggested here that although the interface concept is valuable it belongs properly to the interface between the *artifact* and its environment. The relation of man and environment is not an interface at all but an elaborate structure of relations which has the nature of a code.[4] In this view, the two domains of human needs and physical artifacts have been 'pulled apart' to reveal the structure of connections between them. This is the dominant system of interest for environmental and architectural theory. Designers must use code structures in order to design buildings; people use them to experience it; society constrains designers and users through them. This offers three basic generalizations regarding the study of artificial language-like systems. First, the problem of effecting a relationship between dissimilar domains of entities is very basic to our ways of thinking and even to our mode of existence. We depend on this ability. Secondly, these operations have a formal resemblance to the idea of 'mapping' between domains in mathematics, a concept which is fundamental to the practical application of mathematics. Thirdly, what is of chief interest to environmental and architectural science are certain kinds of relationships which are in some sense mediated or modified by environmental change. This leads us to the concept of function, seen not in the traditional sense of architectural discourse, but in the scientific sense.

THE CONCEPT OF FUNCTION

The concept of function is important because it expresses exactly such relationships. In a recent paper, *The Idea of Architectural Research*[5] this concept

	MAN-NATURE relation	MAN-MAN relation
buildings as THINGS	climate modification function	activity-space function
buildings as SIGNS	economic function	social language function

Figure 1 Four-function model: simple matrix version

was applied to architecture and shown to underlay the organization and development of architectural research. It was suggested that a useful conceptualization of a building was the 'four-function model' which identified the building as behaviour modifier, as climate modifier, as symbolic modifier and a resource modifier. Each of these functions can be expressed as a relationship. The first is between behaviour and spatial structure which is mediated by building; the second is a relation between human psycho-physiology and the natural environment, mediated by building; the third is a relation between the physical artifact as a sign and its symbolic meaning, mediated by building; and the fourth is a relation between the use of resources and goals, mediated by building. These relations are in effect realizations of a more basic set of relations. The matrix (Figure 1) gives a straightforward version of the structure of these more basic relationships. The columns represent the basic categories—the relation between *man and nature*, and the mediation between *man and man* which are ubiquitous in all forms of the artificial environment; and the rows represent how buildings function both in a visible, tangible way (buildings as things) and in a less obvious but pervasive way as a cultural language (buildings as signs). The boxes of this matrix yield the four-function model. In functioning as a climate modifier the building acts as a complex environmental filter between inside and outside, modifying (by decreasing, increasing, selecting and specifying) the sensory in-puts into the human

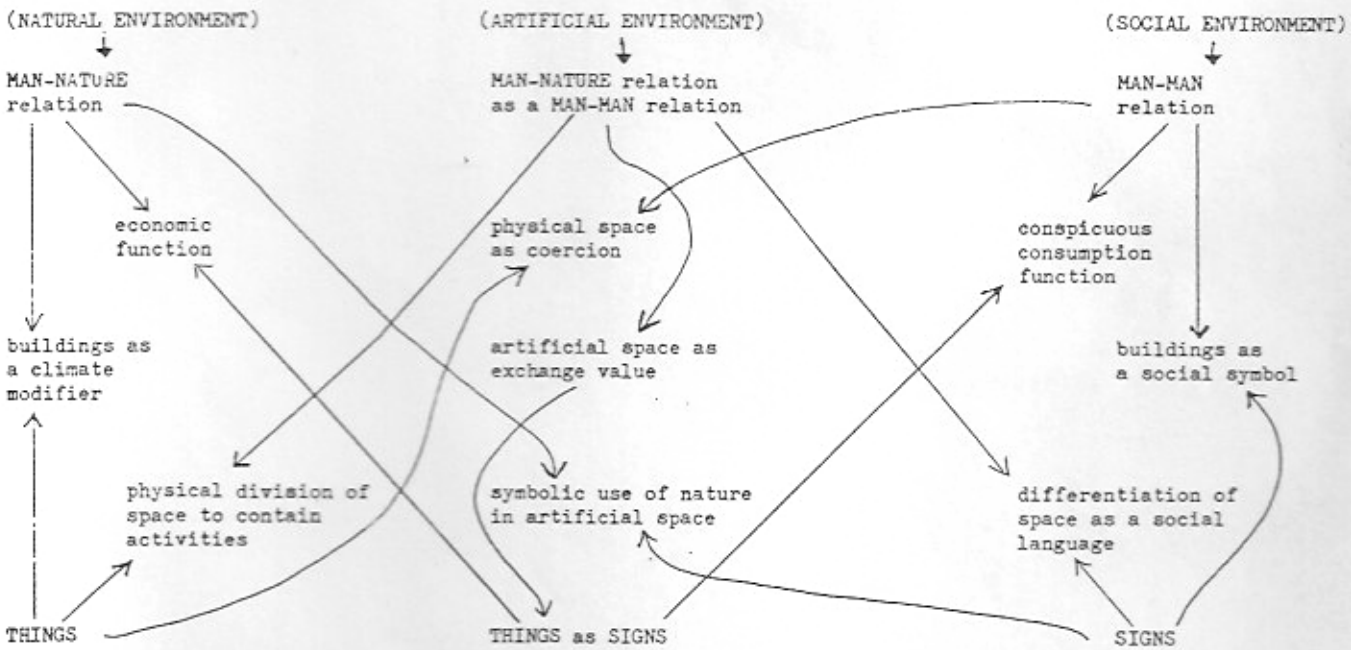

Figure 2 Four-function model: full matrix version

occupants, and also having displacement effect on the external climate. As an activity modifier, the building inhibits some activities and facilitates others, perhaps prompting or determining them. It also locates activities within a broader ecological framework and constitutes a modifier of the total behaviour of that part of society that comes into contact with it.

