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REFLECTIONS ON SPAN AND SPACE

Towards a Theory of Criticism of Architectural Structures

This project deals with the load bearing structures of architecture. The formulation of problems in the project is the outcome of experiences from years of teaching structural design at a school of architecture, and in the capacity of being consultant to practicing architects. The primary objective of the project, thus, is to contribute to raising the discussions on the design of architectural structures to a level of professional discourse, and thereby establishing a theory describing how one might organise a criticism of such objects. The main strategy for achieving this, is to try to establish a dialogue between theoretical (or epistemological) disciplines and the particular knowledge possessed by the actual professions involved, namely engineering and architecture. This dialogue takes the form of a discourse between theoretical references and professional references in the form of buildings and writings on buildings. A particular aspect of this dialogue is that it involves two professions which really belong to two different research traditions: While engineering engages in scientific and technological research, architectural research primarily involves the humanities. Both traditions meet in, and share, the design objects they have in common, namely the structures and the buildings.

The Idea

Interpretation is at the core of pedagogical work, which is very much a driving force of the present thesis. An interpretation of structures means to point out those language games that structures take part in, to use Wittgenstein's concept, to point out the various contexts that surround the object in question, and of which the object is a part. To be able to identify those; methods and concepts from both of the two professions must be invoked: Reflecting from the position of engineering, a socialisation with the methods and concepts of architecture seems necessary. With an ambition of bringing, up to a certain point, the two traditions together in the discourse on structures, the thesis aims at bringing the discourse to a level where the particular knowledge of the two professions may confront epistemological disciplines like mechanics, the philosophy of science as well as aesthetics.

An important aim of this work, and an implication

of what have been said up to now, is to try to theoretically engage the solid and the void at the same time, meaning that a division between what might be considered the field of engineering and the field of architecture is not recognised as being neither fruitful nor of value for this particular study. If we, in these matters, deliberately blur the modern distinction between the professions of engineering and architecture, providing the architect with the necessary concepts and knowledge to understand the solid properly, and providing the engineer with the necessary awareness of the architect's requirements for the void, the space, then we might be able to meet on a common ground and having more than a casual glimpse into the professional knowledge of each other.

The Structure

The thesis is organised in three parts: the first part, an Ontology, aims at describing the particularities of architectural structures as a class of objects; how might they be characterised and what make structures different from other man-made objects? The second part addresses the mechanical premises for structural form, and is termed Pragmatics because it aims at identifying and explaining the basic preconditions for structural actions; establishing a dialogue between mechanical theory and the built practice. Thirdly, an Aesthetics of structures is proposed, leaning heavily on the two foregoing parts, the aim of which is a theoretical construct that may enable us to open up for a richness of our aesthetic experiences of structures, bringing about an understanding of what we see and why we react. The aesthetic perspective addresses, thus, the premises for structural quality.

The Methods

Some words on the methods applied: Structures are in this thesis seen from two main positions; a pragmatic and an aesthetic position. It is not, however, always simple to make a sharp distinction between them. Both may involve reflection and interpretation, but their aims are quite different: While the pragmatic position is concerned with the explanation of facts and also with trying to understand the practical reasons for structural form, the aesthetic position aims at understanding the visual appreciation. There is therefore an element of judgement in the latter which is not present in the former approach. Where the pragmatic position raises questions like "How is the structure made?", "How does it work?", and "What does it do?", the aesthetic position aims at understanding the perceptual experience: "Why does it seem appropriate?" Reflecting from an aesthetic position, and this is an important part of my thinking, is not possible without seeing the structure also from a pragmatic point of view, because, as is argued in the chapter on Aesthetics, the aesthetic experience of structures is constituted through an interpretation of their pragmatic aspects. The elaboration on an aesthetics of structures is much influenced by the philosophies of Ludwig Wittgenstein and Roger Scruton.

Also; depending upon what formal feature of the structure is to be explained or interpreted, different kinds of explanations or different modes of understanding must be invoked: Science is concerned with describing natural processes and is thus able to establish causal relationships between various physical influences and the resulting effects on structural form. In that respect we may say that certain aspects of structural form exist because they are necessary, their load-bearing function taken into account.The mutual an unwavering relationship between shape and strength may exemplify this point.

