LES DOCTORATS EN

DOCTORATES IN DESIGN + ARCHITECTURE

Proceedings Volume 2

Results and Reflections

Doctorates in Design and Architecture

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Results and Reflections

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The EAAE is an international, non-profitmaking organisation, committed to promoting the exchange of ideas and people within the field of architectural education and research, and to encouraging the development of the subject throughout Europe. The Association respects the pedagogical and administrative approaches of the different schools and countries. It has two official languages: French and English.

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Doctorates in Design and Architecture: An Outline of Issues

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Introduction

In February 1996, colleagues from 23 different countries spent two days talking about Doctorates in Design and Architecture. A summary of about 80 papers is included in the Conference Book. Volume 1 of the Proceedings covers 15 full length papers giving an impression of the State of the Art. The way in which doctoral research in design is organised in different countries, the way it is financed, leading themes, criteria for selection of candidates and so on are here the main issues. Volume 2 of the Proceedings before you contains nearly 40 papers reflecting on doctorates in Design and Architecture. What is the essence of (research in) Architecture? What is its relationship with other disciplines? What are the relevant focal points for education in design and research?

Volume 2 also includes the papers on the approach, progress and (provisional) results of current or recently concluded doctoral research done in this area. Design concepts, designer's strategies and methods, oeuvres of well-known architects and so on are described and discussed. The papers are grouped into eight themes. Here and there we have deviated from the sequence used during the conference to make it more coherent. For each theme, the papers have been listed in alphabetical order by author's name.

Research in Architecture and Other Disciplines

Architecture has much in common with other disciplines: social sciences, management, operational research, history of architecture, philosophy, etc. We may well ask what the essence of architecture itself is. Brierly, Matthews and Heynen too (Volume 1) make a serious attempt to get to the essence of architecture and architectural research.

Brierly discusses the thesis, that the essence of architectural research can to an extent be identified by a process of disclaiming research which is primarily founded in disciplines and methodologies other than those of architecture. Yet, that argument implies that the subject of architecture has definable values which are exclusive to the subject. In reality it is often difficult to distinguish those values which are due to the nature of the discipline of architecture. The features which distinguish architecture from other disciplines tend to have indistinct boundaries. Similar statements can be found in the papers of Heynen en Neuckermans. Heynen too, argues that the essence of architecture is not easily identifiable. She believes that the study of architecture requires an initiation in so many different fields and disciplines that the exact focus on an autonomous reality called architecture anyhow becomes blurred.

Neuckermans believes architecture can be quite easily researched provided it is approached from various angles: social, epistemological, phenomenological, technical, semantic and morphologic. So it may well be impossible to provide a definition of the precise content of architecture. According to Brierly a more rewarding approach would be to identify research that has an architectural content.

Matthews argues that too much design research has been research into design. Designed objects are generally speaking poor vehicles for the communication of useful information about the world. The knowledge that is embodied in a designed object forms only the tip of a potential iceberg of insight. Designs are not readily interpretable as generalised knowledge. "Most design knowledge dies with the designer", remarks Matthews. To recover what is beneath the inscrutable surface of the designed object one must allow the design process itself to speak and facilitate the recovery of the programmatic and philosophical dimensions of design. He wants to reclaim design research for designers. According to his opinion too much design research has been conducted by technologists, systems practitioners, historians, psychologists, sociologists, anthropologists, organisation and management theorists. Too little design research has been research conducted by designers doing what they do best: designing. For this reason he pleads for a research orientation during training, an early initiation into a discipline-specific research culture.

In four papers on Research in Architecture and Other Disciplines the search is particularly for an element linking architecture with other disciplines. Arrhenius points to similarities in the conceptual framework of architecture and philosophy and works this out further in terms of deconstructivism. Kubelic argues that post graduate programs in the history of architecture can act as a bridge between the humanities and the more technical oriented faculties. Pakarinen shows how art theory and cultural studies may act as a bridge between the different attitudes of architects and urban designers and different methods of architectural and urban research. The post-modern discourse in which cultural studies are a common denominator seems to offer an outstanding possibility to create communication between different disciplines. Swanson finally points to the surplus value of interdisciplinary cooperation for the quality of buildings. He describes a collaboration between the College of Architecture and the College of Nursing at the University of North Carolina. Similarities and variations in nursing and architectural values, and shared research methods of nursing and architecture are noticeable issues here.

Education in Research and Design

Adequate education in research seems quite problematic in many schools. Even in schools which do have long traditions in research, there is insecurity concerning the object of architectural research, its methodology and theoretical base, the required skills of the researcher, and the criteria for evaluating the products of research. Dunin-Woyseth (Volume 1) argues that the transition from traditional undergraduate training to post-graduate architectural research almost implies a re-education of the architect. According to Lundequist (Volume 1), one of the main problems is, that architectural research education organisations made the mistake of taking over methods and other intellectual tools from the established sciences and of applying the tools in the field of architecture, without any reflection on the specific conditions of architectural research. As a consequence the specific kind of architectural research (pragmatic, practice oriented, closely linked to the needs of the architectural profession) is underexposed.

Integral use of research-based knowledge in design teaching is rare. The traditional academic organisation of the university curriculum is primarily focused on professional knowledge and skills. According to Teymur the gap between profession and discipline is a major factor in explaining why (doctoral) research does not impact sufficiently on the curriculum. This leads to a limited use of knowledge by architects. He pleads for epistemological maximalism in research education. According to Marda design domains are transmitted visually or conceptually and not at both levels simultaneously. Theorising about the profession and creating a clear vision of how design can be learned have still not adequately been developed. What for example is better: structuring the curriculum from simple to complex design questions, or tackling (complex) design questions in heterogeneous groups of junior and senior architectural students? What is a didactically sound way to teach technology to architectural students? In how far can new techniques such as Geographical Information Systems contribute to a better relationship between education and research? Questions like these are dealt with in papers by Radu, Marda, Boudon and Cardoso et alia. Proposals are also made on how to improve the education of PhD candidates. Downing and Warden advocate a course in the broad range of research methods, and a course in the philosophy of research in relation to the nature of fact, understanding, and knowledge. According to Pakarinen (see the first theme), acquaintance with one theoretical discourse (e.g. the post-modern discourse) makes it easier for the student to enter the world of research and encounter other disciplines.

Generating Design Concepts

How do designers think? What strategies and methods do they use for creating objects or spaces that have both a practical purpose and an aesthetical component? According to Deshayes, designing is primarily a matter of induction. This contradicts with research methods which are based on deduction, logics, algorithms. Architects' decisions are influenced by a wide range of functional aspects, symbolic meaning, socio-cultural aspects, economy and so on. Because of the methodological focus on the design process as a rational problem solving activity, too little attention is paid to the designer's vision. Vision is considered by Gijsbers and Hekkert as an integrating principle that gives direction to the design process and integrates all knowledge into a coherent design solution. It is a coherent and qualitative image of what a product should look like, how it must interact with users, what functions it must fulfil etc. The personal vision of the designer is shaped by the knowledge and views of the culture and praxis the designer belongs to. In turn, this personal vision can effect the vision at those higher orders of organisation. Shared knowledge and meaning structures determine a collective vision towards products. Changes of cultural knowledge may lead to personal visions that are radically different from current ones. Ecological problems, for instance, focus more attention on durability and sustainability.
Luescher investigates the relationship between the kind of images we consume and the way we construe the world. Photography, film, television and digital media are characterised as vehicles of architectural transmission and evaluated for their discreet and collective contribution to the evaluation of architectural conception. The author concludes that architectural representation is experiencing a fundamental shift in definition and function, and that the continued refinement of image-producing media with its increasingly sophisticated use by non-architects will have a significant effect on the nature of architectural conception.

Finally Van Wesemael discusses how in World Exhibitions the architecture and spatial layout of the site play a key role in the process of instruction. In this context, we can speak of 'didactic architecture'. The author shows how differences in didactic views can lead to different concepts of architecture. At the same time discrepancies appear to exist between the architectural concept and the objectives of the customer. The study is a plea for a new kind of architectural history and conceptual or analytical studies of the historical development of architectural and urban questions.

Design Theory and Methodology

Closely related to the previous theme is design itself. In four papers, this subject is dealt with from entirely different angles. Asanowicz argues that designer's thinking is characterised by simultaneous consideration of many contrary opinions. He sees in CAD techniques the possibility of objectifying the design process, but warns at the same time that techniques like these have to be adapted to the working methods of designers and not the other way round. As we deal with 3D-imaging, we need graphic means to show the full potential of the design process, taking into account the dynamic character of the designing activities.
Heintz' study aims to develop a virtual office support system for concurrent design in architecture. He wants to exploit an existing system for controlling the distribution of information and results in parallel problem solving processes and to apply it to the architectural process. The purpose of the tool is to assist the various agents in the design process to integrate the results of each other's design decisions, and to monitor and distribute information and tasks in a more efficient and effective manner. Two case studies will be handled so as to create a model of contemporary building design decision making. The model will focus on the messages used to communicate the status of the agent, the current state of the design world, changes made to the design world, and the status of both sub-tasks and the task as a whole.

Hekkert investigates the origin and impact of vision in the evolution of design. He points to the analogy between Darwin's theory of organic evolution and the evolution of artefacts. Following his considerations two types of designers are distinguished: the 'genes' and the 'hox genes'. The former deal with the quest for novelty by adding small changes to existing design solutions. The latter break out of this error-correcting method and introduce new styles which differ radically from the prevalent archetypal style.

Finally, Leupen discusses the concept of an Architectural Framework. Design of the urban environment takes place at various levels. Decisions are taken at the levels of organisation of the city and urban space, the overall configuration of a building, the main supporting structure, the facades, the access system, the interior design and the furnishings. The separation of different levels of design can be realised by using one level as a basis to define a clear framework for the other. When this framework has an architectural form or meaning it is indicated as an architectural framework. According to Leupen such a framework should allow the designer himself, other designers or the users to act freely without affecting the concept defined by the framework. The concept is illustrated with several examples.

Materialisation and Production of Design
Prefabrication and product innovation are the key terms here. According to Thöne, in the future all products forming a building will be prefabricated. As a consequence, production can be stringently controlled. His research is focused on developing a design method for connections between components. Points dealt with are durability of materials, simple construction and deconstruction (in connection with recycling) and aesthetics. Emmitt investigates the process by which architects become aware of building products that are new to them. In practice, designers appear to choose time and again for materials and products with which they are familiar. Most direct mail on product information is thrown away and trade representatives are only seen if it is related to a specific project. Most important reasons are risk evasion, lack of time, and an overload of diffuse information. Emmitt's case study shows that architects actively search out building product innovations only when the need arises, and not before. There are two reasons for looking outside their palate of well-known products: technical substitution and a new situation. Technical substitution would arise if the products in the architect's palate of favourite products are not suitable for the given situation. A new situation would arise if the architect is engaged on a different building type to that normally commissioned.
In Oostra's paper a plea is made for a more sophisticated way of presenting information, using on-line link-up possibilities with manufacturers, calculation and visualisation techniques on computer, and so on. Why can't building products be ordered just as easily as a pair of Levy jeans: fast, and exactly the way you want them, on the basis of easily accessible information in a database? Finally, according to Ostorero the design of a building has to be able to give and not to take meaning away from the endless series of objects, apparently banal but with a deep influence on everyday life. He proposes the design of a museum dedicated to the history of technology and science, where one could see, for instance, a refrigerator not only as a mass-produced object, but also as a re-arranged history of the cold. In such a museum, both designers and the general public could become more familiar with the meaning of changing products and technologies.

Analysis of Oeuvres
Studying the oeuvre of a specific architect has always been a favourite subject for doctorates in architecture. At the EAAE-conference, five studies of this kind are presented.
Katja Grillner examines the relationship between theory and practice of artistic creation in the pre-scientific world of the early 17th century, as exemplified in the work of the architect and engineer Salomon de Caus. In his writings and in his oeuvre, theory and practice converged in what was the fundamental justification of human production at the time: the mediation of knowledge of the immaterial and Divine through worldly matter. Both theory and practice were vital instruments for the perfection of art. Today the relationship between theory and practice has a more problematic nature. Grillner's study of a dynamic relation between theory and practice may shed light on the conditions governing this relationship today.

Molinari and Schultz deal respectively with the work of Ernesto Rogers and Carlo Scarpa. Molinari examines the evolution of Roger's individual reasoning process and the continuity of his work as a designer and theoretician, whilst simultaneously examining the role of crisis as the cause of change in consciousness. His micro-history sheds light on the role of belief-systems and precedent knowledge in design innovation and the relationship between individual ideology and collective events. According to Molinari this type of historical research into the evolution of an individual theoretical structure can help to determine the basic components for a model of the strategies that generate design concepts. Central to the analysis of Carlo Scarpa's oeuvre is the application of the stratification-principle. The term stratification is normally used in the technical description of facades. In addition, the method of stratification can be used to integrate different time-levels into one building. Apart from the material aspects of stratification, one can find a level of association in architecture which is reminiscent of historical traditions and creates a certain poetry of symbolic significance (the 'association layer'). Schultz examines how Scarpa transformed the stratification-principle into an instrument of design. She discusses the historical roots of stratification and its spatial and formal effects. She concludes that, apart from the visible spatial effects, the method of stratification also contains a didactic component in directly explaining the attitude of the building.

Van Stralen describes de differences and the similarities in the oeuvre of the Dutch architect H.Th. Wijdeveld, and tries to explain these in terms of Wijdeveld's philosophy of life, opinions of professional matters, and the inspiration he obtained from the work of great architects such as Peter Behrens and Frank Lloyd Wright. Vakalo finally compares the morphology of seven houses of Tadao Ando and shows how the use of a computer based framework (ANADER) can be helpful. The morphological structure of the building plans are analysed at two levels: the geometric structure and the spatial structure. A Universal Shape Grammar is defined to provide a common ground on which the geometric structure of two-dimensional orthogonal compositions can be analysed, compared and derived. Furthermore a Universal Architectural Grammar with 1243 architectural rules is defined.

Urban Design and Architecture

Five papers are devoted to Urban Design and Architecture. Bobic describes two approaches for studies into the morphology of place: phenomenological and quantitative. The former approach is usually focused on an analysis of formal aspects, genesis and meaning, the latter on geometry and structural problems. His research aims to discover the process of creation - morphogenesis (how is it constructed and why) and to decode the complexities of the place - morphology (what is constructed). According to Bobic, attention needs to be given particularly to the synthesis of different quality requirements, a sense of place, the context, and space-time analyses. Glaudemans investigates the concept of the 'ville-territoire' of Corboz from a cultural and historical point of view, and its relevancy in architectural, urban and landscape designs. He is quite critical of current urban and landscape structures. In the same way as Rem Koolhaas, he asks why the typical contemporary condition of the city, which is in formal terms extremely close to Piranesi's reconstruction of ancient Rome and even has the same textural richness, is so totally disappointing. According to Koolhaas, urban designers display an inability to work within the forces that are currently operative. Relative to the contradictory tendencies of congestion (the 'compact city') and dilution (suburbanisation) a process of de-territorialization and re-territorialization is taking place.

Glaudemans wants to find out how these processes will affect specific urban-, and landscape designs, and how to formalise a durable format for the future urbanisation of the (Dutch) landscape. Piranesi's plea for utility, durability and perplexity are seen as the concepts on which a new theory of design should be explored.

Korbel discusses the shift from the centrally planned socialist economy to the free market economy and the effects of this on urban planning and design. There appears to be over-investment in some areas and an almost complete lack of funds in others. On the basis of two case studies - the Kazimierz Action Plan for Poland, and the Chattanooga Downtown Plan in the USA - he tries to create a theoretical model for urban space refurbishment in Poland in accordance with free market economic conditions. How can dying urban spaces be reanimated with the proper guidance of private investment? How should we preserve their usually considerable historical character? Korbel thinks the answer lies in the processing of complex data. He pleads for the explicit involvement of economic data in the development of planning and for a well-structured framework for modern urban space refurbishment.

The way in which green areas, city skylines, open spaces, lanes and vistas dissect the urban landscape and connect its parts is the central theme of the paper of Meeus. A comparison is made of the green structure of Voorschoten (a town behind Holland's dunes) and Almere (a new town in the Flevoland polder). An outline of their characteristics is followed by a proposal to extend the layout-model of Dutch metropolitan landscapes with 'continuity', 'orientation', 'biodiversity', and 'landscape character'.

Prahl takes a critical look at public urban open spaces. In his opinion, many open spaces such as plazas, streets, parking lots, parks and voids have been reduced to their technical function. These are merely locations of individual experience, not of social congregation. The shift of urban public life from open spaces to indoor realms, such as shopping malls, tends to diminish the density and diversity of outdoor activities. A different part of public life is evolving in forms that have no physical dimension. Social and political exchange for example is now being conducted via the media. As a consequence, increasing privatisation and control in public life is emerging. Architects and urban planners can no longer ignore this situation nor its consequences.

Sustainability
A major part of the urban environment will have to be readapted or reconverted. According to Barbey & Clivaz the urban environment should parallely be investigated in terms of its material condition, building type, use, aesthetic value, and experiential impact. They try to develop a precise methodology for the diagnosis of downgraded buildings, on the basis of which the choice between conservation or restoration can be weighed carefully in the balance. Their research is an attempt to relate the evolution of cultural heritage to the evolution of the natural environment.
Restoration and renovation of buildings are good occasions to improve the energy performance of their envelope and interior. Both Guimarães and Ravesloot investigate this item. Guimarães tries to develop a methodology for the integration of energy saving systems, active or passive energy systems, and energy conservation, in historic buildings. His project aims to present specific solutions based on case studies into methodological conclusions showing how they can be applied to a large stock of buildings. Ravesloot too, in his research, aims to reduce environmental problems caused by building and construction. He tries to reveal legal, economic, and other obstructions still blocking the successful introduction of sustainable building. The author argues that for the application of sustainable building

techniques, new methods of research are needed that take account of the cultural effects of introducing new concepts and techniques.

Kuc-Sluszniak investigates from an architectural and town and country planning point of view, the consequences of liquidating industrial complexes in Poland's Upper Silesian Agglomeration. Poland's centrally planned socialistic economy gave rise to rapid industrial development with no environment protection, resulting in ecological, spatial and health problems. However, old buildings or industrial complexes become the symbols of place identity. They grow into the landscape of town and countryside and confirm the history and traditions of their locations. She searches for new applications for old industrial buildings that are of historical and cultural value.

Concluding Remarks

The 40 papers in the parallel sessions and the plenary sessions together provide a good overview of the content and opinions on Doctorates in Design and Architecture. On the need for research everyone is agreed. Research leads to knowledge both of architecture as a profession and architecture as a discipline. Knowledge is power. Without its own body of knowledge architecture will scarcely be able to survive as an autonomous discipline and increasingly loose ground to associated disciplines. It is necessary to redefine architectural knowledge in a way which commands public respect. But what is the core of architectural knowledge, of design research? Opinions on this differ. Some think the question has no meaning and emphasise the multidisciplinary character of design research. Others believe that the designers themselves should have a more important role in research: one must allow the design itself to speak. Closely related to this, is the question of which research methodology is best. Does design research need a design specific approach? No clear definitive answer is given on this. The gap between art and science has been pointed out from different quarters. Ethics and aesthetics, for example, are fundamental concerns for architects. But on what scientific grounds should such problems be handled? Another gap is that between architecture as a discipline and architecture as a profession. Although both of these components have a certain degree of autonomy, theory and practice have to be brought closer. The interaction between discipline and profession, between 'savoir et savoir-faire', might be improved by integrating design and research into one organisation. We need however to ensure that there is enough scientific distance and enough scope for basic design research.

Education in research and the development of a research attitude also merits close consideration. Research culture is desperately needed as a craft inside the profession, as was postulated in the round table discussion. A prerequisite is the introduction of research methods and research data in undergraduate studies. The best way to improve knowledge and to influence the world is by teaching. Special attention is necessary here for conceptual tools and conceptual reflection to clarify the fundamental concepts of architecture so as to articulate architectural practice. History, philosophy and art theory could act as a bridge between the different attitudes of architects and other disciplines. What form research training should take exactly however is still being heatedly discussed.

One last point is the dichotomy between demand for more and better research and the scarcity of financial resources. For this reason various authors argue that it is better to have a limited number of research centres. Spreading research over a host of different institutions only serves to put more of them below the threshold of proper functioning as well as to dilute the resources and quality of the research. It is better to aim at cooperation, division of tasks, and concentration.

All in all material enough for a new conference!

Research in Architecture and Other Disciplines

The Construction of a New "Ism"
The Rhetorical Context of Architecture

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Abstract

By looking closer at the creation of Deconstructivism, an architectural 'ism' that established itself on the architectural scene towards the end of the 1980's, this paper will discuss some of the different desires and rhetoric that may underlay the contemporary tendency for architects to establish working relations with philosophy. The introduction of the term "Deconstructivist" into architectural parlance can be traced back to the exhibition Deconstructivist Architecture held at the Museum of Modern Art in New York in 1988. The paper therefore returns to the material presented in the exhibition. Focusing on the text Deconstructivist Architecture by Mark Wigley in the exhibition catalogue, the paper begins with a brief discussion of the relationship between the philosophical term 'deconstruction' and the architectural term 'Deconstructivist' in order to reveal the underlying rhetoric behind the concept 'Deconstructivist Architecture'. This rhetoric is discussed further by investigating the exhibition's references to the avant-garde of Russian Constructivism and by considering the political connotations of architectural form.. Continuing, the paper claims in opposition to the curators of Deconstructivist Architecture that the architecture of the exhibition gained its critical edge specifically through discourse, and concludes by arguing for the necessity of a rhetoric in contemporary architectural practice.

Introduction

Over the last fifteen years an interest in questions of theory and philosopy has developed in architectural education in Europe and the United States; in many schools contemporary theory is now included in the core curriculum. How is this newly gained theoretical knowledge applied within the field of architecture? And how should this increased interest in theory be understood?

By looking closer at the creation of Deconstructivism, an architectural 'ism' that established itself on the architectural scene towards the end of the 1980's, this paper will discuss some of the different desires and rhetoric that may underly the contemporary tendency for architects to establish working relations with philosophy. The introduction of the term "Deconstructivist" into architectural parlance can be traced back to the exhibition *Deconstructivist Architecture*, held at the Museum of Modern Art in New York in 1988 and curated by architect and theorist Mark Wigley together with Philip Johnson. The paper, therefore, begins by considering the material presented in the exhibition at MoMA as documented in the catalogue.

Deconstructivist Architecture

The title of the exhibition makes an obvious reference to the field of philosophy by twisting the term "deconstruction" introduced by the French philosopher Jacques Derrida. First presented to American audiences in 1966 at a conference organised by John Hopkins University, Derrida's writing made an enormous impact on the development of American criticism. Specifically within literature the conference marked the emergence of a 'literary' deconstruction that established itself in academic discourse. Derrida's deconstruction suggested a close and critical reinterpretation which challenged the logocentrism underlying any given text. Deconstruction in the Anglo-American version, however, took on a more general significance and ironically, given its massive institutional success, was heralded as a critical force aiming to dismantle the homogenising and absorbent tendency of academic criticism (Norris, 1991). The title of the MoMA exhibition suggests a similar challenge to accepted critical norms; however, the relationship between deconstruction and Deconstructivism was of a complex nature.

Deconstructivist Architecture featured seven contemporary architectural offices: those of Frank O. Gehry, Daniel Libeskind, Rem Koolhaas, Peter Eisenman, Zaha Hadid, Coop Himmelblau and Bernard Tschumi, architects whose works were supposed to show a new sensibility towards deconstruction. But did they? The link between Derrida's deconstruction and the exhibited architectural work was not very obvious. Out of the seven exhibitors only Eisenman and Tschumi admitted that their methods of design had been inspired by the philosophy of Derrida, while most of the other architects participating rejected the label Deconstructivist for their work altogether (McLeod, 1989). There was, then, an ambivalence about the relationship between deconstruction and Deconstructivism which was underlined by the curators themselves.

Mark Wigley's introduction, written in an elegant Derrida manner, claimed that the purpose of the exhibition title was not at all to relate to contemporary philosophy : "*It is not that they* [the projects] *derive from the mode of contemporary philosophy known as deconstruction. They are not an application of deconstructive theory. Rather they emerge from within the architectural tradition and happen to exhibit some deconstructive qualities*" (Johnson, Wigley, 1988). Wigley, then, ignored the work of Tschumi and Eisenman, who declared themselves to be influenced by Derrida's philosophy; he inferred, rather, that the work was a continuation of the tradition of Russian Constructivism which, in his view, carried the same critical potential towards its own discipline as does Derrida's deconstruction to the metaphysical tradition of Western philosophy. Wigley proposed that criticism can be carried out within architecture itself, not in the realm of theory but instead in its physical structure: "*Critical work today can be done only in the realm of building: to engage with the discourse, architects have to engage with building; the object becomes the site of all theoretical inquiry*"(Johnson, Wigley, 1988). Architecture is thus given a critical potential gained by returning to the strategies of the Russian avant-garde: "*in dismantling the ongoing tradition, in which modernism participated, they find themselves inevitably employing the strategies rehearsed by the avant-garde*" (Johnson, Wigley, 1988).

Wigley explains that Deconstructivist architecture is to focus on the canonical tradition of modernism; by challenging high modernism's orthogonal forms a deconstruction is performed: *"They apply the cool veneer of the International Style to the anxiously conflicted forms of the avant-garde. Locating the tension of the early work under the skin of modern architecture, they irritate modernism from within, distorting it with is own genealogy"* (Johnson, Wigley, 1988). Deconstructivist architecture in Wigley's construction becomes an interdisciplinary discourse in which architecture effectuates a criticism of its own discipline not, as traditionally, through a body of texts (the thesis, from Alberti to Le Corbusier) but through architectural form itself. Architecture becomes critical theory: *"With these projects, all the theory is loaded into the object: propositions now take the form of objects rather than verbal abstractions"* (Johnson, Wigley, 1988).

Wigley explains the exhibited work as challenging the traditional status of theory in architectural discourse " *No longer is it* [theory] *some abstract realm of defence that surrounds objects, protecting them from examination by mystifying them"* (Johnson, Wigley, 1988). The questions raised by Wigley's "programme" for deconstructivistic architecture are interesting. Is it possible for architectural form to exert criticism without dependency on a body of explicit theory to communicate that criticism? And if it were possible for the forms of Deconstructivist Architecture to communicate such criticism independently, why then the need of an exhibition authorised by that most established of institutions, the Museum of Modern Art in New York?

Construction of an "ism"

Deconstructivst is not a new style. [...] Deconstructivist architecture represents no movement"(Johnson, Wigley, 1988). Philip Johnson assures in the preface of the catalogue that the exhibition is not intended to be a presentation of a new "group", "movement" or a "style". The exhibition communicated the same message; the different projects showed strong diversity in design strategies as well as stylistic outcome. No ensemble had existed before the exhibition and the connection between the architects was created exclusively by the curators of the MoMA exhibition. Rather than a homogenous group, with a common attitude towards architecture, the exhibition showed seven independent architects.In their denial of the concept of a group, style or movement, the curators seemed to be aware of and to encourage this heterogeneity of the participating architects. But at the same time they successfully repressed the diversity by creating a common historical ground and by stressing the formal resemblances between the exhibited work.