As a symbolic modifier the building functions not only in terms of the designer's intentions, but also in terms of the expectations and awareness of those who experience it. In this way the building has a similar displacement effect on societies' symbolic systems as a whole. As a resource modifier the building functions in transforming existing patterns of use value and exchange value. It adds to the value of its raw materials, acts as a capital investment, redistributes scarce resources of manpower and material over space and time; and, in a less measureable way adds to the existing use value of the building stock.

Figure 2 gives a more complex and true-to-life version of these sets of relationships, and shows how in fact they embody contradictory pulls. The basic components of the matrix are, as before, man-nature relations, man-man relations, buildings as things and buildings as signs. But further complexity is added by thinking of the *intersection* of similar components in the matrix. This gives the rather unfamiliar idea of man-nature relationships acting as man-man relations (this means, an artifically made, socially constructed surrogate 'nature') and buildings as signs (which means as economic or resource signifiers in themselves). The intersection of like categories in the matrix along with the *union* of unlike categories provides a more complete map of the way in which social space is constructed and used.

Take, for example, the intersection of buildings as things and buildings as signs (things as signs) and its union with nature (man-nature) and society (man-man) respectively. This provides the two major, and contradictory, dimensions of how buildings function economically. The first gives an economic function based on minimum cost in the exploitation of natural resources; the second gives an economic function based on exploitation of prestige which promotes conspicuous consumption. Similarly, if the intersection between nature and society (man-nature relations as man-man relations) is unified with buildings as things and buildings as signs respectively, two types of spatial differentiation are derived. One is based on the pure physical division of space to contain activities; the other expresses how the division is used as a social language. The other categories in the matrix are derived in a similar way.

As argued in *The Idea of Architectural Research*[5] the four-function concept has, implicitly at least, underlain the development of architectural research over the past decade. This represents a significant shift from previous thinking about architectural research in which it was presumed that research was the prerogative of the 'knowledge' based disciplines and nothing to do with the 'action' disciplines like architecture and planning. With this model it is easy to see why no amount of sociological or psychological or engineering or materials research on its own would tell us what as designers we really needed to know. The knowledge we require is more about the structure of connections between human needs and physical artifacts as they exist in the real world.

It is through the development of research into such relationships that the possibility of a scientific and integrative approach to architectural and environmental problems, based on the sphere of interest of designers and problem-solvers rather than the academic structure we have inherited, has become possible. It has also had the useful effect of shifting the focus of research from the methodology of design to the nature of the artifact itself, while at the same time making the connectivity of science and design much less of a problem. Environmental design and research can, it appears, converge considerably as far as their subject matter is concerned while retaining the basic distinctions in how they approach it and how they apply it.

ARCHITECTURE AS A SCIENCE OF THE ARTIFICIAL

If this approach is useful, then what are the implications for the old conflict between architecture as art and architecture as science? Our argument is that there is no conflict, any more than there is a conflict between using and studying language. No linguistic research has ever had a bad effect on language. The fallacies of 'basic English' arose not from linguistic theory but from linguistic scientism. Linguistic theory today takes off from the concept of a 'rule-governed creativity' (to use Chomsky's phrase). In fact, its theories today are essentially answers to the question: how can unconscious organized systems permitting 'rule-governed creativity' exist in our heads, what are they like and how do they get there? This is exactly the foundational concept that we need in architecture.

Using this basic idea, and orientating research towards an understanding of unconscious social codes that construct both our awareness of space and our actions as designers, architecture can become a member of the community of truly modern sciences without sacrificing anything of its preoccupation with the human, the intuitive, and the free run of the socio-spatial imagination. But there is a problem. If architecture sustains such a theoretical inquiry into its own foundations, in society and in the evolutionary morphology of built form, then it will no longer be the same type of system as it was before. Its consciousness of itself, its increasing ability to externalize its social nature and effect will itself be an important component in the system under study. We arrive at the problem of sciences that are part of their own subject matter.

Again this is not unusual. Returning to economics, a society which has an economic theory, and maybe mathematical models of the economy based on that theory, is not the same society that it was prior to having that theory and those models. The model may itself become the most important single aspect of the economy. Today, the economy fluctuates as a result of its own contemplation of itself, made possible by economic science. In the field of human endeavour, scientific theories become part of the society in which they develop. This is not new. It is this that gives social reality its abstract nature. It has been true in economics ever since 'Aristotle discovered the economy'[6], and theoretical ideas began to construct the role of the market in urban societies.

The proper name for these sciences which become part of themselves and create their own universe should not be 'human' or 'social' sciences but

'sciences of the artificial'. Their essential concern is with the self-developing, self-perpetuating properties of man-made systems like languages, cities, economies and even society itself. The 'social and human' sciences concept is insufficient because it is implicitly constructed from a direct analogy with natural sciences. The concept of 'sciences of the artificial' arose through increasing awareness that within a decade of their development, computers had to become the subject of a 'natural history' in order to understand what was happening to them and how they were changing the environments in which they were out.[6] Architecture is a science of the artificial, and its mode of action—design—as well as its unconscious codes and theories are part of its subject matter, and not some rootless extension into an ethereal domain of unconstructed intentions and ideals.

This paper was originally prepared in April 1974 and presented to a conference at the York Institute for Advanced Architectural Studies concerned with activity and space. The authors would now give equal emphasis to the study of built form itself as to function and their current research is concerned with the development of a theoretical model for the description of space relationships in buildings. See, for example, Hillier, B. and Leaman, A. The architecture of architecture, in Hawkes, D. (ed.). Models and systems in architecture and building. London, Medical and Technical Press, 1975.

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