Technology, on the other hand, also deals with intentional acts. Thus; when mechanical aspects of structural form are explained by referring to issues concerning the natural sciences, the explanations are causal and based upon deductions from general laws. When technological issues are involved, causal explanations that refer to the manner in which the actual processes work or function must necessarily be accompanied by interpretations of the meaning or purpose of the actual technological acts. Technology, thus, is characterised by participating in both causal as well as intentional relationships.

Furthermore; technology and science seek to find a practical solution, by way of materials, processes and form, to the spatial functions that are the structure´s

Renzo Piano, architect, Peter Rice, engineer: Museum for the de Menil Collection, Houston. The aesthetic experience of the roof structure displays a conflict between an interpretation of the structural form as a supporting system, and one that sees the form as related to the conditions for natural light. In fact, a conception of the structure based solely on the loadbearing aspect fails to provide a convincing aesthetic understanding. To achieve a sense of appropriateness in this particular case, a conception of the structure's spatial function must be invoked.

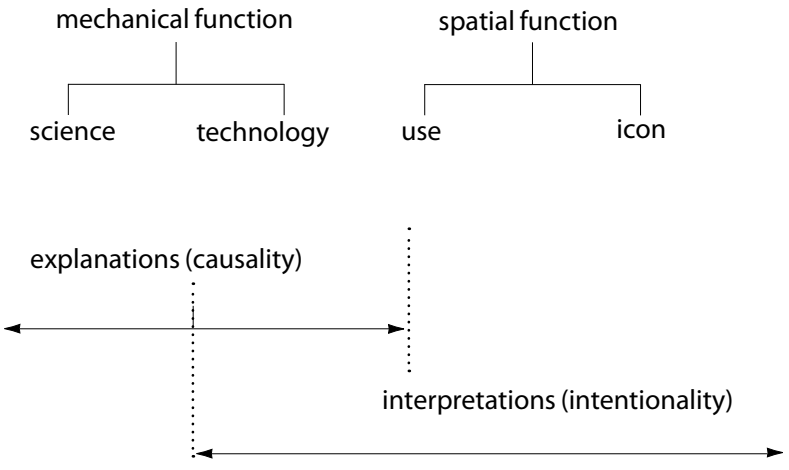

Fig. A diagrammatic model depicting the scientific methods that apply to the different aspects of structural form.

primary aim. When, in making a critique, we comment on a structural form from the point of view of its spatial function, we are obviously not offering causal explanations, but instead, we try to interpret the meaning, purpose or intention behind the actual structures. Aspects of the structure's spatial functions are hence approached in a hermeneutic frame of mind. What we do, in principle, when interpreting, is typically to conclude from something that is observable (the physical form of the structure) to something that is not observable (e.g. organisation of human acts). From observations like these, I am able to put up a chart that tries to organise the relationship between the various structural aspects and the relevant cognitive methods.

Conclusive remarks

The new knowledge generated by this project appears on two different cognitive levels. The meta-level involves a knowledge that might be of interest to those who contribute to a general inquiry in the "making disciplines". Critics who reflect on the relationships that exist between the various practices and the relevant theoretical references, might find it useful to follow a line of reasoning, although this in the present case, has its point of origin in the engineering and architectural professions. Furthermore, we may notify the new knowledge brought about by the present thesis on the cognitive level which is of specific interest for the involved "making" professions, namely that of the relationship between structure, form and architecture. It is concluded that the structural quality of architectural structures in many ways can be seen to be dependant upon the spatial context. This suggests a more liberating view of structural form than what is most frequently formulated. The main premise given for a balanced and informed view of structural form, however, is to seek appropriateness in all aspects, identified as a chain of arguments that relate to the suggested structural aspects of mechanical and spatial function. The basic aim of the thesis is always that of clarifying the reason behind appropriateness, or alternatively, the lack of it.

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