By naming the architect's work *Deconstructivist Architecture* Johnson and Wigley suggest that the works have something in common that qualifies them as Deconstructivist. By this suggestion the curators seem to slip into a traditional art-historical classification: *"It is a confluence of a few important architects' work of the years since 1980 that shows similar approach with very similar forms as an outcome. [..] Since no forms come out of nowhere, but are inevitably related to previous forms, it is perhaps not strange that the new forms of deconstructivist architecture hark back to Russian Constructivism of the second and third decades of this century"*(Johnson, Wigley, 1988). While first rejecting the idea of this being a group, movement or style, Johnson falls back on a formal definition of the projects and suggests that the group is put together for stylistic reasons speaking of a common source in the Russian Constructivism. Wigley promotes a similar stylistic classification: *"The aesthetic is employed only in order to exploit a further radical possibility, one which the Russian anvant-garde made available but did not take advantage of. [..] The projects can be called deconstructivist because they draw from Constructivism and yet constitute a radical deviation from it. They accomplish this by exploiting the aberration in the history of the avant-garde, the brief episode of about 1918-20, in which contorted architectural designswere proposed. [..] The forms themselves are infiltrated with the characteristic skewed geometry, and distorted"* (Johnson, Wigley, 1988).

Thus the art-historical classification that both Johnson and Wigley eagerly try to avoid is highlighted by the connection they make between the exhibited work and the Russian avant-garde. The formal similarities were stressed by adding a retrospective of Russian Constructivist architecture to the main exhibition. This historical section gave the otherwise unfamiliar forms of the new work a home in history, one which obviously some of the participants were unaware that their work originated from: *"Some of these similarities are unknown to the younger architects themselves, let alone premeditated"* (Johnson, Wigley, 1988). At the same time as the two curators denied that they were creating an "ism", they clearly inscribed the group within a traditionally conceived art-historical classification depending on style and origin.

Affirmation and Commodification

But creating an "ism" has more than stylistic consequences it also has political implications. In this case the identification of Russian Constructivism as a single formal source emphasises the critical potential of architecture. The curators could have acknowledged a variety of sources for the work in Deconstructivist Architecture: contemporary sculpture (Gehry), German expressionism (Coop Himmelblau) or conceptual art (Eisenman). Instead they chose to look back to the Russian avant-garde, in which architecture was seen as an important force for the change of society, and in which it was given a high status as the only of the arts able to combine form and utility. This choice of emphasis made by Johnson and Wigley originated, surely, from a desire to reconstruct (rather than deconstruct) architecture's political and critical position: *since architecture is so intertwined with society, the social revolution requires an architectural revolution* (Johnson, Wigley, 1988).

To understand the implicit rhetoric of the Deconstructivist Architecture exhibition, one should take a brief look at the architectural climate in United States and Europe at the time. The pluralistic Postmodern Movement in America as well as Europe had its roots in a growing dissatisfaction with the utopian and elitist tendencies of the Modern Movement. This generated a criticism of the aesthetic and social parameters which had guided the modernist manifesto and led to a rekindled interest in areas that the Modern Movement had rejected, areas such as mainstream culture, tradition and regionalism. By the end of the 1980's in the United States Postmodernism had effectively defeated Modernism, however its populist bias had also opened up architecture to forces of commodification and the critical potential of postmodern architecture seemed largely to be exhausted. American Postmodern architecture seemed to a great extent to have abandoned its critical transgressive dimension and was creating an eclectic and affirmative culture strikingly in accord with the tone of contemporary Reaganism of political life (McLeod, 1989).

The result was a hedonistic consumption of architectural form not much different from that which resulted from modernism's affiliation with capitalistic power that the early Postmodernists had been so critical of. A similar tendency could be traced in Europe but with less emphasis on mainstream culture and more on traditionalism and historicism. In Europe, and perhaps especially in England, Postmodernism became a synonym for antimodernism (Rustin 1989). Even here the initial crusade against the Modern Movement's exploitation of the inner cities and its lack of respect for historical sites faded in the 1980s into an affirmation of the status quo or a "back to basics" attitude. By the end of the 1980's both American Postmodernism and European Traditionalism seemed to have alienated themselves from the contemporary problems of architecture.

Critical Edge

In the climate of affirmation and commodification that dominated the architectural debate in the 80's the creation of Deconstructivism can be understood as a rhetorical move, a move to challenge what were perceived as Postmodernism's conservative dimensions: its historicist imagery, its commonplace contextualism, its conciliatory and affirmative properties, its belief in cultural consensus and its repression of the new. By using architectural form to engage contemporary cultural dilemmas – estrangement, loss of centre, lack of common consensus - Deconstructivism aimed at regaining for architecture the critical edge it had lost. It is with that rhetoric in mind that one can understand the exhibition at MoMA, both its emphasis on Russian Constructivism, recalling a time when architecture had a revolutionary rather than affirmative role, and the significance of the philosophical associations caused by the exhibition title.

But how is Deconstructivist architecture to engage in criticism? For Wigley the answer to this question is highly specific and pertains to architecture's use of form. Wigley suggests that Deconstructivist architecture, even though it refers to the tradition of Russian Constructivism, does not imitate historical forms (as does eclectic Postmodernism): instead it uses an inherited geometrical configuration to destabilize the structures of high modernism. And by not being involved in imitation Deconstructivist Architecture returns to the social realm that the eclectic Postmodernist has forgotten: *"The use of the formal vocabulary of Constructivism is therefore not a historicist game which deftly extracts the avant-garde works from their ideologically charged social milieu by treating them as just aesthetic objects. The true aestheticization of the early formal investigation was actually effected when the avant-garde itself made them ornamental rather than structural. The projects in this exhibition, however, do make the early investigation structural and thereby return them to the social milieu"* (Johnson, Wigley, 1988).

The suggestion is that by avoiding the ornamental surface (a quality emphasised by eclectic Postmodernism) and declaring (twisted) structure, architecture becomes socially engaged.These remarks begin to uncover a paradox which underlies Deconstructivist Architecture's relation to deconstruction in general. The rhetoric visible in

Wigley's comments is precisely that of high modernism: that ornament must be suppressed in favour of structure. Although, Deconstructivist Architecture may destabilize the *architectural* structures of high modernism it leaves its philosophical structure intact. The *a priori* qualitative hierarchy between structure and ornament is not challenged or deconstructed, but affirmed. Further, Wigley's argument carefully avoids architecture's potential for criticism through means other than the formal. As with eclectic Postmodernism, the political impact of architecture is considered to derive only from its formal qualities. The role of program, site, client and production are not considered as possibilities in challenging the existing structures of architectural politics. Rather Deconstructivist Architecture, as exhibited in the MoMA, accepted the economic as well as institutional power structures that traditionally govern architecture's role in the society.The political role of Deconstructivist Architecture was then reduced to that of a cultural object where political force was understood to reside in the physical structure of architecture, in its nature as an object.

The Retorical Role of Deconstructivism

But architecture's subversive power as a cultural object shouldn't be underestimated. The formal experiments of Deconstructivist Architecture have a political force because they challenge the conservative connotations produced by eclectic Postmodernist configurations. The architectural forms of Deconstructivism partake in a *rhetorical* discussion in which different forms take on varying political connotations. In this rhetoric "mute" architectural forms become codified with different architectural "meanings" which challenge or conform with the political climate in the society. Architectural form is circumscribed in a field of theory in which architectural criticism, research and education as well as publications and exhibitions create a rhetorical discourse which interprets as well as surveys the cultural and political connotations of form.

The political impact of architecture in the society is then of necessity twofold: both that of economical force and that of cultural object. In that twofold condition the "rhetorical field of architecture" can play an important role by formulating a position for architecture in society which surpasses the strictly economic. In the contemporary society, distinguished by a lack of master narratives or a common consensus (Lyotard 1984), theory can take on an important role as a mediator producing the agreement (more or less temporary) which makes practice possible. Architectural theory, then, should not be understood as a passive observer of praxis; rather, it's role can be seen as that of creating the possibility to build by establishing new foundations for architecture.

Retrospectively, one can see how the creation of Deconstructivism through the MoMA exhibition, together with the following architectural debate, established a framework for a new group of architects, a framework that allowed many of them the possibility to move from theoretical to built projects. The subsequent successful careers of the participating architects should partly be understood as a result of the exhibition's ability to communicate their concepts of building by rhetorical means. The rhetoric of the new "ism" could challenge the Postmodern Movement and open up architectural discourse to new approaches in architecture.

Conclusion

This creative role of theory and criticism in formulating new possibilities for architecture can explain the increasing interest in theory in contemporary architectural education. The creation of the new 'ism' of the eighties -Deconstructivism- is a clear, but also curious, example of how and when an architectural rhetoric has been used to create a new foundation for architecture.

The MoMA exhibition, followed by several publications on Deconstruction in the architectural press, established Deconstructivism as a new architectural concept on the American and European architectural scene in the late 80's. The catalogue for the exhibition shows how theory can be used as a tool to communicate and to inscribe certain interpretations on a group of architectural projects. A rhetoric was created that, even though inspired by Derrida and Post-structural thought, constructed rather than deconstructed an origin, a meaning and a centre for a group of diverse architects' work. Even if the curators themselves rejected the rhetorical use of theory - *"Indeed the force of the objects makes the theory that produce it irrelevant* (Johnson, Wigley, 1988) - this paper has argued that the built form of Deconstructivism gained its critical edge *because* of the drawings, lectures and writings about it. In opposition to Wigley who suggests that the force of the *form* of Deconstructivist Architecture makes the theory that produces it irrelevant, this paper has explored how a skilful production of an architectural rhetoric surrounding the MoMA exhibition created itself the political force Deconstructivist Architecture aspired to.

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The Boundaries of Architectural Research

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Abstract
Whereas the intellectual field of architecture is amorphous, the practical objects and personalities associated with the discipline provide a rich vein for academic investigation. The features which distinguish architecture from other disciplines have tended to have indistinct boundaries and indeed one of the delights of research associated with architecture has been the way in which research has drawn upon other disciplines. Architecture relies upon a variety of sources of inspiration, knowledge of culture, and properties of building structure and materials. Each study area may claim distinct characteristics of research methodology. Research themes develop a philosophical and contextual framework for the identification of intellectual projects often drawing upon disciplines that impinge on the field of architecture. Aspects of investigations may be speculative or based on the rigours of empirical research within defined limits of study.

Concepts and Traditions
If we consider the position of architectural research in brief making or user evaluation, several other disciplines may be involved in the research activity. When does a piece of research enter the realm of the social scientist or operational researcher rather than architecture? No one answer would meet the demands of academic rigour. Yet, clearly the subject matter would be of architecture, the design disciplines or the built environment. Without that focus the research is determined by the thinking of some other discipline than that of architecture. The difficulty in defining the extent or content of subject matter has been encountered in the arts in general. Wollheim argues that although a definition may be suggested for art, it is impossible to prove the definition. However, he feels that 'it may anyhow be that a more fruitful, as well as a more realistic, enterprise ... to seek, not a definition, but a general method for identifying works of art' (Wollheim, 1970).

Yet, that approach, of considering the work of architecture as an object, may be seen to preclude the consideration of conceptual issues such as space. But the abstract study of space would be a philosophical issue which may inform an architectural design project. A note of caution should be raised for research into conceptual issues should beware of confusion due to vagaries in the use of language and the potential lack of clarity when stating factual observations or developing hypotheses. In this respect Norberg-Schulz has observed that, 'the word space ... is employed without making clear if one refers to a physical or a psychological space, or perhaps to some undefinable metaphysical entity' (Norberg-Schulz ,1968). Van de Ven's study of *Space in Architecture* initially employs a conceptual approach to the subject which leads into a contextual relationship of the notion of space with that of the avant garde movements in architecture. Thus the nature of that research uses both the methods of a philosophical enquiry and of the art historian. Although this cross discipline influence enriches the study, the substance of the study is however intrinsically that of architecture (Van de Ven, 1978).

In a similar manner to the conceptual aspects there are also material facets for consideration beyond the needs of properties of materials and of structure. Research into these areas is the legitimate concern of architects but when do we enter the field of the physicist and engineer? There is an equivalent concern in issues related to controlling the nature of the environment. For example the physicist and engineer can provide data and analysis of the efficiency of photovoltaic cells but the positioning and formal organisation of the cells is within the realm of the designer. To an extent this point highlights the traditional relationship of Building Science with architecture, for in the immediate post-war generation the idea of funded academic research in this area tended to be associated with Building Science rather than architecture. This was due in part to the support given to the various national building research establishments.

In formulating disciplinal boundaries the traditions associated with a subject clearly are of use. This is also reflected in historical study. However, when does the influence of the art historian outweigh that of pure, if we may use the word, architectural research? The nature of critical assessment and theoretical definition within this area is complex. Thus even the traditions of a discipline are open to questioning by other disciplines. The question of architectural style may seem to be at the route of architectural debate. Issues related to this aspect are by no means clear cut, indeed from basic concepts complex issues ensue. A comment by Conley is particularly apposite in this respect. He questions: 'How do styles develop, and why do they differ so markedly? Do they succeed one another or share pertinent traits? Do aesthetic styles convey, in a broader sense, the notion of particular "manners of thinking"? Can styles be periodized and, if so, what are the ideological motivations betraying the historical schemes that also tend to produce them?' (Conley, 1993).

Process and Performance

Surely, however, one may assume that the process and method of architectural thinking is a clear case for disciplinal research. Yet, when does this area become one of management, or of operational research? The heuristic process of shifting through data is one equally used by operational research and architecture often unknowingly. The analytical logic employed may also be observed in mathematics, indeed this was the basis for Alexander's work on the synthesis of form (Alexander, 1964). Other attempts to systemise the design process have focused on the routine of reiterative problem solving or by centrifugal methods such as the well established development cycle by Lonberg-Holm and Larson, which presents a never ending sequence which may be interpreted in a variety of ways. One example would be the sequence of research, design, construction, use, obsolescence and further research. At present, rationalists of the design process in architecture are arguably not as significant as they were a generation ago but the subject area is a rich mine for architectural research (Broadbent, 1973). Possibly, the lack of emphasis upon method and process in recent years has been due to the notion that to design is not a simple rationalist concept for much of the way in which design occurs is irrational.

It could be said that the architects role is that of one who compresses the boundaries of the subject into a coherent whole.

The study of building performance is a less clear cut issue in defining the position of architects in research for here the work of architecture and the role of architecture in society becomes the object for academic investigation by other professions and disciplines. One of the implications of research of this nature is that interdisciplinary work will occur and the definition of the boundary of architectural responsibility becomes clouded. Indeed the whole issue of the architect's involvement in building performance is one related to the definition of the architect's professional role. It may well be that the architect's position in such work is that of the formulation of creative opportunities rather than the empirical role taken by other disciplines. Often the context of building performance leads to pragmatic discussions. It could be argued that the exchange of value systems and beliefs between disciplines not only provides the opportunity to clarify research objectives but stimulates a whole new field of research activity. The interdisciplinary work of the Building Performance Research Unit at Strathclyde (BPRU, 1970) provided the ground for a whole series of research studies including that of the then seminal architectural psychology subject (Stringer et al, 1969).

One point of interest in the comparative attitudes to research of the academic on the one hand and the architect on the other is that the architect in practice perceives design competition work and unbuilt proposals as a research activity in its own right. The architect in practice relates research, amongst other things, to the selectivity of materials, components and systems and he relies to an extent upon interdisciplinary skills so that often the authorship of the design of a building is difficult to define. Often the originality of a design places emphasis on the conceptual approach rather than the realisation or the implementation of the idea. The academic point of departure is however, concerned with the substance of defining a thesis proposal which is supported by the establishment of the originality of the research project.One of the anomalies of research is that the body of documentation and artifacts upon which a project is based and the work that produced the data is often considered to be of a different intellectual level than that of the work of the research worker. For instance the publications and designs of the de Stijl group are viewed in a different light to the thesis of Jaffe on de Stijl, which he identifies as the Dutch contribution to modern art (Jaffe, 1956).

There is also a further issue of some consequence that results from the thinking of groups such as the de Stijl group this is concerned with the concept of the integration of the arts and implies that there are similar creative processes employed by the several branches of the arts including architecture. There is a further point of some consequence in this area of research which was identified by Semper. This is that of the perception of the distinction between the history of art as a product of society and as a product of the history of forms (Semper ,1863). It should be added that the two approaches to history are not exclusive indeed at times they may be interrelated.

Culture and the essence of architecture

Writers and thinkers on the nature of architecture have attempted to define the essence of the subject often returning to either symbolic and allegorical themes or to the classical values of the discipline. Writers such as Scott and Watkin would fit this classification. Scott writing in the early years of this century took the line of argument that the humanist values of the Renaissance were the essence of architecture and that other critical analyses based upon ethics, biology or the machine and indeed the romantic tradition were a fallacy (Scott, 1914). In a similar vein Watkin in more recent times stresses the values of the individual imagination and artistic tradition as opposed to 'explaining architecture away as a consequence or manifestation of something else' regardless of religion, politics, sociology, philosophy, rationalism or technology (Watkin, 1977). Yet this narrow form of definition of content has the implication of placing the constraint of a straitjacket on the boundaries of the subject which belittles the stimulation to research created by the blurred boundaries of disciplinal recognition. Such an approach leaves little scope for designers who emphasis a social attitude to design and implies a lack of understanding of concepts like that of Bakema that architecture is 'the three dimensional expression of human behaviour' (Bakema, 1961). Nor would they appreciate the clarity in the thinking of Norberg-Schulz and others that designers should strive for an integrated approach to design.

There are other factors which influence the stimulation for research activity that are suggested by thinking which originates outside the narrow confines of architecture. One of these influences of some note is the cultural aspect, which is a variable that can change from decade to decade. Arguably one such change has been that of architectural research which has seen a shift in emphasis from a concern with various aspects connected to a structural understanding of the organisation of design to one in which the less tangible concept of the narrative understanding of design has been given prominence.

Clearly there are similarities with the study of language and its use in the way in which the architectural debate has used this comparison to literature. In the 1960s the content of design was linked to notions of structuralism in language. Arguably this led to a formal approach to design in which the parts of design were seen as interrelating aspects of the whole. Certainly geometry played an important role in this.

A reaction to that attitude can be found in the various approaches which resulted in a concern with the urban narrative and in an awareness of the poetic as an integral component of the design activity. Two sources which have been readily quoted in recent discussions of design influences have been those of Bachelard, *The Poetics* of *Space* (Bachelard, 1969), and of Calvino, *Invisible Cities* (Calvino, 1974).

The concern with the structural aspects of design has also been related to a social awareness of the implications of design. That is of what people do in the environment and how they use spaces. On the other hand the urban narrative relies in some way upon memory and experiential values. That is of appreciating the sometimes disparate connections we make in places and the way we connect places in our mind. In terms of research the former position is one of observing, recording and making decisions; in terms of the latter the process may be understood more readily as an artistic activity.

Quite clearly this polarity of approaches is a reduction of the research content of each approach and to varying extents there is an overlap between the two positions.

Observations

Whilst recognising that interdisciplinary activity can stimulate research the discussion of the paper illustrates the argument of the thesis that the essence of architectural research can to an extent be identified by a process of disclaiming research which is primarily founded in disciplines and methodologies other than those of architecture. Yet, that argument implies that the subject of architecture has definable values which are exclusive to the subject, whereas in reality it is often difficult to distinguish those values which are due to the nature of the discipline of architecture.
The paper has thus attempted to define boundaries to the subject area of architecture and to identity some of the contents of architectural research whilst observing the contrasting notions of building performance with the philosophical basis of architectural thought. In the final analysis however the previously quoted discussion of Wollheim may set the seal for considering the boundaries of architectural research. Thus it may well be impossible to provide a *definition* of the content but that a more rewarding approach would be to *identify* research that has an architectural content.

In conclusion a paraphrase from a note by Ivan Illich is worth some reflection. An architectural researcher, unlike a work of architecture, cannot be classified as an artifact. Architectural researchers belong to a different class of resource from the objects they investigate. Architectural research workers may be listed and contacted in a different way from the way works of architecture are made available and 'a person formally becomes a skill resource only when he consents to do so, and he can also restrict time, place and method as he chooses' (Illich, 1971).

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The Specific Role of the Doctorate in the History of Architecture within an Architecture School

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A doctorate program in the history of architecture belongs to the more "traditional" post graduate degrees offered by schools of architecture. Its popularity and fate, historically speaking, is unfortunately linked to the prevailing taste, at any given moment in time, in architecture itself.

Thus, in the 19th century, when historical styles were the prevailing paradigms, a profound knowledge of historical forms and details were a necessary tool for any architect, an additional degree in architectural history and the capability to operate within the then valid methodology, was considered, if not a professional necessity, then at least an added plus which could be used in every day professional life. The architectural historian, that is a professionally trained architect, who then specialized in architectural history, and who was then in a position to methodologically and correctly do research on historic architecture, and usually transferred this into his own creative architectural work, was not only a sought after architect, but was also needed as a teacher in this discipline. Already then the relationship between the architectural historian trained as an architect within a school of architecture, and the one trained within an art historical program of a philosophical faculty was not really clarified. At that time tensions must have existed, but as the professional goals of the two were totally different, these can only be traced back in such things as the professional relationship between the two on specific projects. The first dealt professionally and architecturally with the object, by for example producing measured drawings, the other considered himself as the connoisseur, who stood above such profane work.

The role of history within schools of architecture changed dramatically in the first half of this century: Different values in architecture, required the teaching of different values; different schools placed emphasis on different parts of the curricula. Common to all these trends was the diminishing role of history. In such a way the history of architecture either disappeared totally from the architectural curricula, or was taught by permanent guests from other faculties, or by art historians (Harvard's Graduate School of Design, for example, only hired its first in-house historian again in the mid 1980is, and then someone trained as an art historian). The issue at stake here is not the question of the validity or merit of these different trends, but the lack of freedom of choice given the student to either reject or accept the knowledge of historical traditions based on sufficient own data. Those teachers who, usually for very acceptable reasons, rejected history as part of the architects training, had in their own right, and based on their own knowledge, rejected history (for example Gropius), but failed to give this same freedom of choice to their students.

Today, just about all architectural schools are in a position to teach historical subjects in-house. Depending on the training of such teachers, different emphasis is placed on the specific position architectural history has in relationship to other historical disciplines, and of course, more importantly, within the architectural curriculum itself. As interesting and as necessary a detailed discussion of these differences would be (they influence for example the dialogue with existing architecture within the minds of the students), this is not the topic of today's paper, and would go well beyond the issues to be discussed here. Common to all these approaches is, the more or less stringent anchoring of such teaching within the criteria of historical, here intended as part of the humanities, methodology. Such a reality, places architectural historical teaching, and even more so any post graduate degree in this discipline, in an extremely individual role within a school of architecture, perhaps places it in a marginal position, but at the same time, and for the same reasons, offers the possibility of bridging inter-faculty and inter-disciplinary communication. This also means, that the methodological, scientific or scholarly approach is more readily understood by other university disciplines. On a purely pragmatic level this means, that university-evaluation, -accreditation or similar committees, usually composed mainly of members of other faculties, and therefore in their majority non-architects, can relate more readily to such higher degree programs or to the degrees themselves. This could, should and in the past has partly been used as a vehicle to introduce further higher degrees in schools of architecture.

This means, that post graduate programs in the History of Architecture can act as an important bridge between various faculties in a University or Technical University and the outside.

Allow me to be more specific:

1. In Universities (and I use this term in the sense of a global university, not for the moment as technical universities), with schools or faculties of architecture, this means, that a doctorate program in architectural history fills the important gap between the humanities and the more technically oriented schools or faculties of such institutions.

More specifically its proximity, and yet great divergence from an Art History program can form the methodological link between the traditional humanities approach to historic architecture, and the equally essential knowledge of someone with an architects training to the understanding of what architecture is.

This means, that in such institutions, these subjects and their exponents can and should use their inner university ties to broaden the communication, teaching, research and ultimately higher acceptance between architecture and the other faculties, be it the traditional faculties of philosophy, theology, medicine and law, or their modern counterparts. At the doctorate level this involves the *mutual* cognisance of what scholarly and scientific criteria and methodologies of the individual disciplines encompass, and thus, hopefully, a positive approach, not only to the discipline itself, but also to its specific criteria, methodologies; that is to what scholarly and scientific research *is* for each particular discipline. It is banal to state that the different type of questions asked in research, require different methodologies and techniques to attempt to answer them. And yet we all know, that in many cases the only valid approaches in architectural research do not fulfil narrower and conservative evaluation criteria and/or legislation. On a pragmatic level the fact that the doctorate in architectural history, for the above mentioned reasons, fulfils such requirements more readily, and could therefore be used as the wedge to broaden acknowledgement criteria.

2. In a Technical University, where architecture forms the link between the humanities outside the university and the other faculties within the university, architectural history should be at the cutting edge of communication; in practice this means, interdisciplinary endeavours.

The situation is parallel to the one mentioned above, except, that the mentioned specific interactions possible for the architectural historical discipline, are now not necessary on an inner-university level, but are one of the few options, in some cases the optimal one, which can act as a link to other institutions of higher education or learned societies. Although the intellectual and methodological aspects in these two instances are the same, the practical means and "political" implications are very different: Towards the inside architectural history is often the ideal link to a humanities component in all technically oriented subjects. The seriousity with which it finds acceptance within its own school or faculty is therefore the measuring scale by which it itself, or sometimes even the whole school or faculty, is seen by the other faculties in a Technical University, on this "humanities" level. Exactly this measure of acceptance then reflects on the whole institution when viewed in its links to the outside. Here lies the danger, I don't think I need to elaborate, of being used as an alibi. But this is something which is different and specific not to each institution, but to the individual or individuals who are its exponents. Issues of a very personal nature as well as those of such things as "international reputation" play a role here; and thus do not belong into a more general discussion of the role of a Doctorate program in architectural history. What is essential here, are the possibilities and influence such a degree program can have on the self-understanding of a Technical University (the two extremes being a highly specialized, narrow research and teaching institution, which can produce optimal and brilliant results on the one hand; and an equally brilliant broader based institution which sees technical disciplines imbedded in a wider picture, on the other hand); and its self-representation towards the outside. If and when the institution sees itself (and wants to represent itself), as open to the broader aspect, then architecture, and very specifically architectural history as its exponent, can play a key role. The dangers are obvious: Representation, or even worse, the attempt at creating an "Image" of a shell without content, can be the nebulous picture intended by a PR-oriented administration. Again the problem is moved into the realm of the individuals responsible and, in this instance, their ethical understanding of their responsibilities.

But the positive possibilities by far outweigh any such dangers: Without losing its own scholarly and scientific individuality, without giving up its specific methodological criteria, the architectural history graduate program has a far greater responsibility; namely to fulfil, within each institution differently, given the specific organisation and goals of such individual institutions, the essential role of bridging the gaps, of creating those new links and re-enforcing existing ones, which only such a program can do, given its specific role.

Doctorates in Design?
Why we need a research culture in design

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Abstract
This paper outlines the background against which research has become an issue in the UK universities that teach design, provides an argument for refocussing the aims and methodology of design research such that it creates a central position for designers in the direction and conduct of design research, and explains how the Hull School of Architecture and specifically the Museum and Exhibition Design Study Centre in the School is addressing the issues raised.

Design Research Context UK
In the UK the focus on research in design departments has been stimulated by a change in status of the Polytechnics and Colleges of Higher Education in which almost all advanced Art and Design education took place. In 1993 they became the, so called, New Universities. They acquired their own undergraduate and, more importantly, postgraduate degree awarding powers and so had to compete directly with older Universities. In particular, they had to attempt to redress the gross imbalance in research funding.

In the universities there has always been a requirement for academics in all disciplines to engage in research. In the former polytechnics academics were not necessarily required to be research active. Most former polytechnic academics therefore have no great track record in research and are in no position to compete successfully for research funding against colleagues in the older universities.

In design we have a different problem. One could argue that because most design was taught in the former polytechnics the design discipline has no research culture of its own. And one can cite the fact that there is no established research funding body that understands and can review design research proposals as official recognition of this lack. Only where design research borrows its objectives and methods from the humanities and sciences can it be directed to an obvious target for funding - one of the national Research Councils.

In the UK design academics are competing for research funds more or less on a level with each other, but from a seriously disadvantaged position in relation to academics in other disciplines. It is very frustrating. If this frustration could be put down entirely to a late start and the need to catch up it would not be so bad, but it is worse than this. I don't think we have yet established the rules of engagement and until we do design will remain vulnerable. Simply as an object of study for other disciplines design does not need to be pursued in a university environment.

Changing Design Research

There is a need to reclaim design research for designers. Too much design research has been conducted by technologists, systems practitioners, historians, psychologists, sociologists, anthropologists, organization and management theorists. Too much design research has been research into design. Too little design research has been research conducted by designers doing what they do best - designing.

To be hopelessly simplistic about it, science is concerned with discovering how things are, the humanities with discovering what things can mean. Design is distinctive, it is concerned with how things could or ought to be. It has, therefore, the greatest potential for a worthwhile influence on political, economic and cultural realities. Unlike craft, design addresses radical material change: unlike art it must address the interests of others. Bound into the very notion of design is the necessity of an engagement with the complexity of the human situation in the world. Design is not only a great orchestrater of knowledges, it constructs its own peculiarly polyvalent knowledge which makes visible and realizable the possibility of change.

In design we have a peculiar problem: generally design does not communicate anything important through its end products. The things, places, messages (Potter, 1969) and systems which are the outcomes of implementing designs normally are not readily interpretable as generalized knowledge. Designed objects are generally speaking poor vehicles for the communication of useful information about the world even to most designers never mind to politicians, executives, technologists, and academics. The knowledge that is embodied in a designed object forms only the tip of a potential iceberg of insight. To recover what is beneath the inscrutable surface of the designed object one must allow the design process itself to speak and in the same operation one must facilitate the recovery of the programmatic and philosophical dimensions of design. This requirement involves a sea change in the way that design as a practice is viewed by its practitioners. It requires the acquisition of a research orientation during training - an early initiation into a discipline-specific research culture.

Developing a Research Culture

Culture is not a straightforward concept as anyone who has encountered Zygmunt Bauman's analysis will know (BAUMAN, 1973). But certain aspects of the designer's experience, in existential as much as in social terms, reveal the fragmentation and uncertainty of the practitioner's condition. Design knowledge, as expressed competencies, is hard won: A succession of master-apprentice relationships is the making of most designers whilst for some a more isolated struggle set against the background of an unforeseeable succession of design opportunities characterizes their personal development. Traditionally little comes to the designer by way of an openly accessible accumulation of design knowledge. Designers have tended to avoid recording the intricate relationship between the design process and its outcomes and reflecting upon the experience of designing in terms of the knowledge it generates of the world. Only infrequently are means sought to produce a transferable knowledge - that rare exhibition that tells the story of a design project[1], that rare publication that systematizes the knowledge of extensive experience[2]. Most design knowledge dies with the designer.

Only when designers believe in and value - and practice as a duty - the systematic documentation and evaluation of designing will things change.

What has already changed is that through the recent proliferation of postgraduate design courses and the address of conferences such as this expectations have been raised, and numerous groups in universities and in professional practice have begun developing methodologies and establishing values for the future of design as a research practice. Dean Hawkes refers to Lord Esher, former President of the Royal Institute of British Architects, who

chastised the profession, and in particular its academic members, for allowing themselves to be enchanted by the siren attractions of other disciplines ...[a] state he characterised as 'the flight to the periphery' (Hawkes, 1995, 11).

Well, the return to the centre in architectural design research is underway. Architectural Research Quarterly published Hawkes' paper in its first issue in 1995: it is the only refereed journal in the field. Other fields of design are served by Co-Design, another new journal which has a refereed section. Design Studies, which has been published since 1979, has been dominated by the periphery. Perhaps this will change, it needs to: the study of design from a variety of disciplinary perspectives is not the same as the study of possibilities for change from the perspective of design.

Knowledge and Power in Design Research

Designers are the natural torch bearers for interdisciplinarity. Design addresses the complexity of the human condition because it requires a simultaneous attention to social, psychological, aesthetic, political, ethical as well as technical difficulty. In analytical terms it resists reductionism and pursues the accommodation of difference. It is, therefore, a hopeful resource in the postmodern boom of interdisciplinary research. To make this a reality, however, designers need to be at the core of a research culture, able to decide who is admitted to design research programmes and who not. This provides the only hope of organizing in the face of already powerful research-based cultures in the sciences and the humanities.

The continued health and influence of the design discipline requires the establishment of a position of strength in relation to disciplines such as management, economics, social science, planning, engineering, etc. each of which derives its credibility with the policy makers if not always its efficacy in practice from rigorous and well presented research. Design was born with and developed as a necessary adjunct to industrialization. In the post-industrial era, the so-called information age, a discipline which cannot renew itself in a radical sense and articulate the relevance of that process will surely become extinct. Therefore, although 'new knowledge' is, one hopes, the outcome of research, the main reason for developing and continuing in a particular research culture is to share in the influence one's discipline gains over the direction of human affairs. In this sense the development of a research culture is not primarily about advancing knowledge, it is about power.

Postgraduate Study and Research Framework at Humberside

In the past two years in the UK there has been an explosion in the number of postgraduate courses in design. Some of the issues that they must address are: exactly what form of study they should support; what objectives and methods they should employ; and in what ways they should explore and add to human knowledge. To achieve a Masters degree one must reflect upon what one does and how one does it and be able to evaluate how this relates to the theories and practices of others. One must take a significant step beyond the ability to understand and reproduce established practices. This demand poses a special difficulty in design: the forms of documentation employed by the practising designer, and learned by the undergraduate trainee designer, may be adequate to the origination, development and communication of design proposals, but they are not generally adequate to the task of thorough and rigorous analysis and evaluation.

The fundamental issue of developing an adequate methodology for research-oriented design is being addressed in the Hull School of Architecture at the University of Humberside in two ways. First a long-established system of organizing postgraduate and undergraduate project work into working units that address particular issues in design is being used to generate the substance of research. And second a modular scheme of postgraduate study has been developed which creates the opportunity for multidisciplinary projects to be undertaken by students. Masters programmes in architecture, project management and facilities management are already established. A new course in interdisciplinary design is being developed by the Museum & Exhibition Design Study Centre to integrate the full range of design disciplines presently operating at undergraduate level, including museum and exhibition design and interior design, into the Hull School of Architecture's postgraduate scheme.

Interdisciplinary Design

The new masters degree in Interdisciplinary Design will address three core demands:

- the need for professional development opportunities for graduates in art, design and architecture
- the need for graduate training opportunities in design practice for those with other than art, design and architecture first degrees, and
- the need to establish a research culture in design practice

It is the latter demand that has the broadest implications and provides the essential rationale for the degree. Briefly, before moving on to a conclusion, I want to focus on the approach we propose to take to developing research methods in design practice.

Research-oriented design methodology

The student will progress through the MA programme in three stages equivalent to Postgraduate Certificate, Postgraduate Diploma and Masters Degree. Each of the first two stages includes a unit of study devoted to integrating the focus on methodology into research projects. In developing the units there have been six key issues:

- formulation of viable research proposals
- organization and monitoring procedures

- quality and breadth of documentation
- aims and methods of analysis
- forms of presentation
- critical feedback

Formulation of viable research proposals
We have adapted the criteria set out by Bruce Archer (Archer, 1995, 6) to apply specifically to what he originally called 'designerly enquiry' (Archer, 1981, 34-5.)

Organization and monitoring procedures
We will utilize a school-wide system of study contracts in which the student negotiates and sets out the context, content and criteria for success of the project with reference to the aims and objectives of the programme. Projects will be monitored by the peer group and process supervised by academic leaders.

Quality and breadth of documentation
We have developed a design model that prompts attention to product, programme, process and philosophy at every stage - the 4Ps model[4]. And a process model which records and tracks the practical techniques and cognitive styles utilized by the student and makes visible any deficiencies in documentation early in the process[5].

Aims and methods of analysis
The criteria defining success will be regularly reviewed, refined and tested during the project.

Forms of presentation
A range of presentation formats is possible - academic paper, book, video, CAD animation, exhibition. The form(s) employed in any project will have to be appropriate to the content and the intended audience and provide the opportunity for critical review.

Critical feedback
Projects selected for their contribution to developing design practice research methodology will become case studies included in a regularly updated manual supplied to all students in the programme. External and internal reviews will be invited, documented, circulated, evaluated and, as appropriate, fed into the research process.

Conclusion

Like it or not, design is in the marketplace of ideas: "No theory today escapes the marketplace. Each one is offered as a possibility among competing opinions."(Adorno, 1966, 4). Without its own core of powerful, intellectual leaders active in investigating through design the direction of future material culture and committed to articulating, communicating and advocating design knowledge, design will suffer technological and political instrumentalization, academic mythologizing, and perhaps oblivion.

We begin a long-term project now which aims to pull the design discipline up by its boot straps. If we sustain our postgraduate students in a newly invigorated research environment and help them to develop ways of designing and communicating that command the serious attention of others, we can look forward to a future in which designers have a commensurate share in the exercise of power.

Notes:

1. For example: The Car Programme: 52 Months to Job One or How they Designed the Ford Sierra, Boilerhouse Exhibition, Victoria & Albert Museum, 1982.
2. For example: Brawne, Michael. (1992) From Idea to Building, Butterworth-Heinemann.
3. We have already had: Design Renaissance, Glasgow 1993; Embodied Knowledge and Virtual Space, London 1995, and; 4-D Dynamics, Leicester, 1995.
4. Developed as part of the author's research: PhD in Management Systems and Sciences at the University of Hull, not yet submitted.
5. As (4) above.

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Proposal for a National Academy of Architectural Science

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Abstract
This proposed new National Academy of Architectural Sciences will offer advanced students the opportunity to earn a professionally oriented Doctorate level degree. The objective is not to duplicate existing PhD programs, which are academic and research oriented, but instead to create a new kind of professional degree for architects, similar to the M.D. and J.D. degrees in medicine and law.

Rather than attempt to build a new free-standing university and try to recruit a high quality permanent faculty, the Academy can instantly create a world-class faculty by establishing a network among the senior people who teach building science in all the schools of architecture in North America. This 'inter-campus university' will take advantage of the latest technology in distance learning and electronic communication to bring together this highly specialized group of teachers and their students.

The Goal
Recognizing that design is the quintessential activity of the architectural profession, the long term goal of this proposal is to create a growing cohort of architects whose special technical expertise and integrated design skills will raise the level of architectural services they can offer to society. This in turn should raise societies expectations of the entire profession of architecture. Thus, if successful, this approach could ultimately lead to improvements in the way architecture is practiced and in the way it is taught.

In order to achieve this long-term goal, it is proposed to create a new kind of intra-university Academy to grant an accredited professionally-oriented Doctorate-level degree in Architectural Science. Tentatively it will be called the National Academy of Architectural Science, and the degree will be called the Doctor of Architectural Science.

Objectives
The objective is to offer advanced post-graduate training for those few exceptionally qualified and motivated building science students who want to go beyond the Masters Degree level, and who wish to become practicing architects able to offer higher levels of architectural expertise and more sophisticated services to their clients, and who seek to create new kinds of architectural firms or to provide new directions to existing firms.

The objective is to equip the people who earn this Doctorate Degree with technical competencies that give them a competitive advantage over traditionally trained architects in traditional firms.

The objective is to create a Doctorate Degree designation that communicates to the people seeking architectural services the fact that this person has acquired special professional knowledge and capabilities beyond the traditional Masters level.

The objective is not to duplicate existing PhD programs, which are research and academically oriented, but rather to create a professionally oriented Doctorate degree. The distinction, for example, would be analogous to the difference between an M.D. in internal medicine compared to a PhD in physiology.

The objective is to prepare people to practice architecture, not necessarily for teaching careers, although undoubtedly many of the graduates of this program will be attracted to that option, and in this case they will be expected to create new modes of teaching and new curricular directions for existing schools.

The objective is to compliment and cooperate with all existing Masters level programs at Architecture Schools throughout the country, not to supplant them, by offering a further professional specialization for a few of their best and most motivated students within the context of their home institutions. In effect, every School of Architecture will be able to offer its best graduates participation in a nationally administered Doctorate program with a world-class faculty.

The objective is to build a world-class faculty by bringing together all the senior people teaching Building Science in Architecture Schools of North America. They might be available either as Dissertation Committee members, as teachers of distance learning courses and technical seminars, as one-on-one consultants/critics on specific design projects, or simply as informal mentors. The potential faculty pool is impressive, even assuming that only a quarter of these 300 senior people participate at any one time.

The objective is to produce dissertations that demonstrate specific ways of improving the quality of the buildings and services the architectural profession provides to society, as opposed to the more theoretically oriented research dissertations of traditional PhD candidates.

The objective is eventually to become formally accredited, although this is unlikely to occur before the first class or two graduates. Because each candidate must previously have acquired a professional degree in architecture, the need for the Academy to become accredited is less pressing. As a precedent, at least one other institution similar to the Academy has already been accredited by the Commission on Institutions of Higher Education of the North Central Association of Colleges and Schools. Based on its prior interest in encouraging doctorate level professional programs, the National Architectural Accreditation Board might favorably receive the Academy, although at present the NAAB only accredits first professional degree programs.

The objective is to try to close the widening riff between the universities and the professions, by bringing the rich intellectual capital of the former to bear on the intractable technical problems of the latter.

The objective is not to create another separate free-standing institution, with its own permanent faculty and physical infrastructure, but rather to create a kind of 'virtual university' embodied in the network connecting all the people who teach these specialized building science courses at various universities across the country.

The objective is to take advantage of all the most useful technologies in distance learning and electronic communication to bring the members of the Academy together.

The objective is to graduate our first class in the Year 2000!

Governance

The Faculty of this Academy will be composed of tenured professors from accredited schools of architecture who teach courses in Building Science. This means that the Academy will not be responsible for the time-consuming tasks of accrediting and promoting individual members of its faculty. The involvement of each faculty member should be less than one day per week, which means that their primary time commitment will remain with their home institution.

The Academy will be administration by a Board of Regents who are elected by the faculty. The Board in turn will elect a Dean and might eventually hire an Executive Officer for day-to-day management. The Board of Regents will be responsible for establishing and maintaining the highest level of academic and professional rigor.

A Deans Council should be available to advise the Board of Regents, made up of current and former Deans and Chairs of Schools of Architecture (perhaps including people like Joe Esherick, John Fisher, Harrison Fraker, Ray Kappe, Doug Kelbaugh, Ralph Knowles, Bill McDunough, Bill Mitchell, Don Watson, etc.)

A Board of Advisors should also be assembled to add their advice and support, made up of nationally recognized figures from private practice and the public sector (perhaps including people like Stewart Brand, Randy Croxton, Al Gore, Amory Lovins, Susan Maxman, Nick Negroponte, etc.).

An Annual Convocation will be held during the late summer to provide the opportunity for faculty and students to interact professionally and socially. This will be the occasion for the Design Competition winners to be exhibited, for new students to meet potential mentors and gain an overview of the Academy and its workings, for advanced students who are beginning their dissertations to meet with potential committee members to refine their proposals, and for the Regents and the faculty to hear final dissertation presentations. This will also be the time for the Regents to hold their annual meeting, and for the Dean's Council and the Board of Advisors to participate and contribute. The Annual Convocation culminates with the commencement ceremony at which the Doctorate Degrees will be conferred.

Curriculum

To be admitted, a student must be enrolled in an accredited Masters Program, or be employed as a post-graduate within the program (i.e. as an teacher or researcher).

Admission will be a two-step process: First, the application will enumerate pre-requisites, outline a potential dissertation topic, and identify the member of the home faculty willing to serve as Academic Advisor and Dissertation Chair. Second, the student must pass the required Qualifying Design Competitions and complete any prerequisite courses. Most of this could be completed within the context of the Master's Degree program at the home institution.

Because students will self-select and may drop out at various steps along the way, it is expected that only a dozen or two of those who begin will actually successfully complete their Dissertations. The Regents will need to establish the desired size of the student body and monitor the admissions process accordingly.

Once the Dissertation Proposal is approved by the Regents, work on the Dissertation may begin, assuming the candidate has completed the required Academy courses and has earned an accredited professional architectural degree (i.e. B.Arch or M.Arch).

The time required to earn this professional Doctorate degree should be at least three years including at least two years beyond the minimum required for the completion of the Masters Degree at the applicants's home institution.

The member of the faculty of the home institution who agrees to serve as the applicant's Academic Advisor must also be able to supervise the dissertation as proposed in the application. The applicant needs to secure at least two other Faculty Members from other campuses to serve on the Dissertation Committee and must communicate regularly with them as the work progresses.

Instead of qualifying exams, the applicant must earn Citations in at least two Design Competitions which test the integration of some aspect of building science in the context of an architectural design problem. The jury for these competitions will be drawn from the Faculty of the Academy. Projects will be judged against a three-old criteria: the architectural quality of the solution, its technical excellence, and the successful integration of the two. Honor Awards could be given to exceptional projects to serve as examples for subsequent competitions.

Instead of a language requirement, a student may substitute facility with computer languages relevant to his or her dissertation topic, for example C++, Visual Basic, DOE-2 BDL, AutoCad, or statistical data analysis and database packages.

Distance learning courses will be offered nationally. Examples might include a course in support of each of the Qualifying Design Competitions, a proseminar on critical issues to the profession, seminars on advanced topics in architectural science, etc.

Dissertations must expand our knowledge in architectural science and demonstrate its successful application to an actual design project in a way that produces a measurably improved solution. This is not research in the classic academic sense, but could be called research on the problems of the practice of architecture.

Each student will present his or her dissertation at the Annual Convocation before the Board of Regents. If the Regents, after meeting with the Student's Dissertation Chair and Committee Members, decide to accept the work, a degree certificate will be prepared and signed by all of the Faculty and Regents who wished to add their names in support of that particular student. Thus, in a tangible sense the value of the degree granted by this institution is value of the people whose names are on it.

Funding

Is will take much less money to create this kind of Academy, compared to the cost of starting a comparable free-standing school and recruiting a top quality faculty. Thus, this Academy is a kind of small-is-beautiful electronic manifestation of a traditional university.

It is assumed that the facilities and services for each student and each faculty member will be provided by the home campuses, such as the use of student work stations and faculty offices, computers, faxes, phone lines, laboratories, and access to the internet, etc. The academy will need to develop a way to reimburse the home campuses for at least some portion of these expenses.

Each member of the faculty will receive an honorarium for serving as a Chair of a Dissertation or as a member of the Dissertation Committee, or for teaching a course offered via distance learning, for acting as a design project consultant/critic, or for being available as an academic mentor. In the first few years however, they might be asked to return a portion of their honoraria as donations to serve as scholarships for the first group of students and to defray start-up expenses. In any case, the faculty will always be reimbursed for their actual out-of-pocket expenses (such as travel costs, communication charges, reproduction, etc).

This is the type of venture that a foundation should be anxious to help start, it is highly innovative, it has a high probability of success, and it could make a significant impact on important social and environmental problems. The Academy should be self sufficient after three or four years of initial foundation funding (estimated needs range from $100,000 to $300,000 per year).

The Academy should become self sufficient as soon as possible, deriving most of its funds from student tuition , from the admissions application fee, and from competition entry fees. Currently a year in a graduate school typically costs from $8,000 to $32,000, but a year in the Academy should cost less. For the first few years, some students will need at least part of the cost of their tuition deferred as a partial scholarship. Once the program is successfully established, corporate support for scholarships should be sought.

The biggest initial expense will be the cost of bringing everyone together at the Annual Convocation.

The Rewards

Whatever financial compensation the Faculty receives will be largely symbolic; the real rewards are in developing a bright student, in working with a person who might also be your Teaching Assistant, in being involved with some important design research work, in forging links with colleagues at other institutions, and in being a part of this new Academy that just might make a difference to our profession and to society.

Acknowledgements

The dilemmas our profession faces and the need for us to make some type of response, has been emerging more insistently in recent discussions with my colleagues who teach in the various areas of building science. The first informal group meeting discussing these problems and a possible solution was held in July, 1995, at the Society of Building Science Educators (SBSE) Workshop in San Francisco.

A rough draft of this proposal was developed and circulated over the internet to participants in that initial meeting and to any others who expressed interest. Everyone who responded was positive, and many people took time to offer detailed comments. I especially want to thank Ed Allen, Eric Angevine, Charlie Brown, Chuck Eastman, Mary Guzowski, Jack Kremers, Tang Lee, Robin Liggett, John Reynolds, Marc Schiler, David Lee Smith, and Don Watson.

Much of my own thinking has been shaped by Donald A. Schon's books *The Reflective Practitioner, How Professionals Think in Action* and *Educating the Reflective Practitioner.* He uses architecture and architectural education to frame many of his arguments. Even thought I do not agree with all of his conclusions, for instance his rejection of what he calls "technical rationality", he articulately shapes many of the issues that the Academy must deal with in order to succeed.

Tentative schedule

Steps Needed to Make the Academy Happen

1995	Fall	Finalize Draft Proposal, Circulate to all Interested Parties via the Internet
1996	Winter	Test Foundation Interest in Funding the Initial Five-Year Implementation of the Academy
	Summer	Meet Face-to-face to Develop Final Organizational Structure (at the SBSE Annual Meeting in Pomona): - Create the Initial Volunteer Board of Regents - Solicit Initial Faculty Interest - Set up Committees to run first Design Competition, Etc.
	Fall	Secure Foundation Funding!!
1997	Winter	Run the First "Test" Design Competitions
	Summer	Convocation 1: Meet to Formally Found the Academy - Set Up Procedures to Formally Elect the Board of Regents - Select Faculty - Review "Test" Design Competition Results - Admit First Class of Student Applicants
	Fall	Teach First Distance Learning Class(es)
1998	Winter	Hold First Design Competition Qualifying Exams
	Summer	Convocation 2: Meet to Evaluate Student Progress to Date - Advance Some Students to Begin Dissertations - Review First Design Competition Exam Results - Admit Second Class of Student Applicants
1999	Winter	Design Competitions and Dissertation Work
	Summer	Convocation 3: Meet to Consider the Possibility of Graduating Some First Year Students One Year Early - Hear First (Preliminary?) Dissertations - Advance More Students to Begin Dissertations - Review Second Design Competition Exam Results - Admit Third Class of Student Applicants
2000	Winter	Design Competitions and Dissertation Work
	Summer	Convocation 4: GRADUATE FIRST DOCTORATES !!! - Hear and Accept Dissertations of First Class - Advance More Students to Begin Dissertations - Review Third Design Competition Exam Results - Admit Fourth Class of Student Applicants

Doctorates in Architecture - Architecture in Doctorates

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Abstract
The intellectual basis of architecture has to be reinforced in order to survive the present threats on the profession. Therefore we need research and in particular doctorates in architecture.
Doctorates have a specific meaning and a specific format required by scientific writing. Their role and function have to be seen together with a model for the schools of architecture.

Architecture as a discipline needs a stronger intellectual basis to survive the current societal changes. Most people say that architecture is in crisis, some others think architecture is alive as never before - look at the magazines - but despite this pessimistic and optimistic view, reality shows a growing part of the built environment 'cake' eaten by a growing number of non - architects: programming offices, quantity surveyors, drafting and computer-aided drafting and rendering service bureaux, construction firms, all kinds of engineers and people with technical skills, space managers, real estate firms, banks, politicians, contractors, promoters, manufacturers, the building industry in general. Furthermore, architects, as has been proved by a recent survey in Belgium, work hard and earn on average an amazing low yearly income compared to other professions which also require 5 years of study.
The picture is not that exciting. So what?
Of course professional associations can and have to fight for a better professional condition for architects, but this is not our primary concern here.
Education, on the other hand, has to make more people aware of the necessity of architecture and this should start from childhood. But first of all education must strengthen the competencies of the architects leaving school. Doing so, society in general and decision makers in particular will be more sensitive to and conscious of architecture - architecture as an evidence - and education will deliver scholars who cannot be by-passed anymore because of their obvious competence.

Look at education in architecture today. We see a disparity of educational systems and not always sound competition: academies versus polytechnics... We see oppositions: art versus science. The overall picture is one of confusion and weakness. We still are discussing what is architecture, we still do not know what is architectural theory, we frequently do not know what and how to do, we contradict each other or disagree in public, many architects produce buildings which prove in fact the redundancy of architects, the layman (Prince Charles) thinks he knows better than the architect and this despite the complexity of the built environment.
Architecture is part of the real world. That world is, whether we like it or not, ruled by economy, and so is architecture or a big part of it. Proclaiming that architecture is an

art and the architect an artist is marginalising them from the beginning, because the economic rationality shows only a biased and limited interest in artistic production. The ambition of architecture to cover the whole domain of the built environment implies that it has to take into account that economic datum. So, what architects have to do, is convincing economists of the necessity of (what they now consider to be) the superfluous. They have to bring evidence to the fore, evidence based on knowledge, experience and skill while being conscious of the power and the limitations of rational thinking.

That is where education comes in. Theoretical courses laying the foundation for a mode of thinking, for a system of thought are underdeveloped or missing. Theory in traditional schools of architecture is not considered a priority: project work dominates. Be original as much as you can is the motto. That mental predisposition towards originality in design persists when it comes to theoretical thinking: original thought prevails on the tuff study of knowledge gathered by others and this results in a manifest lack of cumulative knowledge. If engineers behaved like architects they would still be re-inventing Edison's bulb.

This brings us to the following two statements:

1. the emphasis on theory has to be strengthened in architectural education; by theory in the broad sense we mean: all coherent theoretical reflections pertaining architecture.
2. a body of knowledge has to be developed and accumulated in architecture through research and through a steady production of doctorates as the highest emanation of research. Indeed doctorates have in se the particular stimulus to take position and to conclude.

For too long architectural education has been based solely on studio teaching, the teacher getting his legitimisation from experience in real practice. Often the studios are even not organised according to a pedagogical logic or sequence, they are merely exposing students to different prima donnas who frequently, if they are good, do not have time for students.

Today, provided our intention still is to deliver that much architects (parenthesis: do we need so many schools and should the number of students in a school be limited?) , we must considerably improve their training. We have to provide them with insight and knowledge about building technology now and for the future, enhance their capabilities to discuss in a logic and rational way their projects or to criticise others proposals, knowing how to cope with the specificity of site and culture, they must know how in the past similar problems were solved and why and with which result.

The time is ripe to bring in more emphasis on research. First of all we have to create the structural framework for research in architecture. We need staff members who are paid to do research. Learning from other well-established disciplines we know that it is better to have a limited number of research centres, because multiplying research over countless institutions brings more of them under the threshold for proper functioning and dilutes the means and the quality of research.

But nowadays existing research institutions are not used to funding research in architecture; representation of architecture in granting committees is weak or non existent, and asking these committees to share the scarce resources with a newcomer is not evident. Universities have some means, but compared to well established domains like engineering or medicine these are peanuts. *Nobody dies from architecture.....*

Doctorates need a research environment with guidance and feedback from a promotor and colleagues, confrontation of ideas on a regular basis. Doctorates succeed when there is synergy between doctoral student, thesis subject, means and research environment. It takes a lot of effort, persistency and enthusiasm to make a Ph.D. It requires intellectual honesty and integrity: the reader has to know throughout the whole text who is speaking, through a univocal citation system and making distinction between first hand and second hand quotation.

Doctorates are by definition pushing the actual limits of science forward. They can explore in depth one aspect of architecture: e.g. case based reasoning in CAAD, or, space planning in architecture. They can bring together knowledge from related disciplines into a new synthesis in architecture: e.g. architecture and design, architecture and computer science, architecture and anthropology, architecture and semiology, architecture and philosophy,...

In terms of methodology much can be learned from an historical investigation (traditionally a diachronic study), as well as from a structuralistic reading (synchronic) of the built environment. Architecture must constitute its own body of knowledge and is already developing its own approaches such as the typo-morphological analysis.

We need a multitude of readings to grasp the essence of architecture. Some of these are scientific ones and suitable for Ph.D. research: historical, epistemological, phenomenological, semantic, technical, social, morphological, typological,... Every doctorate has to profile itself clearly as to what aspects of reality it is addressing, making clear what is the underlying value system.

A doctorate is a well defined product of scientific research. It complies with strict rules of scientific discourse: economy in formulation, logically consistent, based on empirical evidence, verifiable or subject to confirmation or falsification. Science does not put limits to the nature of the object of investigation but rules the way this investigation is done and described. Typical for architecture is the designerly way of looking at reality, operational knowledge, extensive use of pictorial and graphical presentation due to the nature of the object of study.

Formally thought doctoral programmes aim at widening the scientific culture of the doctoral student and provide him with the epistemological and methodological tools for doing research. They give him momentum to reflect on his own work. Particularly interesting is a course on philosophy of science and methodology discussing the nature of science, demarcation criteria and evolution of scientific thought, methodological issues.

Architecture as a part of the real world has to do with values anyhow. These values and the underlying value system have to be made explicit in order to produce a scientific discourse. A doctorate has the well known format of scientific writing. Consequently a poem, a painting or a masterpiece of music is not a Ph.D., no matter how wonderful they can be, no matter how substantial their contribution to architecture is. Indeed each of this media reveals in its own right some aspects of reality in casu of architecture, but they are mutually not exchangeable: the one can not be expressed in the other.

A doctorate is a doctorate is a doctorate...

Architecture cannot be caught in doctorates. Architecture is more than doctorates: there is the design, the making, the writing, the critique, the poetry, the representation, the magazines, the physical presence, the meaning, the artistic production and the exhibitions, ...
Architecture is in the air, not only in the books. Architecture is more.
In other words the debate about doctorates has to be seen together with a model for schools of architecture. Indeed besides what a doctorate means for the doctor, its role in schools has to be assessed carefully. Doctorates and the requirement of doctoral degrees for teachers, or a significant part of them, should improve the quality of theory in architectural teaching. This will result in better argumentation of projects if theoreticians operate as (visiting) critics in the studio. Subsequently schools will deliver architects who are better equipped to face the economic imperatives. Schools then will recruit these practitioners which again will improve the theoretical basis of project work.
Thus the model is not one which replaces project work by theory, but one which improves project work by theory. This also means that not all teachers have to be doctors. A good mix of both theoreticians and practising architects will do. As a rule, doctors should teach theory, architects the studio. But in reality all kinds of combinations are possible, the exception proves the rule.
To cope with the complex nature of architecture, schools need a mix of teachers with different competencies and interests,
Architects do not need a doctorate. In terms of academic career they have to follow another path which has to value their merits and maybe some of them will get a doctorate honoris causa.

Art Theory and Cultural Studies as a Bridge between Architectural and Urban Research

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Abstract

To overcome the barriers between architectural and urban research as well as architectural research and education, experiments have been made to create communication between different discourses. One starting point was offered by the postmodern discourse of late 1980's in which cultural studies were a common denominator. An interest in the production of culture brought sociologists close to art theory and cultural studies.

Here an experiment is presented that joins together the studies of second and third year students in the history of urban culture, the design studio of fourth year students in urban planning and a work of a doctoral student starting from her advanced Master studies to her present work as a researcher in a multidisciplinary research project.

The common theme is avant garde, which is problematised as a form of artistic intervention and as a specific historical phenomenon in the formation of modern urban landscape. A case study is common to the students' design studio and the researcher. This is a renewal of a post-WWII modernist suburb along the lines of the 1990's national suburban renewal programme, which is expected - on technical and economic grounds - to include an intensification of land use, a making denser of the existing areas.

To understand the problematics of the transformation of a symbolic landscape, both the cultural production of landscapes and the role of artists and intellectuals in this production is studied. This analysis also gives a deeper insight into the problem of communicative planning.

Some results can only be evaluated in the long run, but some can already be seen. The students' greater reflectiveness to their own design was achieved. The young architects adaptation to the research milieu was also significantly better than in previous, unprepared cases.

About the background

As a researcher of architecture and urban planning I have often heard the question: of what use is the research to architectural practice and architectural education? Should not research produce the kind of knowledge that could directly be applied in design and planning? What good does it do to expand the scope towards other fields of knowledge?

As a member of various multidisciplinary research programmes I have had to face other kinds of doubts. Urban researchers often wonder what architects as researchers can do on the whole. Architects want to solve problems; they can hardly be disciplined to stay in the position of explaining and analysing phenomena. In fact, architects do not get a researcher's education.

I have had the chance to follow the development in multidisciplinary research and in combining research and architectural education for decades. I have seen various kinds of attempts to solve the problems, with varying success. Most certainly there exists an interaction between architectural and urban research as well as between research and education. Just as clearly the position of autonomous architectural research in this interaction needs to be strengthened.

At the end of the 1980's, I saw a good chance for creating the communication between different disciplinary discourses further. The so-called postmodern discourse seemed to offer arenas where formerly separated points of view could meet. Characteristic to the postmodern discourse seemed to be a relative disappearance or a possibility of fading away of interdisciplinary borders. It was no more unusual that economic aspects were discussed together with aesthetic ones or that social questions were analysed from a culturalist perspective. Art no longer was an alien body for the urban research.

The sociologist Scott Lash has characterised the difference between modern and postmodern by using the terms differentiation and dedifferentiation. He thereby refers to a change in all four components of his cultural paradigm. Modernism differentiated 1) the relationship among types of cultural object produced - i.e. aesthetic, theoretical, ethical, etc., 2) the relationship between the cultural as a whole and the social, 3) its 'cultural economy', whose elements in turn are conditions of production and consumption, the institutions of culture, mode of circulation, and the cultural product or good itself, and 4) the mode of signification, i.e. relations among signifier, signified, and referent. Postmodernism, again, dedifferentiated these (Lash 1990).

The postmodern discourse produced interesting analyses of the cultural production. In these the production of urban architecture was often a part. It was tempting to try if the art theoretical approach could be integrated more in a multidisciplinary urban research. It was also tempting to try if the architectural students would be more interested in urban theory, when this was served in the framework of cultural theory and more obviously presented in connection with analyses of art and architecture.

The interest of the sociologists has already since the postmodern discourse turned towards new problematics. Scott Lash himself, together with Anthony Giddens and Ulrich Beck, discusses now 'the reflexive modernity' (Beck, Giddens, Lash 1995). The idea in this is that modernism has come to a phase where, together with growing crises, modernity seems to have become capable of reflecting itself. Besides the fatal trends caused by the instrumental rationality of modernism there would be a possibility for critique and choice.

It has to be noted as well that the postmodern discourse never was very liked among architects, at least not in Finland. This is probably because the term postmodern has always been assimilated with a certain architectural style, most often considered reactionary and not worth of serious attention. However, Michael Dear has, among others, made a distinction between three possible meanings of postmodern. Dear separates postmodern as a style, postmodern as a method and postmodern as an epoch (Dear 1986).

Dear agrees with critical architects in that postmodernism as a style in architecture is a rather superficial phenomenon. He is willing to admit that signs of an epochal change are clear enough to justify a periodisation, at least as a tool in discussion. Most interested Michael Dear is in postmodernism as a method. Here he finds deconstruction as the most promising approach. Again, deconstruction does not refer to an architectural style only, but more widely to a cognitive remapping of the history of planning (Dear 1986).

To justify my own interest in the postmodern discourse as a useful tool, I will still refer to Scott Lash. To characterise the postmodern mode of signification, Scott Lash has compared it to the modes of signification of realist and modernist art. For realism, both presentation and reality were unproblematic. Modernism questioned presentation; a revolutionary renewal of ways of presentation was the emblem of modernism. Reality, however, still remained unproblematic. Postmodernism has, according to Lash, problematised presentation as well as reality (Lash 1990).

Scott Lash does not, however, want to join those celebrating the flimsiness of reality as a new fashion. Instead he claims that postmodernism facilitates both rational and irrational paths of development. Whatever the case may be, there is nothing inherently 'irrationalist' in a problem-solving enterprise, trying to make sense of the latest phase aesthetically and theoretically, Lash says (Lash 1990). This problem-solving enterprise is my emphasis in trying to confront different discourses (1).

In the following I present an example of my experimenting activities as a teacher and researcher in urban planning and design, in attempting to create a discourse between urban theory and architectural research on one hand, and between research and education on the other. The theme chosen for this presentation is avant garde.

Those involved in the experiment and the concrete case

The experiment includes second and third year students of the history of urban culture, fourth year students of urban planning one doctoral student earlier in her stage of advanced architectural studies, and now in her early doctoral studies. The second and third year students of the history of urban culture learn about the history of avant garde and about its influence upon the formation of modern urban landscape. The fourth year students of urban planning make their own intervention into the modern urban landscape in the phase where it has ceased to be the least bit avant-gardist in the minds of people. The doctoral student learned about the specific conditions of cultural production in the postmodern phase while doing her final studies for MArch. Now she is problematising the social and cultural preconditions of architectural intervention in the modern urban landscape as a part of a multidisciplinary research project.

The case common to the urban planning students and the young researcher is a modernist suburb from the post-WWII period. It is a late variant of the 20th century avant-gardism, a copy of original ideal models. The frame of reference to the intervention is a national suburban renewal programme, which has already experienced two phases. In the first phase, about a decade ago, the main idea in the intervention was to 'fulfil' the original plans, to repair the houses and take care of their immediate surroundings in a more careful and pleasant way than was done earlier. The second, present, phase is characterised by the notion of sustainable development.

Now the idea is to significantly intensify the existing land use of the existing areas. It has been proven in various research projects to be both technically and economically very advantageous to rather make the existing areas more dense than they now are than to build entirely new areas outside the existing urban structure. This idea of a dense, compact urban structure is, however, rather strange to the Finnish people, who are used to living in sparse areas in close contact with nature. The organically decentralised garden city landscape has already become a kind of national landscape. The object area, for example, is of an overall density of 0.4 and it is crossed and surrounded by large green areas mostly in their natural state. Therefore the theme of the research project studying possible interventions are the social and cultural preconditions in making the urban structure denser.

In the Finnish planning climate the idea of a communicative planning practice has gained a lot of support. In the case of the suburban renewal it is the specific wish of the state administration that the procedures should include people's participation.

Interpreting the modern and postmodern landscape

I usually explain the formation of modern urban landscape to the students as a reduction of a utopia. Since the ideal cities of the Renaissance the idea of an intentional production and transformation of the social and physical landscape existed. The classical utopias were first reduced to experiments in the early industrial phase. These again were pragmatically reduced to industrial model communities of mid-19th century. Garden suburbs followed by the turn of the 19th and 20th centuries, the Siedlungs a couple of decades later. The next phase already is the suburb, applied as a general model in the post-WWII Finland. Organic decentralisation was the solution for the chaotic metropolis of the turn of the century, and it was successfully modified as the main doctrine of later modernist planning.

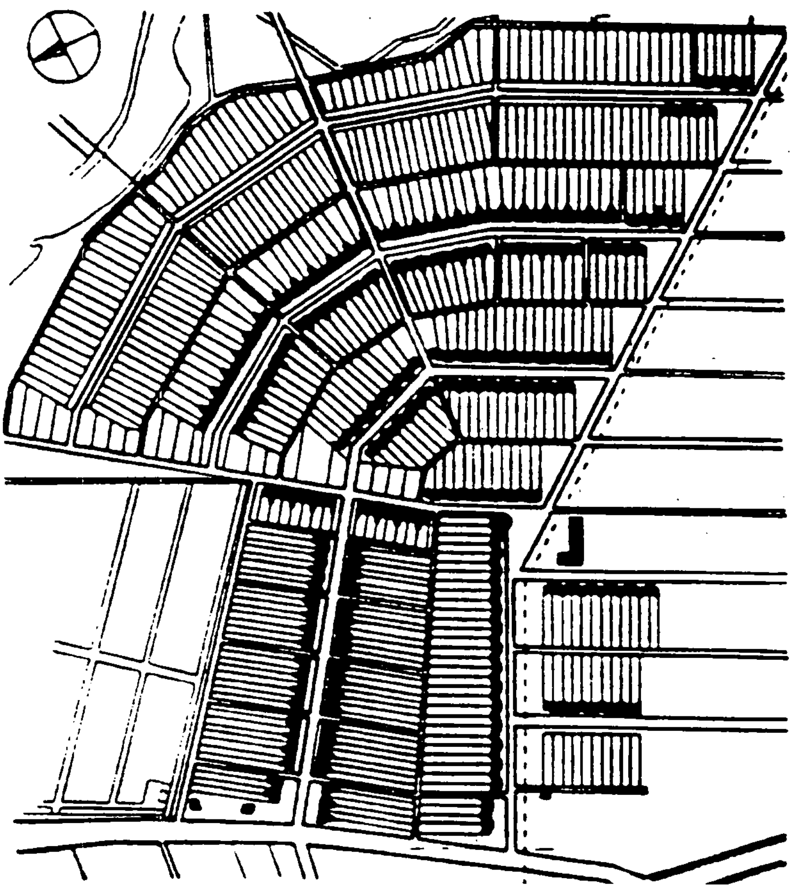

Figure 1: Avant Garde

Even if in opposition to the periodising use of the term postmodern (Featherstone 1991), researchers of postmodern landscape name certain characteristic features. Philip Cooke speaks about an uneven geography compared to the modernist tendency to balance inequities spatially and socially (Cooke 1988). To Sharon Zukin, specific post-modern phenomena are 'gentrification' and 'dreamscapes'. Islands of attraction are woven into the web of either traditional urban network or to the anonymous suburban belt (Zukin 1988). The once systematically planned wholes tend to dissolve into fragments and into a mosaic of independent parts. Looking at the latest great commercial projects it is not hard to imagine, either, what Fredric Jameson meant by hyperspace.

The spontaneous change of the postmodern landscape is not a result of planning. There is no planning decision about transgressing into another kind of landscape. Yet the change is inevitably a cultural process, involving various kinds of actors. The conditions of the production can therefore be studied.

As Scott Lash says, modernism and postmodernism are not strictly chronological and mutually exclusive. Rather, different phenomena appear side by side (Lash 1990). Thus the type of landscape represented in the object area will most likely be further treated as a kind of state architecture, as a part of a comprehensive reformist plan. This makes it a specific type of postmodernist landscape transformation, yet within the general conditions of cultural production.

The problem of intervention

Manfredo Tafuri once said that there are two principal alternatives of operative practice: avant garde and experimentalism. Avant garde, according to Tafuri, is always positive, absolutist and totalitarian. It unconditionally demands a construeing of a totally new context. Avant garde must be sure that the linguistic revolution not only implies a social and moral upheaval, but actually realises one. 'I don't look for, I find' by Picasso is a good example of avant garde security (Tafuri 1980).

Experimentalism, on the other hand, isolates, combines and confronts languages and syntaxes without accepting them as such. Experimentalism can also make brave innovations, yet always with feet on the ground. Experimentalist hypotheses may prove to be wrong, but experimentalism is always safely anchored (Tafuri 1980).

Avant garde faces its destiny without discussing with the reality it intends to destroy. Even in a conflict situation avant garde sets itself above the contradictory situation on the grounds of its characteristics and ability to plan the history of future. Experimentalism may also present revolutionary statements, yet without an aim of annulling anything. The aim of experimentalism is to expand the linguistic material, formal codes and conventions, supposed to be reality (Tafuri 1980).

Tafuri claims that the general insecurity of architecture on one hand follows from the will to keep the problems internal to the discipline rather than to discuss with outside research, and, on the other, from the unwillingness of the younger generation to ever give up avant garde (Tafuri 1980). Tafuri's statement can be taken as a challenge. What happens if problematising in architectural research is opened to outside research? And is the longing for avant garde still there among the younger generations.? And what, after all, is avant garde?

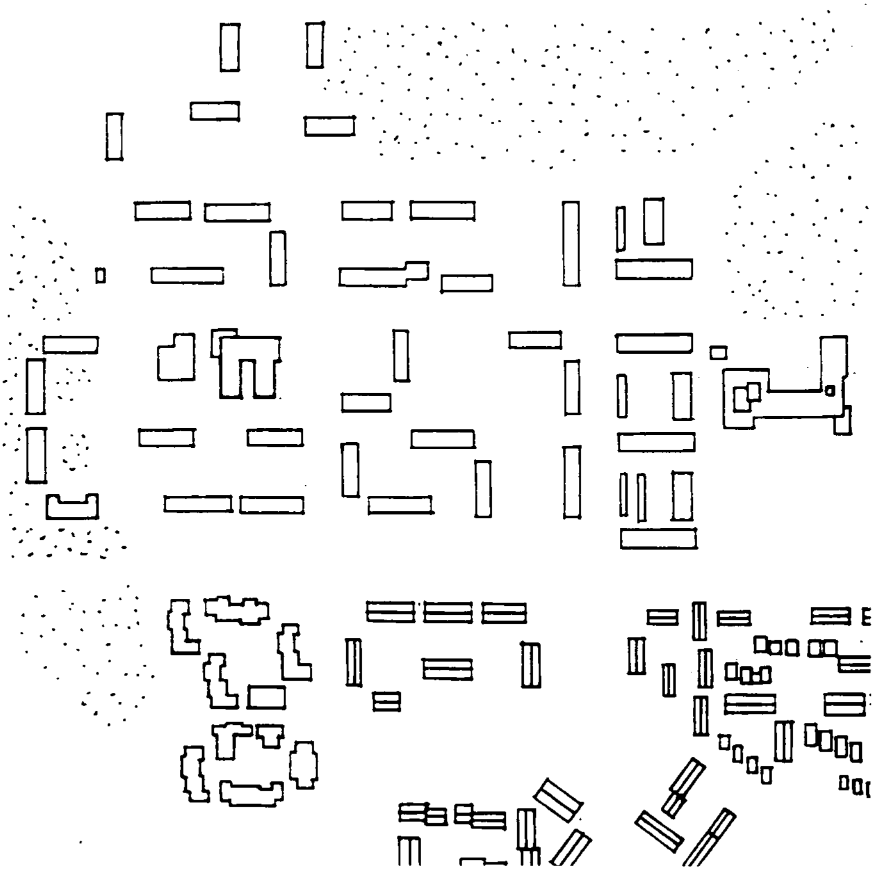

Figure 2: A modernist suburb

Problematising avant garde

Explaining the history of avant garde in the formation of modern urban landscape on one hand and experimenting avant garde as a form of intervention in the studio work, on the other, should illuminate at least one essential feature of the avant garde: the capability of avant garde to distance itself from actual practice and to be self-critical (Bürger 1984). This should further a conscious use of means.

Historically the concept of avant garde explains the birth of a totally new architecture as a result of challenging the art institutions on one hand, and the ways of presentation, on the other. The search for new means was motivated by the experienced ineffectiveness of artistic means. It is important, though, to remind the students of the fact that without the late 19th century aestheticism there would not be any avant garde either. Thus the seemingly ahistorical movement has also firm historical roots (Bürger 1984).

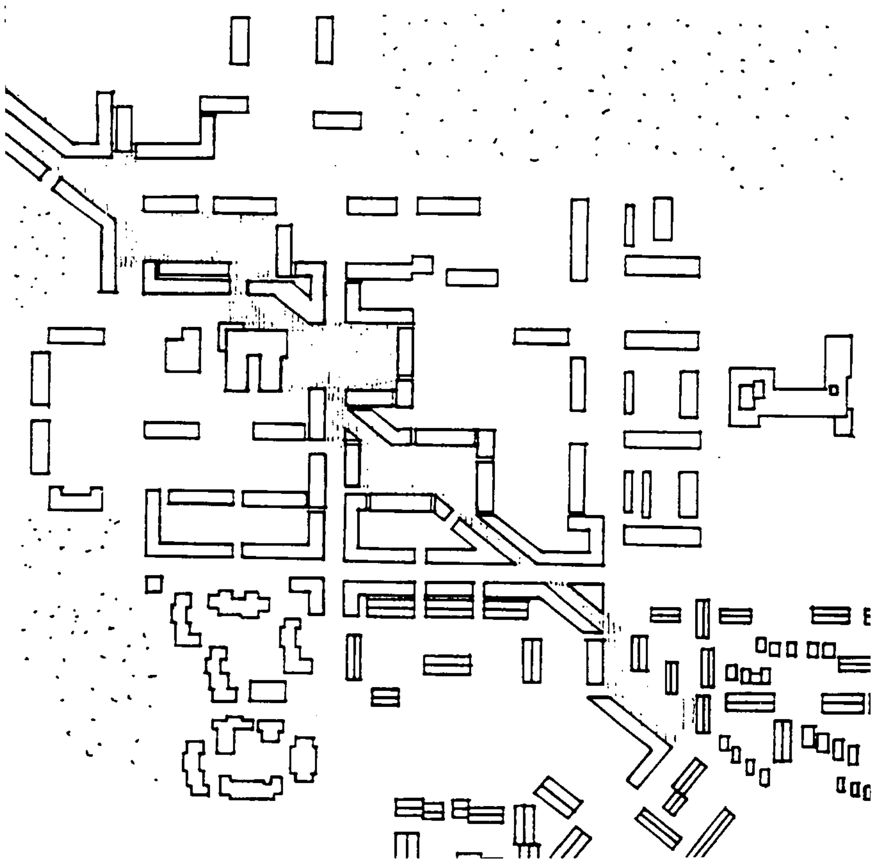

Figure 3: the postmodern intervention: avant garde or experimentalism

The historical avant garde of the turn of the 19th and the 20th centuries also had a specific content. The uniting of art and life was the great aim. Life was supposed to be permeated by art (Bürger 1984). This idea led to an interpretation of the role of art as an organiser of all human life (Tafuri 1979). According to this line of thought, our object suburb should show how art penetrates the everyday life of modern urban citizen. This, as we know, is not the case.

As early as in the 1930's, a more pragmatic interpretation of a social involvement of art into great societal programmes was adopted. This alliance between art and the emerging modern social state meant an end of the independent avant garde and the beginning of 'the plan' (Tafuri 1979).

In postmodern art the problem of the relationship between art and life is again actualised. This time the question is raised on the ground of notions concerning the collapse of a hierarchy between high culture and mass culture. There are obvious tendencies of blurring the distinctions. The postmodern idea no longer is art permeating life, but life becoming art, through a stylisation of life. Mike Featherstone talks about a project for the aestheticisation of life (Feartherstone 1991).

Whether postmodernism then again can be avant garde is a question that raises many doubts. Mike Featherstone says that it would be tempting to see postmodernism as avant garde, but that this cannot be done without actual analyses of the preconditions (Featherstone 1991). The way Scott Lash sees it, postmodernism refuses all avant garde, both aesthetic avant garde and political one. It is not critical towards the commodification like modernism was. It returns to the position of a stable subject that reminds of realism, Lash claims (Lash 1990).

The built environment is, according to Lash, different from other cultural objects. The mode of signification, the obvious materiality and the position in the cultural economy distinguish the built environment from other products. Therefore, the analysis of signification cannot be applied as such to the built environment. The duality of materialist and cultural treatment is constantly there. Discussing the built environment in terms of modern and postmodern means necessarily emphasising its cultural and symbolic dimension. One might as well talk about a post-Fordist or a disorganised capitalist city (Lash 1990). Exactly because of this liminality of concepts, I think, the connection between disciplines can be found.

The cultural production of landscapes

Analysing the possible ways of intervening in the Finnish post-WWII national landscape means examining a symbolic landscape. The production of such a symbolic landscape is a cultural process. Therefore studying the preconditions of this cultural production is adequate. As Peter Bürger says, the avant-gardist attitude of the artist and the real status of the art works are two different things (Bürger 1984).

In order to understand postmodernism we need to approach it on a number of levels, according to Mike Featherstone, who has studied the sociology of consumption. Firstly, it involves changes in the artistic intellectual and academic fields, manifested in the competitive struggles in particular fields over the canon. Secondly, it involves changes in the broader cultural sphere in terms of the modes of production, circulation and dissemination of symbolic goods which can be understood in terms of changes in the power-balances and interdependencies between groups and class fractions on inter- and intra-societal levels. Thirdly, it involves changes in the everyday practices and experiences of different groups who, as a result of the first and second set of changes, start to use regimes of signification in different ways and develop new means of orientation and identity structures (Featherstone 1991).

Featherstone himself uses a dual focus. Firstly, he wants to focus on the transformations in lifestyles and city cultures which are taking place and which allegedly amount to a postmodern shift. Secondly, he wants to raise the question of the changes in the social structures and relationships which dispose particular sets of cultural specialists and intermediaries to exploit and develop new markets for cultural goods and experiences. Featherstone wants to emphasise the role of the interpreters, carriers and promoters of a range of new cultural goods and experiences as well as the perception of those goods and experiences as significant, meaningful and worthy of investment (Featherstone 1991).

Featherstone claims that the role of intellectuals as legislators tends to change into a role of interpreters in postmodernism. As Featherstone himself notes, this is by no means a generally accepted truth. There are many who see the task of intellectuals to be to resist the populist democratizing spirit of postmodernism and to retain the authority to speak for humankind (Featherstone 1991).

The latest trend in urban planning - in accord with the attitude of state administration - is the so-called communicative planning, the idea of people's participation in the decision making concerning their enviroment. Experiences of direct democracy within particular projects have shown the limits of this approach, if applied without any problematising of the method. The analysis of the cultural production of landscapes could bring us further in understanding the complex networks of communication and social influence behind the process of landscape formation.

To think the role of an architect, among other intellectuals, as an interpreter instead of a legislator may be useful, even if one wants to avoid mere populism. Because of this aspect I have emphasised in the urban planning course the need to thoroughly analyse the existing landscape and its meanings to the people concerned. The approach applied has also evidently created, among the students, a special sensitivity towards the meanings attached to the landscape. The researcher will elaborate her theme in interaction with locally influential people and local residents. The designs of volunteering students are used as material in discussing various alternative ways to transform the landscape. Students and researchers elaborate the designs by discussing with each other.

Students in the postmodern condition have to consciously choose their operative practice, which of course may vary from task to task. As Peter Bürger characterises their starting point, the achievement of the historical avant garde was - inspite of its failure to change the institutions of art or the status of an art work - to make it impossible for any later artistic school to declare itself universally valid (Bürger 1984).

To conclude

A part of the results of the experiment can be seen, a part remains to be followed in a longer perspective. In education, activating the history teaching by creating a link to the students' own experience of their present reality and their own practice seems to make the subject more interesting. Increased sensibility can be perceived in the older students' studio work. Increased consciousness of the scope of choices and an ability to reflect one's own thinking make the design process more delicate. An interest for analysing the preconditions of cultural production can also be seen, maybe not least because of the high unemployment rate among architects.

For the young researcher the acquaintance with one multidisciplinary discourse already in the phase of Master's studies has made it easier to enter the world of research. For the time being she is construeing a theoretical frame for the procedure, where citizens' participation and expert views are woven into an analysis of the scope of alternatives. This simulation of the preconditions of cultural production then lead to the next phase of research.

In the beginning of the postmodern discourse Kenneth Frampton wrote in 1983 that there is a tendency to reduce planning almost entirely to the allocation of land use and logistics (Frampton 1983). In my educational experiments and research projects this view has not, however, been promoted.

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(1) As a background knowledge it may also be useful to remind the readers of the fact, that in the Finnish education system, like in Sweden, Norway and Italy eg., planning and architecture are not separated. No specific planning schools exist. Architectural schools, like a few other academic fields, such as geography and social sciences educate planners, who achieve their final specialisation in professional practice. Because of the co-existence of planning and architectural aspects in education, a problem of - at least seeming - incommensurability often exists. On one hand the co-existence of architecture and planning is a problem, on the other it is a challenge.

Confronting the Barrier between Qualitative and Quantitative Research: Collaborative Efforts between Architecture and Nursing at The University of North Carolina at Charlotte

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Abstract
After two years of preparation, the College of Architecture and the College of Nursing submitted a joint research proposal to two federal 'hard science' research institutions. The proposal was welcomed in part as an innovative approach to examining long-term care environments for the less fortunate elderly. On the other hand one of those innovations, of combining quantitative and qualitative methods, became a major impediment that kept the proposal from consideration of funding. This paper briefly discusses our preparations, the development of our research proposal, key aspects of the criticism that we received, and the lessons we learned in approaching hard science institutions for support of architectural research.

Preliminary preparations
The College of Architecture and the College of Nursing at the University of North Carolina at Charlotte have engaged in joint teaching and research from 1993 through 1995. Joint undertakings in this area are rare in the US. Our collaboration was welcomed by administrators on our campus, by regional professionals, local researchers. Presentations of our efforts at conferences have been received with interest.

In the course of our collaboration we have found that the Nursing and Architectural professions are concerned with similar problem types and have similar aspirations that offer numerous opportunities for collaborative research. Of course, the differences in vocabulary and scope of interests can cause misunderstandings. A key area of similarity that encouraged us to continue with our efforts despite occassional differences and that had a major impact on the preparation of our research proposal, was that both disciplines maintained an ardent belief in the necessity to examine quality of life issues from a holistic approach. Through the course of our discussions we found that we had similar areas of concerns in our professional values, in select areas of investigation, and research methods. These areas of similarity sprang from a central concern inherent within each discipline - of our desired outcome for the older adult.

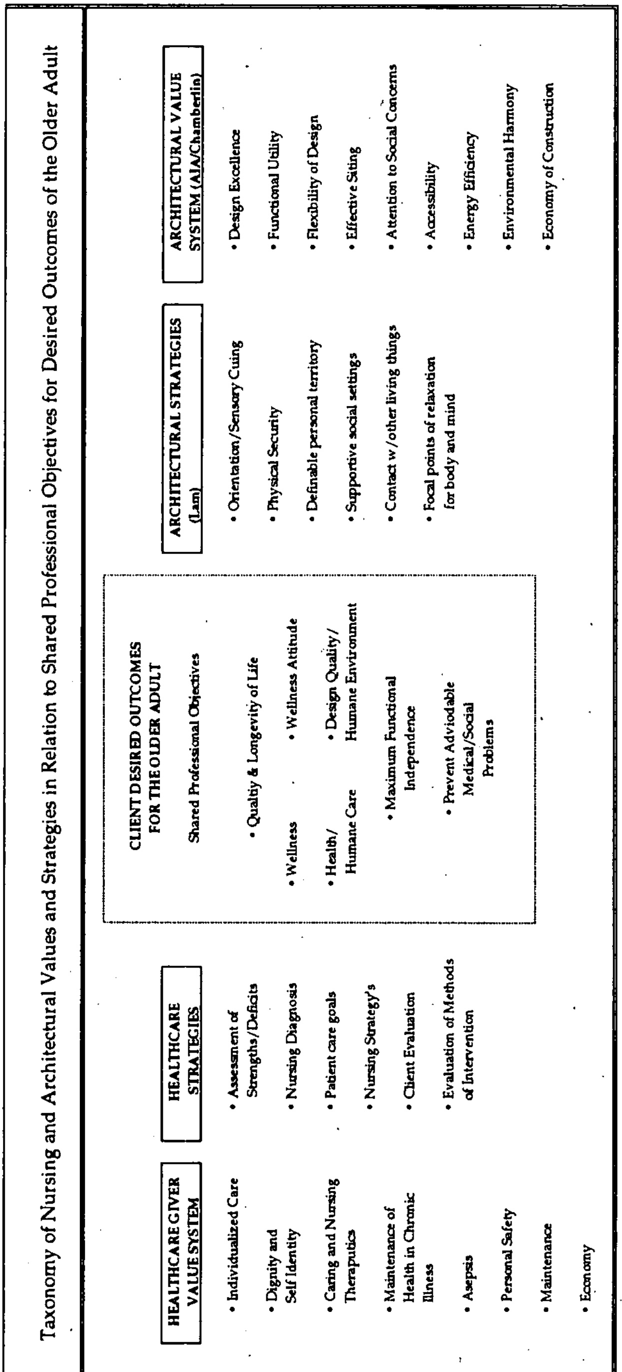
Taxonomy of Nursing and Architectural Values and Strategies in Relation to Shared Professional Objectives for Desired Outcomes of the Older Adult
HEALTHCARE GIVER VALUE SYSTEM
• Individualized Care
• Dignity and Self Identity
• Caring and Nursing Theraputics
• Maintenance of Health in Chronic Illness
• Asepsis
• Personal Safety
• Maintenance
• Economy
HEALTHCARE STRATEGIES
• Assessment of Strengths/Deficits
• Nursing Diagnosis
• Patient care goals
• Nursing Strategy's
• Client Evaluation
• Evaluation of Methods of Intervention
CLIENT DESIRED OUTCOMES FOR THE OLDER ADULT
Shared Professional Objectives
• Qualtiy & Longevity of Life
• Wellness
• Wellness Attitude
• Health/ Humane Care
• Design Quality/ Humane Environment
• Maximum Functional Independence
• Prevent Adviodable Medical/Social Problems
ARCHITECTURAL STRATEGIES (Lam)
• Orientation/Sensory Cuing
• Physical Security
• Definable personal territory
• Supportive social settings
• Contact w/other living things
• Focal points of relaxation for body and mind
ARCHITECTURAL VALUE SYSTEM (AIA/Chamberlin)
• Design Excellence
• Functional Utility
• Flexibility of Design
• Effective Siting
• Attention to Social Concerns
• Accessibility
• Energy Efficiency
• Environmental Harmony
• Economy of Construction

Figure 1

In Figure 1, each discipline's values and select strategies for implementation have been diagrammed with regard to the shared objectives that each has for the older adult. The desired outcomes for the older adult have been placed in a central position and our concerns have been listed vertically with regard to their priority of importance. For example, we have found that both disciplines place a priority on maximizing the quality and longevity of life for the older adult. The second priority from a nursing point of view was to *promote wellness* among the elderly through a positive attitude, knowledge, and personalized care. The architectural discipline however, is limited to *promoting a wellness attitude* through the design of the environment, since we did not have direct contact with the residents of a facility. This distinction between nursing as a directly applied knowledge, versus architecture, as a discipline responsible for establishing a setting that promotes personal wellbeing and social interaction, is of course at the root of the differences in terminology and concerns that follow. The third priority of providing humane care and producing a humane environment is similarly distinct to each profession but intimately shared. The forth and fifth priorities are almost spoken of exactly in the same terms between the professions, and addresses maximizing functional independence of the elderly and of preventing physical or social problems.

It is of importance when examining Figure 1, to recognize that both professions are guided by ideals and practical concerns. For instance, when we compare the criteria listed under the Healthcare Giver Value System with those listed under the Architectural Value System, the issue of economy can be found in the lowest rank of concerns. Curiously there are beliefs in both professions that the matters of economy, i.e. a lack of money, should not be allowed to hinder the fulfillment of those issues of higher priority. A glance across the other criteria listed can be taken to illustrate the broad compatibility of idealism that underlies these practical disciplines.

The prioritization of issues in both the nursing and architectural strategies and value systems are based upon a summary of a literature search spanning 1963 to 1995[1]. The architectural strategies, were found to be most comprehensively addressed in the work of Bill Lam (1977)[2]. and the Architectural Value System, was similarly addressed by the American Institute of Architects (1987, 1990, 1992) and Chamberlin (1993)[3].

Our efforts at finding areas of compatability in research and some form of corresponding research methodology can be found in Figure 2. Client/resident focused areas of investigation were most easily broken down into three areas: the examination of physical attributes of the client or environment, behavorial studies, and quality of life issues.

Shared Research Methods, found in the lower half of Figure 2, addresses methods that are commonly being used in research by both disciplines. The initial level containing surveys, multi-varient studies, experimental studies and retrospective studies, were found by us to be most often applied to the physical and behavorial areas of investigation. We found that a frequent way of handling quality of life investigation was by employing descriptive case studies although these varied in a range of ways.

After having completed a good deal of background work, we established a new joint research course for graduate nursing students and 4th year architecture students that was supported by both our college administrations. In this course we established teams of nursing and architectural students apply research methods in the examination of existing nursing homes. During this course, which was run in the spring of 1995, it was the task of its instructors to evaluate the methods that had been used by the students for their applicability. Following the completion of this coursework, the draft of a research proposal was begun.

Client Focused Long Term Care Issues for Investigation and Shared Research Methods of Nursing and Architecture

CLIENT FOCUSED AREAS OF INVESTIGATION

Physical Attributes of a Person or Facility	Behavorial Attitudes & Expectations	Quality of Life Spiritual well being Holism
Client attributes	Individual needs	Beauty
Environmental & Facility attributes	Supportive Environmental & Facility Characteristics	Logical satisfaction Emotional peace of mind Spiritual sense of completeness
Social Interaction Community Environment	Social Interaction Community Environment	

SHARED RESEARCH METHODS

- **Surveys**
  written/graphic
  observation
  interview
  instrumented
- **Multi-varient Studies**
  statistical
- **Experimental Studies**
  scientific method
- **Retrospective Studies**
  Post Occupancy Evaluation

Descriptive Case Studies

Historical Methods
Art History
Marxist
Hermenutical (semiotic)
Material Culture/Anthropological
Typological

Figure 2

Proposed research

During two years of discussion, we had come to believe that improvements to resident quality of life, quality nursing staff working environments, and facility design were inherently bound together and affected by the initial financing and regulatory decisions that define facility development. We had also found that improvements sought through research conducted from an single discipline's point of view were usually made at the expense of other important factors within the total project development. What we proposed then was an interdisciplinary research effort guided by a facility life cycle cost approach to offer the soundest path to achieving reduced long term costs and improved resident/staff quality of life. Achieving improved quality of life for the residents and staff with reduced lifecycle costs of the building, required that we engage in both qualitative and quantitative research and that this data be correlated.

We had proposed to jointly examine the user satisfaction and building performance of a single long-term care facility in North Carolina, to improve the design quality and cost benefit ratio for an anticipated 40 year facility life cycle. We further sought to examine the design/construction process to understand and document the changes that had taken place between the time of the initial design and the final construciton of the building. The research was to be undertaken by a four member team comprised of one nursing researcher, Assoc. Prof. Dr. Gloria Hagopian, RN, and three architectural researchers; a physical environment researcher, Assoc. Prof. Dale Brentrup, a building economist/engineer researcher, Professor Charles Mitchell, and myself as research coordinator.

The correlation of qualitative and quantitative data became a key component to this proposal and since it had grown out of the shared ideals of our disciplines, it also became the most difficult part of our proposal to generate. To correlate these two types of information we chose to initially undertake a series of behavorial studies to identify areas of importance to the daily life of the facility residents. This information would then guide the location of our computerized monitoring equipment that would continuously measure internal and external environmental conditions, as well as the coming and going of residents and staff. During the period of instrumented environmental recording, an indepth dialogue to establish qualitative conditions was to be undertaken with the residents and staff. We proposed a continuous review of both daily experiences and measurements of the physical environment for one month as a sufficient indicator to warrant further research or not. While interviews and instrumented measurements were being undertaken, the third member of our team was to be reviewing and recording the annual costs of facility for the life of the facility. Each evening we proposed to review both the qualitative and quantitative data that had been collected during the day to find indicators of correlation.

Dr. Gloria Hagopian was able to define this technique as a continuous comparative analysis. We were aware that this was not an approach that offered verifible results since it relied upon our shared expertise to uncover evidence of a correspondence or linkage between data pools as well as to bridge the methodological differences between our two disciplines.

The facility to be researched was found and a plan of it can be seen in Figure 3. The facility exists in Charlotte, NC., and construction was finished in 1991. A developer/ architectural firm that exclusively produces nursing homes initiated the project, and after all regulatory demands were resolved, sold the project and was retained by the new owner to complete construction and furnish the facility. We found that numerous replicas of this facility exists in the southeastern US.

As can be seen the plan is a simple single story courtyard scheme with the resident rooms arranged around it. On the north east corner of the plan (north is to the top of the figure) the dining, kitchen, daily activity rooms, and administrative area can be found. Two nursing stations are located in the residential area in opposing corners. The facility has a gross area of 28,800 square feet, with a useable area of 23,800 square feet, resulting in a very high design efficiency ratio of 84%. The maximum resident capacity is 125 persons, with the following allotted population care types: Home for the Aged, 20 beds; Intermediate or Skilled Care, 64 beds; Skilled Care, 25 beds; Sub-acute Care, 16 beds. Each care type is zoned separately from the other, as facility limitations permit. The staffing of the facility has remained steady at 110.5 Full Time Equivalent's (FTE), plus or minus 2 FTE's per week (1 FTE = one 40 hour staff position per week). The nursing staff represents 75% of the total staff needed, or approximately 80 persons per week.

The care provided to the elderly had been reviewed by the North Carolina State regulators and was awarded their highest rating which provided confidence in our selection of this facility. All financial records were available, the architect could be reached and the nursing staff was eager to share their experiences in the building with us. We had also received permission from the facility manager to monitor the building and residents.

Having resolved these problems, the specific aims of this study were hammered out. We proposed to:

- identify the major positive and negative environmental/architectural attributes in a nursing home that affect the nursing staff's working environment and the resident's quality of life;

- document the design-delivery decision making process that preceded facility construction. Document the selected nursing home study site architecturally by producing building survey drawings;

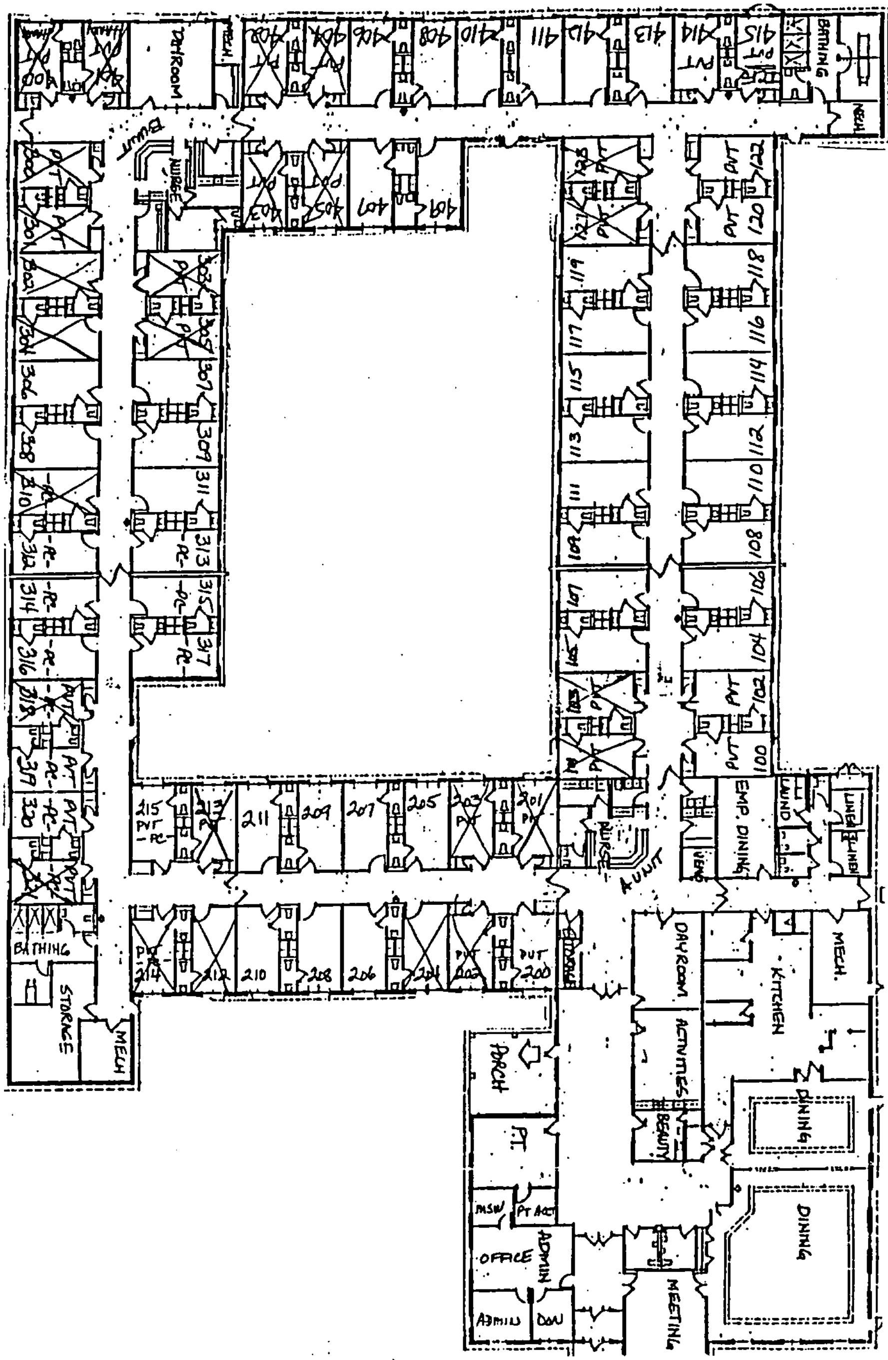
DAYROOM
NURSE
BATHING
STORAGE
MECH
EMP. DINING
DAYROOM
ACTIVITIES
BEAUTY
KITCHEN
MECH.
DINING
DINING
PORCH
P.T.
MSW
PT ACT
OFFICE
ADMIN
ADMIN
DON
MEETING

Figure 3

- monitor and record the present internal and external environmental conditions of the study site for both the nursing staff and residential areas and compare them with operational regulatory performance standards;

- construct an economic history of the selected facility that establishes total resource flow accounting for: planning and construction expenses, annual operation and maintenance expenses, annual debt service, taxes, insurance expenses, facility modification expenses, and annual income generated;

- trace the development of selected major attributes through the design/delivery process to identify the forces that impact their implementation. Classify the negative forces for magnitude of effect and the desirability of change;

- compare the presently used minimal first cost method to control the nursing home design/development process with a life cycle cost economic method to determine if more attributes improving the resident's and staff's quality of life could be provided given the same total cost over the life of the facility.

The broad long-term objectives of this proposal were to:

- Identify improvements in the nursing home design/delivery/healthcare process that would result in an improved quality of life for the resident and quality working environment for the nursing staff, without an increase to the total life cycle cost of the facility, and that can be implemented by design professionals, state regulatory officials, and facility managers.

- Develop interdisciplinary methodologies to more accurately represent the shared environment within which nursing home residents and nursing staff interact.

Review of criticism

In August and September 1995, the research proposal, "Improved Design Delivery & Life Quality in Nursing Homes," was submitted for review to the National Institutes of Health and the Agency for Health Care Policy and Research, organizations characterized as "hard science" institutions. Both institutions regarded the proposal as innovative in that it attempted to combine points of view from both disciplines. Key aspects of the criticism that were voiced by both critics can be divided into three areas; concerns about the problem, about the methods employed, and about the researchers.

First, the problem was felt to be too specific to the state of North Carolina, and since it was ultimately aimed at improving the process through which facilities are designed, this became a political problem which fell outside the strict realm of scientific inquiry. The current scope of the problem did not allow a sufficient size data base to be constructed to produce reliable results. It was suggested that a field of perhaps fifty or so buildings should be researched to permit a sound data base to be constructed. Furthermore, the existing proposal appeared to contain more work than either the time frame or the money we requested would allow.

Second, concerning our choice of methods, it was felt that the qualitative methods. were very primitive tools that would not provide data that could be duplicated and should be removed from the proposal. It was further stated that the qualitative side of our proposal would not be viewed neutrally but negatively, and should be removed. The ability to validate the data gathered was essential to the interests of these institutions. At this point, an alternative approach was suggested, that it might be better to design the tools and methods in a first proposal and then undertake a wide spread facility examination. Perhaps to offset this blow to our efforts, the economic approach was viewed as being very attractive and offered the greatest potential through which a sound proposal could be assembled.

Finally, concerning the researchers, it was stated that one of the demands that must be met is that funding be given to individuals who have between fifteen and twenty publications as a minimum in the specific area of research being proposed. This requirement insured that the individual had received a sufficient review of their capabilities and that the work being undertaken would not only be finished, but would also be published.

To conclude the criticism, both agencies stated that unfortunately, funding for soft research fares poorly in the context of traditional scientific research and suggested seeking non-federal funding sources.

Ofcourse when I informed my colleagues of this criticism there was a noticable period of silence in the room, followed by a false bravado of what had to be done next. We knew there was a risk in submitting a proposal that was going to attempt to seek out correspondences between quantitative and qualitative methods, as well as trying to be cross-disciplinary at the same time. Clearly we were not prepared for the range of criticism that was received nor were we able to coherently suggest further directions of development when what we had proposed made so much sense to us. After a span of several weeks, our reflection on this situation seemed more fruitful.

The Lessons Learned

Speaking from within the architectural discipline, several criticisms now seem inconsistent with one of architecture's traditional objectives of seeking a balance between art and science. If architecture were pure science we could devise a solution to a problem and apply it globally with success, much like a vaccine for a disease. In part, the failure of a global approach led to the demise of Modern Architecture, the well discussed architectural shortcomings of the work of Buckminster Fuller, and the universal space of Mies. As a discipline we are better off for having had these experiments, particularly if they were sufficiently well developed not to bear repeating.

The methods employed by the social sciences do make it difficult to provide reproducible results, but as others have noted, this is because reality is messy. Sound architectural production, like setting the standard of care for the elderly, is in part a political problem. Being asked to ignore these factors by scientific institutions because absolutes cannot be established seems unfortunate but not unjustified. Because absolutes cannot be established when dealing with humane issues, the architectural discipline have made a virtue of devising a unique design response for each commission. This is after all a pre-scientific justification that seems to have withstood the test of time, and strangely enough, is a truth that science prefers not to deal with.

Hope of finding flexibility in scientific assumptions does exist. By requesting that our next proposal be educative, the review panel adopted a position of openness, suggesting that financial support could occur if sufficient justification for undertaking the research can be proved, and if the substantiation of the personnel and the methodological approach survive a close scrutiny. In retrospect, the largest and unspoken problem to the proposal was that the work was to be synthetic which appears to be contrary to routine scientific investigation. This quality and the turn of mind that can achieve it, genuinely distinguishes our discipline from most others and really should not be sacrificed to current research trends. As a discipline we have no choice but to continue probing this dilemma, of being a scientific fit or misfit. Research is undertaken to contribute to the improvement of man's estate and the aim of architectural research seems no less so.

Notes

1. Swanson, Randy S. and Betty Glenn, (1995), *The Development of a Typology for the Evaluation and Design of Long Term Care Enviornments for Older Adults,* A Research Report prepared for the University of North Carolina at Charlotte. This report contains a record of our efforts at trying to establish bridges between Architecture and Nursing in the areas of research, research methods and professional objectives. The report also contains a substantive bibliography.
2. Lam, William C., (1977), *Perception and Lighting as Formgivers for Architecture*, New York, McGraw-Hill.
3. *Design for Aging, An Architect's Guide*, (1987), Washington, D.C., The American Institute of Architects Press.

   Design for Aging: An Annotated Bibliography 1980-1992, (26 pages) (1993), Washington, D. C., The American Institute of Architects Press.

   Design for Aging, 1992 Review, (1992), Washington, D. C., The American Institute of Architects Press.

   Ms. Mary Chamberlin, Healthcare Design Awards Program Manager, for the *Modern Healthcare Weekly Business News.* This journal oversees the Annual Health Care Design Awards in the USA in conjunction with the American Institute of Architects National Conference on Health Care Facility Design. Ms. Chamberlin has been the Program Manager for the Healthcare Design Awards from the inception of the program in 1986, and is intimately involved in its continuing operation.

Education in Research and Design

De l'influence de l'idée de technique sur l'enseignement de l'architecture

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Abstract
The influence of materials on architecture - from Vitruvian "soliditas" - is a topos of architectural discourses. Nevertheless an influence of architecture on technics is also thinkable as did Alvar Aalto ! The paper aims at showing, using some examples, how technical aspects of architecture are involved with other aspects, which is an issue which should be taken into account before any attempt of organising technical matters in architectural education.

"Une bonne vision des détails techniques et des choix de matériaux appropriés est essentielle. Quelle sera l'influence des matériaux nouveaux et des méthodes de production sur la conception du projet?" Telle est la question posée dans cette section du programme de notre *Workshop.*

Posée ainsi la question est très vaste et on a deux façon d'y répondre. L'une est de jouer les prophètes, l'autre est de répondre qu'on ne sait pas! Je souhaiterais toutefois m'interroger sur cette question non pour y répondre - car je ne crois pas qu'il y ait d'autre réponse effectivement que les deux que j'ai dites, mais pour tenter de la comprendre et d'en cerner les enjeux.
Je voudrais rappeller pour commencer un article de Philippe Deshayes qui avait porté l'attention sur un article d'Alvar Aalto intitulé *De l'influence de l'architecture sur la construction*[1)]. Je ne développerai pas le contenu de l'article d'Aalto, le titre suffit assez à indiquer par son caractère inattendu que la flèche de l'influence y va dans un sens inhabituel : nous sommes plus enclin à imagner quelqu'influence des méthodes de construction ou des matériaux - de la technique - sur l'architecture que l'inverse. Il est même d'usage de dire que l'architecture en procède.

Or Aalto envisageait dans cet article les choses en sens contraire, posant la question de l'influence de l'architecture sur la technique ! Philippe Deshayes quant à lui montrait comment Aalto au cours de l'article, inversait la vapeur et finissait sur un mode plus classique que celui par lequel il l'avait commencé, n'ayant semble-t-il pas pu "tenir" son propos jusqu'au bout sur ce mode de l'influence de l'architecture sur les matériaux, sur la construciton, la technique.

Ce que je voudrais dire c'est que la version que je dirai classique relève d'une épistémologie déterministe tandis qu'une épistémologie constructiviste permet d'envisager les choses différemment.

Pour ce faire je m'appuierai sur l'analyse que l'on peut faire architecturologiquement de quelques cas de conception dans lesquels le technique - ou plutôt quelque chose comme "du" technique, pour rester vague en un premer temps - intervient.
Le cas du *Hancock Building* à Chicago est un bel exemple dans lequel intervient "du" technique : on peut voir un magnifique contreventement en façade.

A bien y réfléchir, comme nous l'écrivons dans notre *manuel d'enseignement de la conception architectural : "le contreventement existe dans tous les bâtiments, il s'agit d'une contrainte et non d'une échelle. Mais mettre le contreventement à l'intérieur ou à l'extérieur d'une façade procède d'un choix qui opère dans l'espace de conception. On ne peut considérer qu'il s'agit là d'une contrainte mais bien plutôt d'une échelle".*
Ce que nous voulons dire c'est qu'une différence doit être faite entre le fait de satisfaire la contrainte de contreventer le bâti et le fait qui, lui, ressortit au libre-arbitre du concepteur, de manifester ou non ledit contreventement à l'extérieur.
C'est pourquoi nous considérons que le concepteur a ici un rapport à la technique qui est de l'ordre de ce que nous appellons *une échelle*, c'est-à-dire de ce qui par rapport à un espace de référence pris en considération - ici *un espace de référence technique* - donne lieu à une opération de conception - ici *<rendre -le-contreventement-manifeste>* - qui n'est pas de l'ordre d'une contrainte.

La preuve de la possibilité d'un tel libre-arbitre nous est donnée par trois exemples dans lesquels la technique est tellement contredite qu'elle évacue parfaitement l'idée de contrainte.

. La banque de Mineapolis utilise une chaînette qui évoque tout ce qu'il faut de la contrainte physique. Or un état du projet montre qu'une chaînette fonctionnant à l'envers avait été envisagée par les architectes.
. L'allège d'une fenêtre de Florence montre une inversion du même genre portant sur l'acte plate-bande.
. La chaise de Rietveld enfin ne manifeste pas une façon très canonique de résoudre le problème de la rigidité géométrique qui sied, si je puis dire, à un sège. C'est un siège malséant.

Ces trois exemples montrent bien que l'architecte peut faire référence à la technique sans pour autant opérer sur le mode d'une réponse à une contrainte. Certes il suit les lois de la statique et par exemple Rietveld a du prévoir des goussets pour permettre la rigidité de sa chaise. Mais qui l'obligeait à se poser un tel problème?
De son côté le problème que posait peut-être la chaînette de Minneapolis a été résolu par élimination du problème lui-même. Quant à l'allège elle ne posait aucun problème, le linteau reposant sur un mur et cessant par là-même d'être un linteau.
On voit par conséquent que du côté de la contrainte les différents cas engendrent des problèmes de difficulté variable. Mais les trois cas ont ceci de commun que l'architecte à un moment de la conception, s'est référé à du technique pour concevoir, ceci indépendamment du problème qui s'ensuit qui oblige l'architecte à "résoudre un problème technique" comme on dirait classiquement.
On voit que s'il n'est pas question de nier que l'architecte puisse avoir à faire face à des contraintes, il serait erroné de limiter tout problème posé en référence à la technique à la satisfaction d'une contrainte. C'est ici qu'on passe d'une vision *déterministe* de la conception à une version *constructiviste*. J'entends ici par constructiviste le fait de

considérer que l'architecte construit son problème avant de construire son édifice. Ou, si l'on veut, on pourrait dire qu'il construit la conception avant de concevoir la construction.

Il conviendrait encore de s'interroger sur le problème du sens des opérations de conception. Ainsi l'opération du Hancock building consiste à exhiber le contreventement. La visée est de manifester du technique, le moyen, dit en termes architecturologiques, revient à utiliser une échelle de visibilité (montrer/cacher). Une autre interprétation pourrait être de l'ordre fonctionnel : libérer l'espace intérieur. Peu importe à vrai dire, ce qui importe est de montrer ici qu'une telle opération apparemment simple est elle-même complexe et fait intervenir plusieurs échelles.
Un autre exemple montrerait l'intervention d'un échelle symbolique : on peut voir que les briques d'un mur y sont retaillées pour manifester un mur de pierre !
En d'autres termes les divers exemples que je montre ici sont des *implexes*, pour reprendre le terme à Jean-Louis Le Moigne qui définit par là un élément simple et pourtant complexe. Complexe pourquoi ? parce qu'interviennent divers échelles et non une seule.

Tout ceci après nous avoir tenu apparemment quelque peu éloignés de la question de l'enseignement amène cependant à poser quelques questions. Si nous nous demandons ce qu'il en est de l'enseignement de la technique nous sommes amenés à considérer comme critiquable - ou tout au moins totalement dénué de pertinence - un enseignement qui séparerait le technique du reste dans le registre d'une monovalence d'échelle selon l'excellente expression de Philippe Deshayes.

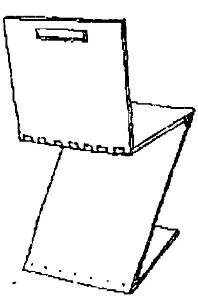
Le *topos* des discours relatifs à l'architecture qui voudrait que l'histoire de l'architecture suive l'histoire de la construction, soumise qu'elle est à son "influence", s'il n'est pas totalement dénué de bon sens, risque de mener à une vision excessivement déterministe si l'on n'admet pas que toute échelle technique dans la conception architecturale doit s'articuler sur d'autres échelles. Il en va ainsi du fait que les objets architecturaux sont des multi-objets c'est-à-dire des objets complexes et non réductibles à la monovalence d'un point de vue, fut-il aussi important que le point de vue technique.

J'aimerais citer ici un passage d'un texte du professeur d'architecture Maxwell qui montre bien à mes yeux une difficulté de l'enseignement de l'architecture à l'endroit de l'enseignement de la conception.

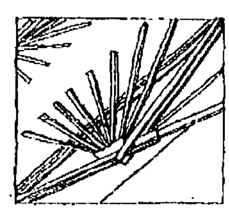
Dans un article du RIBA magazine de 1983, intitulé "The two theories of architecture", Robert Maxwell raconte :
"étudiant à l'école d'architecture de Liverpool en 1948, j'étais censé savoir comment construire des coupoles en béton. Des coupoles *parce que cela était traditionnellement l'élément majeur dans une composition architecturale; en* béton *parce qu'ils 'agissait d'un matériau moderne. Pendant approximativement les deux jours qui précédaient l'examen j'étais capable de spécifier très précisément, et en détail, la quantité et la disposition des armatures métalliques dans une structure de béton de 400mm d'épaisseur sur 100 mm de diamètre. Le jour d'après, j'avais tout oublié et jamais, depuis, je n'ai été appelé à devoir fournir ce type de connaissance. Il n'y a pas non*

plus un grand nombre de coupoles en béton de par le monde et celles qui peuvent exister, nous pouvons en être sûrs, ont vu leur armature calculée par des ingénieurs.
On saisit là, poussé à l'extrême, un problème qu'on sait récurrent de l'enseignement de la construction à l'intérieur de l'enseignement de l'architecture.
On trouve encore dans ce même article de Maxwell la référence à la "fourmi" de H. Simon. Je le cite : *"comme Simon l'a magnifiquement montré avec sa parabole de la fourmi, la complexité que nous rencontrons dans le comportement des organismes vivants tient au fait que ce comportement ne se présente pas simplement comme l'intégration de systèmes internes combinés mais comme le résultat d'un interface entre structures internes et structures externes"*
Mais il me semble que Maxwell ne relie pas l'histoire précédente à ce qu'il vient de dire ici. Or si nous rapprochons *la fourmi* de Simon du problème de la technique, nous retrouvons bien la nécessité de ne pas poser le technique de façon autonome mais bien comme l'élément d'un environnement qui, *sans même prendre la peine de sortir du bâtiment lui-même* est constitué de la variété des autres pertinences que l'architecte met en jeu pour concevoir.
Ou plutôt Maxwell a conscience de l'idée d'environnement - sans quoi il ne citerait pas Simon - mais il passe tout de suite à l'environnement que, par commodité, j'appellerai externe du bâtiment. Je le cite : *"Pour rendre compte du fait que les édifices - en tant qu'ils sont conçus - sont des entités aussi complexes, nous devons comprendre que leur complexité n'est pas seulement le fait de leur matière et de la façon dont elle est organisée, mais de la façon dont ils sont insérés dans un environnement global."*

Sans nier l'intérêt de ceci je crois que cela revient à manquer le fait que le technique se trouve, à l'intérieur même du domaine architectural, immergé dans un contexte qui le dépasse et que la pensée du technique dans l'enseignement de l'architecture doit s'effectuer dans un système plus global dont elle est représentative.



chaise par Rietveld



charpente de l'hôtel de ville de Saÿntsalo par Alvar Aalto

Note

1. Deshayes Ph., "De l'influence de l'architecture sur les matériaux", in *Séminaire sur les processus de conception,* Paris, MELTM, Avril 1992.

Savoir & Action : Les "Nouveaux Outils" sont-ils "Urbainement Corrects" pour les Relations Enseignement/Recherche?

Elenilde Cardoso, André Del, Christian Nidriche

RIAAU Recherche Pluridisciplinaire d'Informatique, Appliquée à l'Architecture et à l'Urbanisme, École d'Architecture de Paris-Tolbiac, 5, rue du Javelot 75645 Paris Cedex 13 France.

Résumé

Les BDU/SIG permettent d'informer par l'instrumentation les rapports du savoir et de l'action dans les champs de l'architecture et de l'urbanisme en offrant de nouvelles possibilités d'articulation entre ces champs, collaborant ainsi à la construction d'un cadre fructueux d'investigation liant enseignement et recherche.

Les nouveaux troisièmes cycles français d'architecture face aux "nouvelles technologies"

Nécessairement spécifiques, par les rapports particuliers du savoir et de l'action que l'activité d'analyse et de conception architecturale implique, ces troisièmes cycles auront à articuler des objectifs de formation professionnalisante à la formation "à" et "par" la recherche permettant seule la construction, l'ancrage et le développement des doctorats d'architecture en gestation, vivier des futurs enseignants-chercheurs.

Les relations enseignement/recherche devraient en être définies selon deux objectifs complémentaires :

- Former des acteurs de la conception architecturale plus conscients des implications des choix et des arbitrages qu'ils effectuent et du rôle qu'y jouent les méthodes de travail et leur instrumentation.
- Développer le champ de la recherche architecturale dans sa complexité et son autonomie relative dans un milieu privilégié où peuvent se cumuler et se "socialiser" les connaissances, méthodes et techniques capables de nourrir d'innovations et d'expérimentations les pédagogies, puis ultérieurement les pratiques et comportements professionnels.

L'intégration des "nouvelles technologies" à ces pédagogies et pratiques en sera dynamisée pour une meilleure saisie de leurs implications dans les démarches d'analyse et de conception et de leurs capacités à modifier les manières de concevoir, de décider et de réaliser.

Dans cette perspective, un des objectifs majeurs doit être l'élargissement du contexte d'exploration par l'étudiant des solutions de conception, le faisant collaborer à un véritable développement de l'aide à la décision de conception dans les domaines concernés. Cet élargissement doit s'effectuer selon une vision prospective de l'évolution des pratiques de métiers, n'envisageant plus l'instrumentation informatique comme la simple transcription, le prolongement de tâches existantes, mais comme ayant vocation d'investigation "ouverte" des solutions de conception, notamment par la simulation de l'utilisation ou la prédiction des transformations que les projets pourraient subir.

La fertilisation "en retour" de la pensée théorique de l'architecture par les innovations issues de cette dynamique nécessite des cadres pluridisciplinaires d'enseignement et recherche permettant de dépasser l'opacité de l'objet d'étude dans sa propre discipline par une démarche de communication entre disciplines créant des possibilités de saisies autres de l'objet, des lieux de compréhension et d'interprétation qu'une vision disciplinaire isolée occulterait. Une telle démarche produit des "effets de sens" nouveaux par rapport à l'enracinement disciplinaire de chacun, et la formation à la recherche et par la recherche ne peut qu'y trouver sa véritable dynamique (1).

L'étude des pratiques d'architecte dans l'activité d'analyse et de projet instrumentée informatiquement, lorsqu'elle s'inscrit dans une telle approche, permet une meilleure compréhension des possibilités d'articulation de l'activité cognitive traditionnelle de l'architecte, "toute d'intégration intuitive des données," au développement de la formalisation explicite des décisions de conception, voire des concepts manipulés. Dans cette interrelation pratiques d'analyse et de conception/"instrumentation intelligente" (2), le nécessaire effort d'explicitation imposé par la formalisation informatique ne peut que contribuer à l'articulation et au développement des champs de recherche impliqués (3).

De nouvelles possibilités d'articulation entre architecture et urbanisme

Mieux comprendre comment la connaissance "travaille" la conception dans ces domaines, sous quelle forme et à quel moment, implique une ouverture à la diversification des approches du phénomène urbain s'inscrivant dans la conception même des dispositifs pédagogiques des écoles d'architecture et considérant l'activité de conception comme située et ancrée dans la diversité des pratiques et des implications sociales des métiers.

L'application des bases de données urbaines (BDU) construites à l'aide de systèmes d'information géographique (SIG) à la conception, la planification et la gestion urbaine lorsqu'on l'expérimente dans les écoles au travers des pratiques d'analyse urbaine et de conception labellisées "projet urbain", relève d'une telle ouverture, contribuant ainsi à une meilleure compréhension/évaluation de l'impact et des limites d'usage de tels outils dans le cadre de ces pratiques.

L'École d'architecture de Paris-Tolbiac (EAPT) et l'Institut français d'urbanisme de l'Université de Paris VIII (IFU) ont conçu ensemble un dispositif pluridisciplinaire liant enseignement et recherche pour l'étude et le développement de l'usage de cette instrumentation, en utilisant les possibilités d'articulations entre architecture et urbanisme qu'elle offre grâce à deux capacités essentielles (4) :

- La possibilité d'une mise en commun de cultures de métiers différentes au travers de l'usage d'une même instrumentation, permettant aux futurs architectes et urbanistes,
  - d'instrumenter en commun leur compréhension et interprétation de la ville comme un systèmes de relations entre événements et objets.

- de tester en commun leurs connaissances des modes de production et de transformation de la ville et leurs implications.
- La possibilité de mettre "en situation" une instrumentation informatique n'ayant pas de vocation au DAO dans l'ensemble des instrumentations traditionnelles de l'analyse urbaine, lui permettant de compléter celles-ci et de créer des coexistences fructueuses.

Architectes et urbanistes sont le plus souvent absents de la conception/production de ces outils, qui tendent à constituer un enjeu actuel important dans l'évolution des pratiques de métiers de la conception urbaine. Ils sont cependant particulièrement bien placés pour comprendre et interpréter la ville telle que nous venons de la poser, c'est-à-dire comme système complexe de relations entre événements et objets.

Dans ce contexte, la question de l'instrumentation informatique de l'analyse urbaine par les BDU/SIG semble être une voie fructueuse pour constituer des cadres d'approches théorico-pratiques résonnant fortement avec les spécificités des cultures de l'architecte et de l'urbaniste, collaborant ainsi à une meilleure compréhension des possibilités d'autonomie épistémologique du champ de la recherche architecturale.

Trois raisons de s'intéresser aux BDU/SIG comme support des relations enseignement/recherche

C'est la capacité "multimorphe" de l'outil à accéder sous une forme homogène à la diversité des informations sur la ville et d'en construire des représentations sectorielles en cours de processus d'analyse et de conception qui est intéressante pour observer les comportements et pratiques de désignation, de description, d'intégration et de restitution des informations.

Confronté à la culture et à l'imaginaire des étudiants, l'outil permet notamment de capter certaines distorsions et points communs entre les différentes constructions mentales de l'urbain mises en jeu. Nous savons, par exemple, que les élèves architectes considèrent que l'outil SIG articule "naturellement" trois aspects de l'urbanité : la morphologie, la densité et la mixité, cette articulation leur permettant "d'accrocher" leur approche de l'outil à leur culture architecturale (5).

Trois caractéristiques majeures des BDU/SIG les rendent particulièrement intéressantes à nos yeux pour le développement des relations enseignement/recherche dans les écoles d'architecture :

- Ce sont des outils impliquant une *"transparence nouvelle" pour les cultures de métiers impliquées.*
  L'intérêt majeur de ces outils pour la formation à l'analyse et à la conception urbaine est qu'ils obligent à expliciter entièrement les objectifs, la démarche, les notions et données, ce qui implique une mise à jour et une clarification permanente des connaissances acquises.

- Ce sont des outils posant la question de la relation dynamique entre les modes de description du réel et les méthodologies d'intervention.
  La mise en œuvre des diagnostics préalables et les évaluations en cours de projet nécessaires à l'évolution du procès de conception sont deux moments privilégiés permettant de poser, en les articulant, deux questions essentielles en liaison directe avec les capacités de l'outil:
  - La question des modes de description du "réel" sur lequel on décide d'agir et avec lequel on va projeter, qui est celle des concepts et procédures opératoires de la description.
  - La question des méthodologies d'intervention développables sur la base d'une meilleur compréhension de l'existant pour une meilleure conception du nouveau, qui implique la possibilité d'une évaluation par le concepteur de la pertinence des modalités de description du réel (6).

  L'exploration de cette relation dynamique en fonction des cultures de métiers impliquées permet à la fois d'évaluer les possibilités d'évolution des pratiques, liées notamment à la variabilité du statut donné à l'instrumentation informatique selon ses moments d'usage dans les processus d'analyse et de conception, et de mieux cerner les limites propres aux domaines concernés en termes de catégorisation, manipulation, représentation et gestion de la connaissance et du savoir-faire architectural et urbanistique.

- Ce sont des outils permettant de former les étudiants aux futures répartitions et complémentarités de compétences et de responsabilités.
  Dans le contexte des écoles d'architecture françaises, qui ne sont globalement pas des lieux de formation introduisant véritablement à la complexité actuelle du jeu d'acteurs de l'aménagement et de la production/transformation de la ville, les "instrumentations partagées" apportant des capacités d'analyse nouvelles, telles les BDU/SIG, offrent l'intérêt d'altérer nécessairement la répartition conventionnelle des pratiques et approches des divers univers professionnels concernés (7). L'investigation de l'impact de ces outils sur l'élaboration de stratégies de travail spécifiques aux cultures de métier impliquées rend possible un dialogue trans-disciplinaire et pluri-culturel d'exploration et d'éclaircissement, entre enseignants-chercheurs et étudiants, préfigurant celui des futurs partenaires de l'acte de conception/réalisation.

Informer par l'instrumentation les rapports du savoir et de l'action dans les champs de l'architecture et de l'urbanisme

Le surgissement permanent de la complexité à l'œuvre dans le procès de conception pose des limites à son approche scientifique, qu'elle soit d'ordre épistémologique, sociologique, psycho-cognitive ou systémique et toute pédagogie se doit en premier de prendre en compte lieu que l'émergence des solutions de conception relève des conditions de la décision de l'action, dont la (les) "culture (s) de projet" en jeu constitue (ent) un élément majeur (8). Parmi les modalités concrètes de construction de cette culture chez l'étudiant, sa relation à l'instrumentation de l'analyse et de la conception est un lieu où cette "culture de projet" se révèle et se constitue simultanément, ce qui en fait un support didactique et expérimental privilégié pour le faire réfléchir sur les rapports du savoir et de l'action, sur la "pensée du faire" qu'il est en train d'acquérir dans la pratique instrumentée du passage des mots vers les choses.

Les BDU/SIG relèvent, dans cette perspective, des instrumentations les plus intéressantes, celles qui confrontent l'étudiant à ses cultures explicites et implicites, à son mode de penser la ville. Elles permettent de rendre les étudiants réceptifs et initiés aux exigences d'analyse et de construction du réel propres aux champs disciplinaires que leurs approches et propositions impliquent, et d'engager chez eux la construction d'une culture pluridisciplinaire suffisante pour participer à l'élaboration des nouveaux instruments et méthodes de la connaissance et de la conception architecturale et urbaine.

La recherche liée à l'enseignement peut ici travailler à l'évaluation des limites d'usage de cette instrumentation et collaborer notamment à l'identification de nouvelles fonctionnalités pour les futurs systèmes d'aide à la décision/conception, tout en constituant une source pour la mise au point de formes renouvelées de l'enseignement de la conception s'appuyant sur des outils spécialisés. (cf. (1), op. cit.).

La constitution d'un champ fructueux d'investigation pour l'enseignement et la recherche

Si elles paraissent relever a priori de la plus "pure" et "neutre" instrumentation, les BDU/SIG, en permettant de poser la problématique de la constitution même des données de la conception de l'aménagement urbain, constituent un champ fructueux d'investigation posant de nombreuses questions liées à la modélisation des données, à la conception de leur système de relations (9) : quelles données, en quelles relations entre espace et temps, et pour quoi faire ? c'est quoi l'information en matière d'urbanité ? peut-on distinguer ce qui est un phénomène observé dans un cadre urbain de ce qui est un phénomène proprement urbain?

L'acquisition/interprétation et la restitution/présentation de l'information en cours de processus d'analyse et de conception sont en effet liées dans ce type d'instrumentation par un rapport "tendu" permettant de questionner fructueusement toute quête de modification/élargissement/transformation des modalités de désignation et d'intégration de l'information architecturale et urbanistique. Deux niveaux spatiaux très contradictoires, par exemple, s'opposent fortement dans l'usage du même outil, permettant de poser la question des spatialités impliquées et de leurs prise en compte:

- *L'espace de type géographique et/ou paysager*, fondé sur une logique territoriale, où un "continuum" spatial est travaillé en termes de typologie d'occupation de l'espace, de superposition de cartographies thématiques (10). Dans ce type d'espace, la typologie des territoires et celle de leurs limites implique une gestion des "frontières" territoriales.

- *L'espace urbain que traitent les métiers de la ville*, dans lequel continuité et discontinuité se posent en de tout autres termes. Celui-ci, non isomorphe, est constitué par les relations entre de nombreux objets "posés" sur une trame graphique, et seule l'approche topologique peut rendre compte de leurs relations de voisinage, de vis à vis, de contiguïté,...

Décrire, gérer, représenter ces deux spatialités s'effectue pour le moment avec les mêmes outils, or cette grande différence des univers spatiaux (et graphiques) impliqués pourrait nécessiter la distinction d'outils spécifiques cohérents dans leur relation entre la typologie des objets et des environnements qu'ils prétendent manipuler et la typologie de requête qu'ils permettent. La probable introduction, à terme, du 3D et du multimédia dans ce type d'outillage nécessitera de préciser et cerner ces typologies et de définir de nouvelles classes de requêtes d'extraction et de manipulation, adaptées notamment à ces univers spatiaux et graphiques distincts. La recherche liée à l'enseignement sur ce type d'instrumentation devrait ainsi permettre de mettre en évidence des besoins d'attachement de données spatio-visuelles et de mixité de requêtes (graphiques/topologiques/attributaires) spécifiques aux cultures concernées.

Cette instrumentation permet, sur la base de ces questionnements, de formuler trois objectifs pouvant se constituer en approches complémentaires développables à la fois comme axes d'enseignements théoriques et comme thèmes de recherche :

- Révéler la position particulière des cultures de métiers impliquées dans la configuration générale des savoirs
- Élucider le (les) statut (s) de la représentation à l'œuvre dans les pratiques
- Montrer le "travail" des notions et modèles infiltrés par les disciplines (qu'elles soient explicitement convoquées ou non) (11).

Les BDU/SIG constituent en cela un "lieu" d'expérimentation et de développement des approches de l'urbain et semblent offrir la possibilité d'une "analyse dynamique" de la ville, se distinguant de "l'inertie" de l'analyse urbaine fondée sur la juxtaposition d'indicateurs. Cette possibilité d'analyse constitue un enjeu actuel pour l'enseignement et la recherche, l'instrumentation permettant de saisir, par l'observation de son impact sur les cultures de métiers et de ses conditions d'appropriation, certaines modalités des reformulations en cours des objets de l'aménagement et de la gestion urbaine. C'est, notamment, la question de la pertinence des échelles d'analyse et d'intervention et celles de la délimitation des objets d'étude et de la cohérence de "chaînage" des processus d'analyse et d'intervention qui sont ici impliquées.

Notes

1. Cette posture caractérise l'approche de l'équipe de recherche (RIAAU) et sous-tend notamment le projet de recherche "Définition d'un environnement d'aide à l'acquisition d'informations spatio-visuelles en architecture et urbanisme".
2. Au sens de "l'Intelligence artificielle".
3. Sur le besoin d'explicitation imposée par la formalisation informatique et ses implications, on peut se reporter à l'approche cognitiviste de la conception architecturale développée par le Gamsau. Voir (Lebahar 1988). Sur les possibilités d'enrichissement mutuel des champs de la conception architecturale et de l'informatique, les travaux développés par le LAREA sur les relations architec-

turologie/informatique sont particulièrement exemplaires et éclairants. Voir (Boudon 1995) et (Boudon et al. 1993).

4. Ce dispositif associe les deux institutions dans un certificat de l'EAPT "Urbanisme, projet urbain et BDU" où des étudiants d'architecture et d'urbanisme travaillent ensemble sur l'application des BDU/SIG à l'analyse urbaine et au projet urbain. Nous reprenons ici une posture d'approche pluridisciplinaire que nous avions déjà développée dans le cadre d'un certificat d'études approfondies en architecture (CEAA) liant enseignement et recherche, "méthodologies des sciences humaines et architecture", de l'École d'architecture de Paris-Conflans (EAPC), en association avec le département de sociologie de l'Université de Paris VIII, à la création duquel nous avons participé.
5. Sur l'approche différenciée de l'instrumentation BDU/SIG par les étudiants architectes et urbanistes, voir (Cardoso, Del, Nidriche 1994).
6. La prise en compte de ce double questionnement, à la fois en sa distinction et en son lien dynamique, constituait un des fondements du CEAA "sciences de la conception" de l'École d'architecture de Paris-la Villette, équipe P. Boudon, M. Hamad, R. Prost, A. Renier . Notre démarche d'enseignement sur les BDU/SIG relève également de ces questionnements.
7. Sur les enjeux liés au développement des BDU/SIG en termes de reconfiguration des pratiques et cultures des métiers de l'urbain, voir (Cardoso, Del, Nidriche 1995) et (Cardoso, Nidriche 1994).
8. Les enseignements et recherches de R. Prost à l'EAPT et au CRESSAC et de M. Conan à l'EAPC et au CSTB sont particulièrement caractéristiques de cette position. Voir notamment (Conan 1990) et (Prost 1992).
9. Le système de relations des données urbaines est ici entendu à la fois comme système d'objets de nature diverse et complexe, comme l'urbanité qu'ils représentent, et mise en situation du système d'acteurs produisant et gérant la ville.
10. Sur l'approche des BDU/SIG comme instrumentation "à risque" apportant une vision du territoire caractérisée par sa virtualité et sa capacité d'incitation à la collection iconographique sur un mode interactif, voir (Cardoso, Del, Nidriche 1995) et (Lussault 1994).
11. Ce triple objectif qui est une des composantes essentielles des enseignements que nous développons avec l'IFU (4), l'est également du certificat "Problématiques et théories pour l'architecture contemporaine" de l'EAPT conçu par A. Farel, C. Nidriche et R. Prost. Sur la position particulière de l'architecture dans la configuration des savoirs on peut se référer fructueusement à (Pellegrino, 1991).

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Method without Theory is Empty, Theory without Philosophy is Blind

(with regards to Immanuel Kant)

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At Texas A&M University we have a program that consists of 40+ Ph.D. students (the largest in the country) whose research emphases range from highly technical to extremely theoretical. Our program stretches across very diverse realms; architectural computing, architectural design, architectural history and theory, construction management, energy optimization, health and environmental systems, health care architecture, historic preservation, visualization science, affordable housing, architectural pedagogy, environment and behavior, et cetera. In our experience, entering Ph.D. students are unaware of the broad *range* of methods that they may potentially use to frame their particular research question. They are unaware of the powerful tie between a particular research method and the assumptions underlying the world view that generated the method.

Doctoral research in architecture presents a confusing array of methods stemming from its birth in various disciplines: historical analysis, physical sciences, and human behaviour. The discipline of architecture crosses so many boundaries; engineering, psychology, sociology, art, criticism, geography, history, aesthetics, design, computing, and numerable others, that it is not surprising that students of architectural research find themselves faced with a plethora of research paradigms. In different Colleges of Architecture, generally one method for research is favored depending upon the particular history of the program and its founders. These programs are generally rather small and focus on one or two defined areas. We believe that the quality of research in architecture would be improved by the inclusion of a course in the *philosophy of research*. The content we propose addresses the problem of the complex and often conflicting foundations of research.

The basic model of research governing most universities is the deductive model, e.g., hypotheses must be supported by facts. This model is analogous in form to a deductive argument which is composed of premises which are assumed or given, a body of reasoning, and a conclusion. An hypothesis is a proposed conclusion, to be supported by facts and reasoning. The form for this model has its roots in the basic syllogism first expertly rendered by Aristotle. Though the overall form remains simple in its three-part division, each individual part (premises, reasoning, and conclusion) has been made very complex through 2500 years of debate over its nature. What we do in this course is to simplify the complexities of the contemporary deductive model by organizing the philosophical debate in relation to the nature of FACT, UNDERSTANDING, and KNOWLEDGE and to organize the effects of these controversies on any research endeavor. The product of research is a presentation of new knowledge in some form. In turn, that knowledge will be the result of an organization of a collection of facts. All three parts---fact, understanding, and knowledge---interact and must be consistent if the student's work is to be eloquent and significant. The focus of our interest is on the debates concerning the nature of facts and their organizations. Philosophical positions and vocabulary are not generally addressed in this manner. Our task has been to try to translate the major issues and vocabulary of philosophy into the primary concerns for architectural research.

Four major philosophical issues impact the clarity and consistency of research designs: TRUTH, JUSTIFICATION, UNIVERSALS, and EXISTENCE. Debates about the nature of any one of the components of a philosophical position impact the structure of the resultant world view and its methods for achieving knowledge. For our purposes---the clarification and consistency of research positions--the components are defined and structured through the following debates:

TRUTH: meaning *veritas* the putative object of knowledge and goal of inquiry.

Correspondence Theory: Statements are true when they correspond with reality.	**Coherence Theory**: Statements are true by virtue of belonging to consistent sets of ideas.

JUSTIFICATION: meaning to make good an argument, statement, or opinion; to confirm or support by attestation or evidence; to corroborate, prove, or verify.

Foundationalism: all lines of reasoning are grounded in basic belief, i.e., the premises of the argument that need no further grounding.	**Coherence**: inferences are justified by belonging to a consistent set of ideas.

UNIVERSALS: meaning abstract or general concepts.

Realism: universals exist outside the mind.	**Nominalism**: universals are not real entities in the world or the mind. They are just names.

EXISTENCE: meaning the state of *being*.

Realism: both things and concepts have real existence.	**Idealism**: the nature of reality is mental or ideational.

We have constructed a table of the possible combinations of alternatives for each component of a philosophical position. Each possibility can lead to a discussion of a world view and how different movements and people might be categorized. Each position is examined in relation to facts, understanding, and knowledge. The danger of such an organization is oversimplification. The virtue is that it can clarify positions and allow students to identify the underlying assumptions of their research designs.

Corres.	Coher.	Nominal.	Idealism	CRITICAL THEORY: (Hegel) **Facts** are historical objects, ideas, or events critically examined. **Understanding** is to propose alternate meanings based on dialogic and dialectic processes. **Knowledge** is allegory.
Corres.	Coher.	Nominal	Realism	CRITICAL THEORY: (Marx) **Facts** are historical objects, ideas, or events critically examined. **Understanding** is to propose alternate meanings based on dialogic and dialectic processes. **Knowledge** is allegory.
Corres.	Coher.	Realism	Idealism	
Corres.	Coher.	Realism	Realism	SYSTEMS THEORY: **Facts** are time-dependent, probablistically observable, quantifiable phenomena given by the world. **Understanding** is gained through historical and contextual models. **Knowledge** is expressed as models that study system, process, and change.
Corres.	Founda.	Nominal.	Idealism	
Corres.	Founda.	Nominal.	Realism	
Corres.	Founda.	Realism	Idealism	BRITISH EMPIRICISM: (Locke) **Facts** are simple ideas given by the world. **Understanding** Facts are organized through an association of ideas. **Knowledge** is abstract and general ideas induced from experience.

Corres.	Founda.	Realism	Realism	POSITIVISM: (Mach, Comte) **Facts** are given by the world, and are observable phenomena. **Understanding** is organized according to quantifiable patterns that are given by the world and predictable. **Knowledge** is models of prediction. ARISTOTELIAN: **Facts** are phenomena given by the world that represent examples of underlying universals. **Understanding** is organized through categories which serve as general explanations of particular occurrences. **Knowledge** is rational explanation.
Coher.	Coher.	Nominal.	Idealism	RELATIVISM: (Rorty) **Facts** are relative to the observer. **Understanding:** Facts are organized according to individual observer. **Knowledge:** Personal and ephemeral CONSTRUCTIVISM: **Facts** are relative to the observer and created by the observer. **Understanding:** Interpretive, (hermeneutic) - logical disputation **Knowledge** : Allegorical model BRITISH EMPIRICISM: (Hume/Berkeley) **Facts** are ideas. **Understanding** Facts are organized through an association of ideas. **Knowledge** is uncertain and personal.
Coher.	Coher.	Nominal	Realism	RELATIVISM/PRAGMATISM: (Dewey/James) **Facts** are relative to the observer, but given by the world **Understanding:** Facts are organized according to individual observer. **Knowledge:** Corroborative models of specific situations that govern intervention
Coher.	Coher.	Realism	Idealism	

Coher.	Coher.	Realism	Realism	STRUCTURALISM:(Kant/Chomsky/Piaget/Langer) **Facts** are filtered through universal structures. **Understanding** comes from symbolic and pattern analysis. Isolate patterns and infer rules that govern a system. **Knowledge: Absolute** formal natural structures. HUSSERL PHENOMENOLOGY: Facts are the intentional objects of consciousness. EXISTENTIAL PHENOMENOLOGY: (Sartre) **Facts** are bits of the world we interact with. **Understanding** is a personal organization of facts that is contingent upon a particular interaction with the world. **Knowledge**: a particular model that represents an interaction with the world and is purely personal. PRAGMATISM: (Peirce) **Facts** are particulars given by the world. **Understanding** is forming particular relationships among facts **Knowledge** is presentation of the general pattern of individual relationships. It is incomplete, but progressive.
Coher.	Founda.	Nominal	Idealism	RATIONALISM:
Coher.	Founda.	Nominal.	Realism	RATIONALISM:
Coher.	Founda.	Realism	Idealism	RATIONALISM: (Spinoza) **Facts** are *a priori* truths. **Understanding** is forming logical relations among *a priori* truths. **Knowledge** is derived conclusions from logical arguments.

Coher.	Founda.	Realism	Realism	RATIONALISM: (Descartes) **Facts** are *a priori* truths. **Understanding** is forming logical relations among *a priori* truths. **Knowledge** is derived conclusions from logical arguments. RATIONALISM: (Plato) **Facts** are the forms. **Understanding** is dialectical reasoning of clear definitions. **Knowledge** is the good.

A critical aspect of delivering this material is the need to present it visually. The course, in variance to typical philosophy or methods courses, uses schematics and diagrams that trace the difference between and the connection across world views. Detailed processes of research are diagrammed and steps are identified. Our students generally come from a background in professional architecture studies and they tend to be visually oriented. We find that diagrams that juxtapose dichotomous ideas and world views, and that outline the specific steps of different research designs, is a more powerful approach for introducing complex material than the traditional reliance on manuscripts. Although students obviously read a great deal of material, it is important that they understand the ideas presented by being able to clearly "compare" the significance of one position to another.

The program at Texas A&M University is designed to encourage a short turn-around of Ph.D. students in 3 to 4 years. It is important, in this case, to begin to form the research question as early as possible. The course we have outlined would assist in that process by requiring students to begin to organize their own thoughts through one of the methods and its underlying assumptions introduced in the course. The exercises that are carried out during the span of the course are necessary in order to instill a desire to provide clear and concise arguments that rely on logic to establish the initial validity of the student's interests as well as the range of "facts" they must rely on to meet their goals. After forming acceptable statements that address their research question, the student is required to take a position on the aim of their inquiry: explanation, critique, or understanding; whether they are approaching research with an exclusive or inclusive set of values; and whether they are a disinterested observer, a transformative outsider, an active manipulator, or a passionate participant. At the end of their course of study students are able to define their research approach and defend the underlying assumptions with respect to ontological, epistemological, and methodological positions.

This knowledge will assist students in many ways. First, students will be able to understand the influences and assumptions that frame their research questions. Second, they will understand the influences and assumptions that frame the research designs of others. Third, they will be able to argue rationally for their position based on primary sources. Finally, the mystique of "philosophy" and "methodology" will be unmasked and clearly outlined for their perusal and debate.

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Transmission of Knowledge in the Design Studio, in Relation to Teaching Methods and ArchitecturalConcept Formation

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Abstract

This research thesis addresses the means by which transmission of architectural knowledge in design studio is developed on a conceptual and contextual level (organising principles of architecture, philosophy of design, architectural language). The transmission of knowledge in the studio is mainly implicit. The aim of the research is to find and reveal the underlying developments that take place on a pedagogical level i.e. on the use of different teaching methods and the consequences of those, in the studio transmission level.

Introduction

The Research

This paper (1) addresses the means by which transmission of architectural knowledge in design studio is developed on a visual and conceptual level (organising principles of architecture, philosophy of design, architectural language). The transmission of knowledge in the studio is mainly implicit. The aim of the research is to find and reveal, through the analysis of verbal transmission, the components and contents of design language and the way these relate to each other. It is focusing on the underlying developments that take place on a pedagogical level i.e. on the use of different teaching approaches and the consequences of those on the studio transmission level.

The Scenery

The research happened in two distinctly different chronological periods(2). It coincided with a shift in architectural education that took place between the late eighties and early nineties in London. Architectural education was transformed not only on the level of the curriculum orientation but on the level of studio teaching as well. In the old paradigm each academic year, and each term within it was distinctively different. The existing educational philosophy behind it is from simple to complex realities. The view is that different type and scale projects presented objectively per se a high rocky of difficult tasks for the students to synthesise. There is a linear development on the level of complexity of 'thematic' and 'programmatic' (3) approaches to the projects, i.e. from an information stand in the first year to a housing complex in the third year. The approach might be considered rationalistic.

In the new architectural paradigm the idea of introducing the same 'theme' to students of different educational levels , and even sometimes teaching them together under the structure of a 'unit' emerged. It is the result of the shift from a more strictly 'realistic' approach to an intuitive approach, where 'experiencing' takes the leading role. The educational philosophy is mainly experiential . The method of approach is to stimulate creativity by introducing in the studio projects, extra-architectural or architectural realities and bringing the students to live through them. The 'theme' of the project (not the programme) thus acquires an importance not on the level of complexity but on the level of experience. As a consequence it can be introduced simultaneously in any educational level as it does not necessarily demands the presence of pre-existing knowledge of a specific kind.

Two different schools of architecture were chosen for the research. The Bartlett School of Architecture, UCL London from the old paradigm and the School of Architecture and Landscape, Greenwich University London from the new paradigm . Both case studies focused on first and third year projects reviews (reviews were chosen for their quality of being verbally explicit). The aim was to uncover the differences existing between the two paradigms in relation to the structure of the studio transmission and concept formation.

Similarities and differences of the two paradigms are going to be discussed on a general level in relation to the content of the discourse its form, structure and cognition.

The Content of the Discourse

In the content of the discourse (4) design domains (Schon 1975) were classified into architectural, transmission and extra-architectural ones (5). Architectural domains offer a complex image in both educational paradigms. Within each paradigm different architectural issues are stressed. Issues of substance are more important for the Bartlett and spatial issues more important for Greenwich. On the level of transmission the differences are more substantial. The content analysis indicates that the domain of Process along with the domain of Representation becomes dominant in the new educational paradigm. The discussion is not only about the outcome, the final product, but on how the outcome came into being. Also extra - architectural domains make their appearance turning the discourse from a self-referential one to a more open one.

The Form of the Discourse

The density of the discourse (framing) and its verbal expression are perceived as its form. The density of the design domains refers to the form of the context in which knowledge is transmitted and received, the frame(6). For the density less words used means that the use of the design domain under analysis happens verbally more implicitly, more words used means that the use of the design domain under analysis happens verbally more explicitly . The level of the verbal expression allows classification to be made through the use of grammar and reveal choices. For the verbal expression for example a descriptive proposition refers only to the project that is presented during the review and is focusing on practice. A conditional proposition (sets conditions) refers to a deeper level, to the underlying design principle of the project under presentation (7). Both density and verbal expression give the degree of control teacher and pupil possess over the selection, organisation, pacing and timing of the knowledge transmitted (design 'themes', rules and method) and received in the pedagogical relationship (Bernstein 1971).

The discourse does not present any obvious development in relation to its density across the years in both educational paradigms. The consistency and similarity of the results, from a quite diverse sample of data, reveals that design domains contain qualities within them, in relation to their visibility and way of transmission, that are not influenced by the context in which they are transmitted.

As we suggested strongly framed domains mean a less explicit verbal transmission. This can have several explanations, the most obvious one being that strongly framed domains are transmitted mainly on the visual level, or that they are used mainly for their visual qualities. On top we can observe that domains that are strongly framed contain pre-existing common knowledge (for students and tutors) that does not need to be explained exhaustively in order to be transmitted or understood i.e. a piazza (Context) , a staircase (Arhitectural Element) . The strongly framed domains provide us with fragments of background knowledge in the sense that they contain formal and functional qualities recognisable as such by both students and tutors. As a result we presume that weakly framed domains having a more explicit verbal transmission, are transmitted mainly on the conceptual level i.e. the domain of Programme Use contains complex architectural concepts like public, social etc. and needs to be explained exhaustively in order to be understood.

The transmission of architectural knowledge takes place on two separate levels, the visual and the verbal (conceptual)(8). All design domains have both qualities, visual and conceptual within them. Their difference lies on the dominance of the visual quality over the conceptual or vice versa, in relation to their main characteristics and to the way they are used. The density of the discourse provides the information on that front. The verbal structure of the discourse provides the information on the front of decision making via the conditional propositions and the propositions of process. The presence of the conditional propositions is the same (9) in both schools of architecture. This indicates that design choices and decisions are equally made in all educational levels. The students very early on, from step one are setting up the conditions and the rules by which they design in order to arrive to a specific architectural proposition. In the new paradigm we have a reduction of the descriptive propositions , a raise of the propositions of process and consequently a more visible discourse.

The form of design language show that the way architectural knowledge is transmitted has almost the same visibility across levels but not amongst the two schools. Visibility is not an issue that is acquired through development i.e. apriori first year is more visible and diploma less or vice versa , but through the peculiarity of the transmission of architectural knowledge. This is due to the fact that a major part of architectural knowledge is transmitted visually and as a consequence implicitly and this visibility is influenced only by the process or method of transmission used. So the transmission of architectural knowledge does not have the ability to become fully visible. The main obvious difference across the two educational paradigms relates to the process. Process is more visible at Greenwich than at the Bartlett, and that seems to influence the form of each discourse.

The Structure of the Discourse

The structure of the discourse corresponds to the syntagmatic and systematic planes in linguistics(10). Classification(11) express the existing or non existing relationships between domains, the degree of boundary maintenance between domains, that means the associative spatial relationships. The verbal structure of the discourse deals with the systematic plane of design language where the domains are united in absentia through relationships of functional contrast (opposition and similarity).

The level of classification is stable throughout the discourse. On the level of design domains the simultaneous examination of both framing and classification indicates that strongly framed domains (i.e. Architectural Elements) are weakly classified and vice versa, that weakly framed domains (i.e. Programme Use) are strongly classified. That means that the domains that are transmitted for their visual qualities or through their visual qualities actually are the main participants of the syntagmatic plane, which seems to be constituted mainly by visual relationships of combinations and fragments of background knowledge.

Conditional propositions are the ones that mainly structure the relationships of functional contrast of design domains the systematic plane. They initiate concept formation in design activity, as they set up design rules and reveal design intentions. Within the systematic plane we have relationships of binary oppositions i.e. inside-outside and of similarity. The relationships of similarity have different levels of complexity in relation to the number of design domains and spatial relationships that are taking part in them. The development of design language in both educational paradigms is taking place only on the level of complexity of the relationships of similarity. As students advance in their academic studies they are more capable in constructing more complex architectural relationships.

Concept Formation

Endostructure/Metaphor - Exostructure/Metonymy

The design discourse is working on the levels of syntagm (visual) and system (conceptual) at the same time, thus allowing the formation of architectural concepts to take place(12). The interaction between the two levels is possible through the use of metaphor. The planes of syntagm and system correspond with the concepts of metaphor (of the systematic order) and metonymy (of the syntagmatic order) used by Jakobson(13). Syntagm cannot 'progress' except by calling successively on new units taken from the associative plane (system) through the creation of metaphors.

Reading through the case studies we realised that relationships of similarity apart from their different level of complexity can be classified within two broad categories. These are of abstract(endostructure) nature which maps onto that of metaphor in signs; and relational (exostructure)nature(14) which maps onto that of metonymy in signs. Architecture posses a certain (endo)structure. This contains specific internal rules and laws .

These rules and laws are formed within an ordered and extended context. They are formed internally (endo) by the way architectural domains are structured (i.e. binary oppositions, endostructural relationships of similarity), or externally by reference to other objects (exo), architectural (i.e. type, historical type) or not (i.e. objects) that posses by analogy similar rules and laws, their own endo and exo structure. All architectural domains can form both type of relationships.

The endostructural relationships try to explain the internal structure of architecture by analysing it. The exostructural relationships try to understand what is disclosed in front of it and its relationship to an extended relational context. Within the endostructural relationships there is a predominance of the conceptual level (systematic or metaphoric) and within the exostructural relationships there is a predominance of the visual level (syntagmatic or metonymic). The discourse of the old paradigm is mainly metaphoric/endostructural and the discourse of the new paradigm is metonymic/exostructural.

Background-Foreground

Design domains are operating in ways that lead us to focus on the role that 'backgrounding' and 'foregrounding' play for the transmission of architectural knowledge. When the design domains operate on the visual level they have a high participation in the syntagmatic plane and a low one in the systematic plane. It is noticed that cases exist when their participation in both planes is high. This is happening when the particular design domains are participating in the formation of exostructural relationships. In that instance 'foregrounding' is dominant.

When the design domains operate on the conceptual level they have a low participation in the syntagmatic plane and a high one in the systematic plane. It is noticed that cases exist when their participation in both planes is low. The particular design domains are not participating in the formation of functional relationships. They are part of the background knowledge.

Background knowledge or assumptions play a very important role in the transmission of knowledge in the studio and in cognition. Background knowledge is recruited from a much wider repertoire of knowledge from our total knowledge base. In the background knowledge the form-use of the object (15) achieves representational status in the structure of the object itself (Sinha 1988). The backgrounding is not functioning on the level of the concept only but on the level of the visual representation as well framing both syntagm and system. Any form of architectural element or type i.e. tower, atrium etc. any concept of function i.e. bedroom, walking etc. can be part of the form function complex of the background knowledge and it posses endostructural features that are uniquely of its structure.

The structure of any background knowledge can be violated(16). The ability to decouple pre-existing design rules of any object or architectural element is crucial for design language development, particularly for its acquisition. This fundamentally creative or innovative cognitive capacity leads to the formation of new design rules, to the 'foregrounding'. For linguistics when language deviates maximally from 'normal' usage, it thrust to the act of expression itself into the foreground(17). This foreground can be of a metaphoric or metonymic mode(18).

Backgrounding and foregrounding exist within both paradigms but their operation is very different. In the old educational paradigm the educational philosophy is about analysing and specifying this background knowledge in order for the students to draw their design hypothesis from. The nature between 'architecturalknowledge' and background assumptions becomes blured. Both 'backgrounding' and 'foregrounding' are operating on an implicit level. The background knowledge (technology and function) is operating , mainly on the conceptual level through the use of specific common design 'rules'(19). 'Foregrounding' much less dominant and implicit is about understanding and synthesising in an innovative way architectural elements or re-synthesising building types. The discourse is mainly metaphoric.

In the new paradigm the background knowledge is taken on board in an extended experiential sense and is operating mainly on the visual level. Visual operation becomes as important as verbal as it advances simultaneously interacting and initiating cognition(20). 'Foregrounding' being dominant operates explicitly and is part of the process that is based on visual transformations. The approach is metonymic.

The new paradigm place under question the operation of design hypothesis. It forwards the visual level as active in the transmission and in the architectural cognition. It is very interesting to notice that metaphoric mode tends to be 'backgrounded' in the old paradigm and that metonymic mode tends to be 'foregrounded' in the new paradigm. That leads us to believe that possibly 'foregrounding' is of a metonymic mode in architecture.

Notes

1. This paper is based on the Ph.D. thesis under completion to be submitted in the Bartlett School of Architecture, U.C.L. Supervisor Julienne Hanson.
2. The research periods are: 1987-89 in the Bartlett and 1993-94 at Greenwich.
3. 'Theme' in relation to the content of the brief and 'programme' in relation to the specific size, and functional requirements of the under design building.
4. A multilayered text analysis (the reviews were transcribed and analysed in the form of a text) was used which advanced from a simple content classification to a meaning classification and anebled the text to be decomposed and reveal its hidden structures. The method is based on a linguistic analysis proposed by Benveniste where each level of analysis is intergrated by the next one leading to the function of communication of language. See Benveniste, E. *Problemes de linguistique generale*, Gallimard (collection TEL), Paris 1966, Chapter X, "Les niveaux de l'analyse linguistique" pp. 119-131.
5. The concept of design domains was first introduced by Donald Schon in order to describe the design process. For him design domains represent different categories of relevant design elements. like scale, cost, building character, presedent etc. Schon does not pursue the search regarding the nature and the structure of design language any further. He offers a possible model for an analysis of a "non-scien-

tific" activity in a systematic way. Architectural domains defined during the content analysis are Structure, Immediate Use, Context, Programme Use, Geometry Form, Space Form, Historical Type, Style, Architectural Elements, Building type. Transmission domains are Representation, Criticism, Transmission and Process. Extra-architectural domains are Objects and Abstract Notions. In the present paper the discussion is not taking place on the level of design domains and their specific operation.

6. See Bernstein, B., *Class Codes and Control* vol. 1 chapter 11, "On the classification and framing of educational knowledge" , pp. 202-230. For Bernstein frame underlines the pedagogy and classification the curriculum of the transmission of knowledge. Their function gives rise to intergrated and collection transmission codes.
7. On the level of verbal expression, the different propositions were classified into Descriptive, Factual, Conditional and on Process.
8. There is a debate for the existing relationship between language and thought. Language express thought (Benveniste 1966) but the two of them can work independently (Vygotsky 1986). The research takes into consideration the above debate recognising that the verbal plane does not coincide always with the conceptual, but is an expression of it.
9. The percentage of participation of the conditional proposition in the discourse is around 30%. in all levels in both schools.
10. de Saussure, ibid. pp.170.
11. see Basil Bernstein ibid. pp. 202-227. Strong classification (less spatial relationships) reduces the power of the tutor over to what he/she transmits as he/she may not overstep the boundary between contents.
12. see Corine Delage, Nelly Marda "Concept formation in a Studio project" in *Educating an Architect* publ. by A.D London 1994. The interaction of the visual and the conceptual level initiate the concept formation.
13. Jakobson Roman *Two Aspects of Language and Two Types of Aphasic Disturbances* in ; Jakobson and Halle, 1956 :54-82. "The aspect of the linguistic code governing relations of *selection, substitution and similarity* between linguistic signs was designated by Jakobson as its metaphoric pole, indicating that metaphoric figures depend for their interpretation upon these relations. The aspect of the code governing relations of *combination, contexture and contiguity* was designated metonymic, indicating that the device of metonymy relies upon part whole relations in an ordered, extended context".
14. The terms are borrowed from Chris Sinha *Language and representation* Publ. by Harvester-Wheatsheaf, New York 1988, Chapter 5, "Context: Background, Presupposition and Canonicality", pp.164-207. For Chris Sihna the dimension of endostructure versus exostructure can serve as an important organizing principle for the analysis of background knowledge, representation and signification.
15. ibid. for Cris Sinha more artefacts are designed to fulfil a certain purpose (canonical or socially standard) that contain function and form . The relations betwen functions and forms may be termed design rules, and any artefact may be seen as a material representation of the design rules current in the culture pp. 106.

16. In our case the use of technology is a very indicative example. From 'backgrounding' at the Bartlett it becomes part of the 'forgrounding' at Greenwich. At Greenwich technology is not used for its structure but for what this structure represents. These metaphoric use allows for the creation of new rules in the act of forgrounding.
17. see Jan Mukarovsky, 'Standard Language and poetic language' in *A Prague School Reader on Aesthetics, Literary Structure and Style*' selected and translated by Paul L. Garvin, Washington, D.C.: Georgetown University Press p.p.43-4.
18. see Terence Hawkes *Structuralism and Semiotics,* publ. by Methuen & Co. ltd. 1988, chapter 'the structure of literature'. The language is used poetically or aesthetically when its expressive aspect is dominant. Forgrounding then becomes very important. Jacobson offers the more refined proposal that the metaphoric mode tends to be forgrounded in poetry, whereas the metonymic mode tends to be forgrounded in prose p.p.80-1.
19. Within the system (endostructural relationships) we have relationships that loose their metaphoric qualities because they are used too often and they turn into "universal rules'. We name these relationships 'fixed' i.e. small scale = individuality.
20. see Vigotsky Lev, *Thought and Language* (1986). Based on Vygotsky's theory about language development, we can accept that for architecture the visual is not always corresponding to the conceptual. The two modes can operate differently. Their meeting point or interface creates architectural concepts.

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Research in Teaching Architectural Design between Empiricism and Science

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Currently the school of architecture are tugged by the practice, in a direct way the school that promote the main values of the system (architecture as a market product), or in a subtle way, the schools that reduce their role to that of teaching various techniques. The attempts to emancipation (initiated with the Bauhaus whose program included also the establishment of a different type of practice) want to reverse the determination of the practice over the school: they emphasize the pedagogical perspective where the interest is to develop the individual resources of the students. But, as seducing as it seems, this option immediately brings out the common question: how to do something like that ? Naturally the answer ought to be searched in the pedagogical principles area. At this moment I think that the research starting point is connected to a couple of simple and maybe rough observations; the first one concerns the pedagogy: the existence of an inner or outer control on the process of learning something new claims the existance of some previous capacities; or, with other words, it should exist a hierarchy of learning (I repeat, if we are interested to create an alternative either for the ritual education based on the creation of a design habitus or for the elitist education); the second one concerns the contemporary architecture understood as a prolongation of the modernity, in the largest meaning, as a moment of break, connected to an aesthetics of crise, or as a "stasis of change" (M.Calinescu, 1987) perpetuating it and institutionalizing the novelty. In both cases, it is difficult to define an educational approach, because either the lack of any rule, or the admittance of every rule; the comparison of these two observations reveal the fundamental dilemma of the contemporary architectural education: how to learn and how to teach something that has no rule?

The pertinency of this question explaines the amount of energy that the researchers had put in their attempts to define what they consider to be the core of architecture, the design thinking (la conception, in french). That is the attempt to define the object of the architectural studies. The results of this efforts cover all the educational specter, from those which believe in the existence of quasi-scientific design methods, to those which stress the importance of the creative - self. Given this variety, the next move would be that of combining the pedagogical and the design thinking approach. In each case this could allow the creation of alternative educational models, adapted to the present plural world. Technically speaking, a model of this kind should take into account: the specific features of the design thinking, the transfer of the pedagogical concepts (educational objective, content, structure of learning, a.s.o.), the link of the architectural and of the pedagogical logic, the definition of the evaluation criteria of the proposed model.

Practically, there are several difficulties in conceiving a pedagogical program that aims the learning of the design thinking:

1. undoubtly this is a long term objective that implies the coordination of the whole study period, requiring
2. the establishment of a hierarchy of learning that takes into account the way in which there are formed and developed the individual capacities of the student (this is a very controversial area inasmuch we have few in formations about the psychological conditions of learning design thinking;
3. usually, from practical reasons, the balance between the importance given to the process and the one given to the results is broken in favour of the last (that also facilitates the evaluation according to the professional criteria and not the pedagogical ones).

Also, de definition of the educational objectives is difficult to accomplish because:

1. learning design thinking involves capacities from the cognitive area, as well as from the affective and the psychomotor area; even the simplest design exercice requires at the same time, for example, the application of some piece of knowledge, the expression of an attitude towards the studied problem and a decision making process followed by the appropiate actions;
2. there is a difference between the objective understood as a specification of the desired behaviour of the student and the objective of the work theme, that, generally defines the "space problem" (P.Rowe, 1987); in this last case, we are concerned with explicite constraints and also with a part of the teachers convictions (values, means, attitudes); here we find the specificity of the architectural exercise, that lies in the fact that it contains a clearly defined part and an opened one; this one could be interpreted either negatively (as it makes possible a schematic and superficial answer), or positively ("glorifying" some aspects in spite of others in order to obtain a character, a quality).

Taking into account these brief observations, it seems obvious that the present educational models that have at the core the design thinking are always incomplete, dynamic, according to the real learning situation and thus being determined by the interaction with the student's background. This seems to be an important direction of research, one that should be the study of this communication process between the student and the teacher. They both should select a content, considered to be relevant, and imagine at the same time the means to be used, the most stimolous path for the student and the way the teacher would assist him during the action. Consequently, the problem seems to be that of the organization of a formative message, of an educational hypothesis.

Epistemological Maximalism vs. Professional Minimalism
(or, why a professionalist education cannot do justice to doctoral research)

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Introduction and abstract

The part of the university education servicing professions of design, architecture and planning is based on a well-established, but seldom-admitted compromise. It is that while largely adopting the traditional *academic* organisation of the university curriculum, it is mainly the *professional* knowledge and skills that constitute the primary objects and objectives of the design and planning courses. These paradoxes cannot however be explained away simply with reference to the specificity of 'design' and 'architecture'. The issues become even more acute and obvious when the problems of particular type, such as doctorates in these fields are to be examined.

To even begin to discuss the problems of doctoral research (or, *'research education'* as I would call it), an understanding of the relationship between at least three dimensions (i.e. the sociological, the epistemological and the pedagogic) is essential. The complex relationship between these three dimensions tend to make up two distinct attitudes to knowledge which I refer to by two distinct concepts:*'epistemological maximalism'* and *'professional minimalism'*. Being a professional education, yet not being able, in a university context, to assert or admit openly its professional *training* aspects, or the epistemological minimalism of its professionalist frame of reference, architectural education tries to be *both* professional *and* academic.

While the established university traditions on this matter seem to present some initial problems for *designerly* approaches to knowledge, that tradition can however be enhanced by a form of creativity that design disciplines are best equipped to promote if only they could see their roles beyond mere training of professionals, and extend their responsibilities to cover knowledge, culture and society in a wider sense.

The context: degrees of attainment

Architectural (and design) education is as much a problem as it is an answer. Its practical, social and intellectual aspects are as problematical as they are obvious. The structure of its curriculum is no more unambiguously given than the definition of its knowledge content. Added to this picture is an inherently anomalous set of positions vis a vis the various stages of attainment, levels of competence, and, degrees and qualifications awarded for them.

Whilst the curricular objectives and course contents towards the awarding of undergraduate degree(s) such as B.Arch, B.Sc or B.A, and the subsequent entry to the profession have been closely monitored (and variously controlled) by the profession, the postgraduate stages have so far been spared of such, largely non-academic, attention. The external involvement in the Masters Degree courses of various types tended to be in the form of sponsorships from the industry, grants from governmental or quasi-governmental bodies and more recently, European Union with some influence in what is and is not taught. The Doctoral work (or PhD) in architecture and design on the other hand is so much of a rarity in many countries and is so recent in history that it has not so far been seen as a major 'problem' by any particular interest group. It has primarily been the concern of those who sought advancement in their interest areas or/and in their academic careers. The occasion to examine this very last stage and the very last academic qualification in architectural education should therefore offer an opportunity to look closely at 'Doctorates' and the architectural education in their relationships.

'Doctorates': a definition?

The most common (and by no means unproblematical) definition of 'Doctorate' / 'PhD' has been that it is 'an original piece of research done generally, but not exclusively, in a higher education institute the result of which is a contribution to knowledge.' Whilst it is possible to have endless argumentation around the precise definitions of the terms such as 'original' and 'contribution', or around the form or nature of 'research' involved, what is to be accepted as the bottom line is that, it is to do with the production of *knowledge*. With this as our starting point, it is possible to examine the problem of doctorates in architecture and design *as a problem of knowledge.*

Problem(s) of knowledge: two attitudes

The part of the university education servicing professions of design, architecture and planning is based on a well-established, but seldom-admitted compromise. It is that while largely adopting the traditional *academic* organisation of the university curriculum, it is mainly the *professional* knowledge and skills that constitute the primary objects and objectives of the design and planning courses. The scope, the methods and the emphases of such knowledge are variously specified, suggested and inspected by professional bodies who may also validate courses periodically — often quite outside the powers of universities' academic authority.

It can be observed on this background that research in architecture, design and planning departments, and doctoral research in particular, is relatively new and rare even in countries which may otherwise have rich traditions of research in other disciplines. Furthermore, an *integral* use of research-based knowledge in design teaching is even rarer.

These paradoxes cannot however be explained away simply with reference to the specificity of 'design' and 'architecture'. The issues become even more acute and obvious when the problems of particular type, such as doctorates in these fields are to be examined. To even begin to discuss the problems of doctoral research (or, *'research education'* as I would call it), an understanding of the relationship between at least three dimensions (i.e. the sociological, the epistemological and the pedagogic) is essential:

a. The specific *sociological* characteristics of the 'profession(al)s' are defined mainly by their role in the production processes and as the members of trades groups. 'Disciplines' on the other hand are mainly defined by the nature of their knowledge;

b. The *epistemological* nature and use of, and attitudes to, the knowledge identified with design and planning practices is of particular importance as far as learning, teaching and research are concerned;

c. The *pedagogic* modes and methods that were built up in schools of design, architecture and planning are highly specific to them and need to be examined in their relationships to the first two dimensions mentioned.

The complex relationship between these three dimensions tend to make up two distinct attitudes to knowledge which I refer to by two distinct concepts:*'epistemological maximalism'* and *'professional minimalism'*.

The first condition, *epistemological maximalism',* is to do with what university education is (or, should be) all about. It is about pursuance of an ideal according to which production, attainment and application of *more* and *better* knowledge would be the aim of teaching, learning and research.

The second condition, *professional* (and *epistemological) minimalism',* however, arises out of the workings of a profession that does not produce much *new* knowledge in the course of its 'practice' although it employs and somewhat transforms existing knowledge, information, know-how and skills. It uses knowledge and information only as much (rather, as little) as necessary to perform the prescribed tasks, to fulfil the clients' briefs and to complete the 'jobs' within given budgets and by the given deadlines. It is almost totally pragmatic, selective and problem-oriented and is 'critical' only in a narrow sense specific to design activity.

Architectural education: falling between two stools

The educational discourse has been traditionally disinterested in examining its own knowledge base, hence notice its own conflicting features as are expressed in the duality just mentioned. Being a professional education, yet not being able, in a university context, to assert or admit openly its professional *training* aspects, or the epistemological minimalism of its professionalist frame of reference, architectural education tries to be *both* professional *and* academic:

- It strives to satisfy the requirements of a professional (and almost vocational) *training*, reproduces the professional worldview with its impatient interventionism and its goal- and client-directed service ethos, and accepts as legitimate the extra-academic processes of entering the profession,
- It tries to be (or to be seen to be) the main source of new, greater and more critical knowledge as expected of university disciplines.

The conflicts and inconsistencies therefore arise out of the co-existence of
i. the professional claims that its 'practice' is, 'in the end', the main arbiter of knowledge, skills and educational achievement as *it* defines them to be relevant to *its* purposes,
ii. the inability of the education to stand up to the professional definitions by asserting the specificity, relative universality and multiplicity of objects, objectives and purposes of knowledge beyond immediate utility.

A diversion: Doctorates: research and/or education?
Doctoral work in any discipline can be seen in at least two senses:
i. Doctoral work as *research,* and
ii. Doctoral work as *education.*

The two sub-definitions are obviously not mutually exclusive, yet, depending on the emphasis chosen, the structure and the output would differ. Seen primarily as research, an architectural / design doctorate would consist of research on/into these practices as well as their products, processes, agents, contexts or relations. Seen as education, a doctorate would still consist of research, but the educational function (i.e. that of the candidate) and educational content (i.e. the epistemological specificity and pedagogical implications) would be of significance. Similarly, the form or the medium in which these various types of doctoral work is conducted would be of varying significance.

On this background, doctoral work in architecture, design and urban planning cannot be assumed to be immune from the conflictual demands and inconsistent expectations from its process or end-results — and much of this, on incompatible assessment criteria. However, seen primarily as a form of research done first and foremost in educational contexts, doctoral work cannot but be a (higher) form of education with the objective of contributing to knowledge while educating the candidate. On the other hand, seen from a strictly *professionalist* point of view, doctorates in design and architecture could not be a viable form of activity that would be acceptable to *professional* arbitration or assessment. Yet, the denial of that form or level of work might imply both a denial of knowledge and a number of untenable assumptions regarding the origins of the knowledge taught in undergraduate education.

Concluding theses
While the established university traditions on this matter seem to present some initial problems for *designerly* approaches to knowledge, that tradition can however be enhanced by a form of creativity that design disciplines are best equipped to promote if only they could see their roles beyond mere training of professionals, and extend their responsibilities to cover knowledge, culture and society in a wider sense.

If PhD is seen as an academic (and not a professional) degree obtained by a course of research (hence, producing new knowledge), the questions of who or what should be awarded this (prestigious?) title would be unambiguous and straightforward. To distribute it to those who have not gone through the process of research education and without the demonstrable contribution to knowledge would only devalue its status for all concerned. In the long run, such a development would neither benefit those who go through the conventional processes nor those who might obtain the degree without doing so. Therefore, the questions as to whether and how doctoral programmes can be improved or expanded should be *internal* to education (which, incidentally, could do well with some doctoral level research on itself too!).

Accepted primarily as a high level 'research education', PhD should and could be both a means of expanding the knowledge base of design and planning practices, but can also be (and continue in many universities to be) a good way of training researchers and academics, and if they so wish, better educated practicing designers too. In Schools contexts, it could also be exploited better as a continuous source of fresh insights and critical knowledge as well as research skills for the undergraduate parts of courses.

It can therefore be suggested that doctoral work, developed in both style and substance, can continue to be the key means by which new knowledge, critical habits and educational advancement can be achieved in design, architecture and planning.

Notes

For an expansion of the concepts and observations presented above, some of my other writing can be referred to:

(1981): *Problems in Professional Education: Conflicts of Definitions, Objectives and Knowledge,* South Bank Architectural Papers, No.7, London, SBU.

(1987): 'From Theory to Discourse', in Protzen, J P (ed): *Planning and Design in Architecture*, New York, ASME, pp.71-74.

(1992): *Architectural Education —Issues in educational practice and policy*, London, Question Press.

(1993): 'Learning housing designing', in M Bulos and N Teymur (eds), *Housing: design, research, education,* Aldershot, Avebury, pp.19-23.

(1996): A Hardy and N Teymur (eds), *Architectural History and the Studio,* (in press).

Generating Design Concepts

Méthodologies de la Conception et Connaissance de la Conception

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Résumé
La recherche en matière de conception peut-elle viser directement l'aide méthodologique en faisant l'économie d'une tentative de compréhension de l'activité mentale autant que concrète de la conception ? Il est en effet frappant de constater que la plupart des travaux s'attachant à produire des "méthodologies" sont fondés sur des logiques, algorithmes ou raisonnements qui, d'un point de vue épistémologique autant que pragmatique, semblent en contradiction avec l'activité même de conception. Ainsi, par exemple, de méthodologies fondées sur des mises en situation de raisonnements déductifs alors que le concepteur semble mettre en oeuvre des raisonnements inductifs, plausibles, rusés, etc... Ceci invite à privilégier une interrogation sur la nature même des démarches de modélisation pouvant appréhender la conception plutôt qu'à privilégier une évaluation ex-post de la validité de tels ou tels modèles. Ceci est d'autant plus essentiel pour l'idée de doctorat que, de notre point de vue, il s'agit, dans un doctorat, de former à une intelligence des problèmes plus qu'à s'attacher à transmettre tel ou tel savoir et, a fortiori, à transmettre telle ou telle méthodologie ou méthode de conception.

Les supports méthodologiques et instrumentaux d'aide à la conception véhiculent, implicitement ou explicitement, une certaine représentation de la conception. Certes, comme a pu le dire Paul Valery, la méthode est un *"système d'opérations extériorisables qui fasse mieux que l'esprit le travail de l'esprit"*. Mais cette extériorité ou, pour reprendre une idée répandue, l'objective neutralité des opérations de la méthode en regard du sujet qui conçoit n'est qu'apparente. L'idée de méthode ne peut pas être dissociée d'une compréhension ou d'une représentation des opérations que l'esprit met en jeu lorsqu'il conçoit. C'est alors, comme le souligne Edgard Morin, "*cette intervention du sujet qui donne au terme de méthode son rôle indispensable*"[1]. Comment, alors, dans le domaine de la conception, penser cette intrication entre méthode et sujet pour le renouvellement des méthodes à ce moment particulièrement crucial qu'est la formation à la recherche?

Trois réductions fréquentes de l'idée de méthode
L'allocation spatiale initiée dans les années 60 et, aujourd'hui, la composition morphologique ou, plus généralement, la composition d'entités architectoniques sont à la base de nombreuses instrumentations méthodologiques. Leur intérêt indiscutable tient, en premier lieu, à leur compatibilité avec les logiques et procédures compositionnelles de traitements de symbole (l'informatique) qui orientent ou sous-tendent la quasi totalité des efforts méthodologiques actuels. Elles s'accordent, en second lieu, aux moments empiriquement importants du processus de conception (avant-projet détaillé, re-conception en phase chantier, rendu, etc.), à certaines situations particulières de concep-

tion (comme la réhabilitation) ou à certaines tâches réputées essentielles pour le travail de conception (figuration graphique, représentation de scènes de perception, etc.).

Le terme de méthodologie s'accompagne pourtant d'une dégradation techniciste de l'idée de méthode[2]. Ainsi de la réduction fonctionnelle qui concentre le point de vue méthodologique sur ce qui relève, par exemple, du champ de l'usage, de l'économie ou de la construction. Ainsi, également, de cette réduction visuelle qui assimile la conception à un travail d'organisation de la perception. Ainsi, encore, de cette réduction plus globale qui assimile la conception à la composition : impliquant l'existence d'entités pré-définies ou plus exactement, l'articulation ou l'agencement d'entités séparées, la composition est en contradiction, à la fois, avec les parts d'émergence et d'élaboration de totalités qui caractérisent pourtant, toutes deux, le travail de conception.

Certes, d'aucuns diront, à bon droit d'ailleurs, que les systèmes de traitement de symbole sont ce qu'ils sont et que, s'ils ne permettent pas encore d'appréhender ces deux parts essentielles de la conception, les modèles existant témoignent de performances indiscutables et qu'en outre des modalités de "détournement" de tels modèles sont des voies possibles de recherche.

Néanmoins, au travers de l'idée de doctorat, l'enjeu est celui de la formation (à la recherche) avec ce que cela suppose de formation, dans une vigilance scientifique autant qu'épistémologique, à une capacité à appréhender, expliciter voire résoudre une question dans sa complexité. Dès lors que l'on peut identifier les insuffisances de l'existant en termes de limites opératoires sous l'égide de limites scientifiques et épistémologiques, l'effort de formation à la recherche ne doit-il pas, alors, s'exercer sur la capacité à renouveler ces apports scientifiques et épistémologiques. Autrement dit, s'exercer en regard de ce qui apparaît crucial pour la conception plutôt que de se concentrer sur l'évaluation ou d'éventuels renouvellements des dispositifs instrumentaux existant ? En bref, l'accent ne doit-il pas être mis autant, sinon plus, sur la capacité à rendre intelligible les opérations, procédures et capacités cognitives à l'oeuvre dans la conception (en vue de générer de nouvelles pistes d'instrumentation) plutôt que de se centrer sur l'évaluation critique ou l'optimisation de méthodologies insatisfaisantes en regard de la conception même si elles sont performantes par ailleurs ?

Cet effort supposerait que soient mises en question les trois déterminations implicites que l'on vient d'introduire : la représentation de la conception comme travail de composition, la représentation de l'activité intellectuelle en termes de logique formelle et l'implicite du point de vue monovalent.

Deux métaphores

H. A. Simon avait utilisé la métaphore de la fourmi pour énoncer l'hypothèse selon laquelle l'apparente complexité du comportement humain est, pour une large part, le reflet de la complexité de l'environnement dans lequel il vit :

"*Elle (la fourmi) sait à peu près où se situe son trou, mais elle ne peut pas prévoir tous les obstacles qui l'en séparent. Elle doit constamment adapter sa route aux difficultés qu'elle rencontre et souvent contourner des barrières infranchissables. Ses horizons* *sont très proches, si bien qu'elle ne peut tenir compte d'un obstacle que lorsqu'elle se trouve devant. Elle fait alors des tentatives pour le gravir ou le contourner, sans se soucier beaucoup des obstacles futurs. Il est facile de la piéger et de l'astreindre à de lointains détours. Interprété comme une figure géométrique, l'itinéraire de la fourmi est irrégulier, complexe, difficile à décrire. Mais sa complexité est celle de la surface de la plage et non pas celle de la fourmi elle-même*"[3].

Cette métaphore conduit H. A. Simon à considérer l'être humain pensant comme un système adaptatif dont les buts définissent un interface entre ses environnements internes et externes ne révélant, comme pour la fourmi, que quelques rares propriétés de son environnement interne[4]. Qu'elle s'inscrive ou non dans l'hypothèse systémique, cette représentation est particulièrement riche et puissante pour appréhender l'organisation du travail et du processus de conception. Elle est explicitement ou implicitement au coeur de la plupart des travaux méthodologiques récents, qu'il s'agisse de l'aide à l'organisation de la communication entre plusieurs concepteurs ou de l'aide à l'organisation même du processus de conception en dialogue avec son environnement[5].

Elle fait cependant abstraction du fait qu'en architecture, à la différence peut-être de ce qui peut se passer pour la conception d'artefacts technologiques voire pour l'architecture navale, la part de cet "environnement interne" du concepteur est omniprésente : l'architecte n'est pas une fourmi ! Ses intentions et son identité de sujet "total" (biologique, historique, culturel, social etc.), pour reprendre l'expression de Marcel Mauss, sont au moins aussi essentielles que cette part de comportement exprimé en termes de système adaptatif.

Autrement dit, pour prendre une seconde métaphore animale toute aussi importante que celle de la fourmi, "ce qui distingue dès l'abord le plus mauvais architecte de l'abeille la plus experte, c'est qu'il construit la cellule dans sa tête avant de la construire dans la ruche"[6] Et, alors qu'avec la métaphore de la fourmi, H. A. Simon est amené à considérer que cette construction "dans la tête" ne met que rarement en scène les traits du sujet, nous prendrons cette métaphore de l'abeille et de l'architecte pour introduire précisément cette importance du sujet dans les constructions intellectuelles liées à la conception architecturale. Elles s'élaborent en effet, nous semble-t-il, autant en dialogue avec et *pour* l'architecte lui-même qu'en termes d'interface d'un système comportemental avec un environnement. L'on est face, ici, à ce que l'architecturologie a pu proposer d'appeler "l'espace de conception" de l'architecte, qui associe autant *ses* classes de représentation du monde qui l'environne et *ses* intentions propres que des opérations extériorisables à caractère à la fois intellectuel et iconique. Autrement dit, si une intelligibilité de la conception peut être atteinte en termes d'opérations intellectuelles et cognitives, celles-ci sont à inscrire dans leurs relations avec le sujet pensant en propre autant qu'en interaction avec un environnement. La question des opérations extériorisables, la question de la méthode, ne peut alors plus être posée en termes d'indépendance envers l'esprit du concepteur ("la" méthode) ou même en termes d'interface comme cela est le cas, par exemple, dans les problématiques d'ergonomie ou de dialogue "homme-machine". En ce qui concerne la conception architecturale, peut-on, en effet, modéliser la fourmi sans modéliser l'abeille?

Nous touchons ici à la fois aux opérations de l'esprit que Paul Valéry pouvait considérer comme centrales pour l'idée de Méthode et à la place essentielle du sujet à laquelle nous renvoyait Edgard Morin. Cela suppose une représentation complexe du travail de l'esprit lorsqu'il conçoit. En relation au problème de la méthode, cela suppose de quitter (momentanément) l'univers de l'évaluation des méthodologies pour pénétrer les arcanes des opérations, micro-processus et procédures par lesquelles et avec lesquelles un concepteur, inséré, certes, dans un environnement multiple et divers, est amené à faire émerger et se réaliser un objet. Comment expliciter (au mieux) les opérations cognitives et iconiques qu'il met en oeuvre ? Comment inscrire le sujet dans ces opérations ? Comment, dans ces opérations et micro-processus cognitifs autant qu'iconiques, s'inscrit (s'intègre et s'oppose) cette relation complexe à l'environnement ? Comment, enfin, dans cette tentative d'intelligibilité, éviter les pièges des trois réductions que l'on a précédemment avancé?

Expliciter la conception

Alors que ces questions sont au coeur de sa réflexion épistémologique, il est curieux de constater les multiples réticences, pour ne pas dire plus, envers les travaux architecturologiques. Ceux-ci, à l'origine, visaient à rendre intelligible certaines opérations de conception liées, notamment, à la mesure. On pourra volontiers admettre qu'un aspect inéluctable du travail de conception de l'architecte est de donner forme et mesure à l'espace. Une reconstruction de la notion d'échelle "point clef du métier" si l'on suit I. M. Pei, s'en est suivi.

Alors qu'elle est fréquemment appréhendée d'un point de vue phénoménologique et qu'elle désigne couramment le problème des rapports du petit au grand, l'architecturologie tente de préciser l'échelle comme un opérateur de complexité. Dans la conception architecturale, en effet, l'échelle n'est pas donnée (comme elle l'est lorsqu'on perçoit un édifice) mais est réfléchie et décidée par l'architecte. Ici, il décidera de concevoir un cube et décidera que ce cube aura 7m de côté (Le Corbusier pour une maison d'artisan par exemple). Là, il décidera, pour d'autres raisons, de concevoir aussi un cube mais décidera que ce cube aura 100m de côté (Otto von Spreckelsen pour la grande arche de La Défense, à Paris, par exemple). Cette opération, qui concerne autant la forme que les dimensions associées à cette forme, met simultanément en jeu les intentions de l'architecte, des choix formels et des décisions d'ordre de grandeur. Ce travail d'émergence conjointe de la forme et de la mesure -ce que l'architecturologie nomme embrayage- est d'abord un travail d'ordre intellectuel relatif à des entités "construites dans la tête" avant qu'elles ne le soient dans le bois, le métal ou le béton. Il associe trois opérations formellement distinctes mais nécessairement solidaires :

- Une opération qui revient à décider d'une ou de plusieurs *pertinence(s)* (des "points de vue") qui procèdent du concepteur considéré dans son environnement interne et externe. Ces pertinences peuvent ainsi être fonctionnelle, symbolique, socio-culturelle, économique, parcellaire, de voisinage, etc. Ainsi, par exemple, dans le cas de la conception du bâtiment de la Banque Nordique à Helsinki, Alvar Aalto a-t-il décidé de privilégier le voisinage (et d'articuler le faîtage aux bâtiments voisins) plutôt, par exemple, que de privilégier un point de vue symbolique, fonctionnel ou géométrique qui aurait pu le conduire à négliger, ou à contredire, cette relation de voisinage...

- Une opération qui revient à décider de ce sur quoi va porter le travail d'émergence de la forme et de sa mesure. Cette opération revient à découper le continuum logico-spatial sur lequel et dans lequel travaille l'architecte. Dans le cas précédent du bâtiment de A. Aalto, ce point de vue lié au voisinage porte sur le faîtage et non, par exemple, sur les percements. Autrement dit, l'architecte *découpe des entités qui serviront de support de mesure* en rapport avec la ou les pertinences choisies. Tout au long du processus de conception, ces entités seront virtuelles, lacunaires et labiles.

- Une opération qui revient à décider de la manière dont va être mesurée l'entité ainsi découpée. Cette mesure sera ainsi, par exemple, donnée par référenciation à une entité extérieure dotée d'un ordre de grandeur (associant forme et mesure) ou donnée par référenciation à une unité scalaire (dimensionnement). Le gabarit du bâtiment de la Banque Nordique est ainsi intimement lié à celui des bâtiment voisins du fait du choix de la pertinence de voisinage et du faîtage comme support de mesure. Au delà du gabarit en tant qu'ordre de grandeur, on notera que la forme même de la toiture est également esquissée.
  L'explicitation de ces trois opérations permet de proposer une lecture du travail de conception au travers d'un modèle relativement élémentaire fondé sur la reconstruction et la mise en oeuvre du couple de notions que sont l'échelle architecturologique d'une part (l'échelle ainsi reconstruite comme opérateur complexe de mesure) et le *modèle* d'autre part (considéré comme opérande de cet opérateur) : un modèle M est, dans la conception, mis à l'échelle par un opérateur E, qui lui confère une mesure. Au-delà d'une possibilité à entrer dans le détail de certaines opérations de conception[7]e modèle permet surtout de quitter l'univers de la seule composition formelle au profit d'une représentation de la conception comme mise en oeuvre complexe d'opérations élémentaires, elles mêmes complexes.

De la conception à la formation à la recherche
Comment, alors, mettre en oeuvre de cette modélisation élémentaire en vue d'une intelligibilité de la complexité procédurale de la conception ? A l'abeille, doit s'associer la fourmi ! Pour éviter les pièges d'une représentation formelle et monovalente de l'activité cognitive, ce problème doit être abordé au sein d'une épistémologie de la complexité. Ce n'est pas l'objet, ici, d'en faire un développement. Par contre, on doit insister sur le changement de perspective que cela peut offrir pour une formation doctorale.

L'idée de doctorat en architecture, comme pour tout doctorat, est en effet, avant tout, celle d'un projet de formation à la recherche. Il s'agit donc de former autant à une intelligence des problèmes que de s'attacher à transmettre tel ou tel savoir et, a fortiori, à transmettre telle ou telle méthodologie ou méthode de conception. D'un point de vue opérationnel, en effet, la question soulevée par la modélisation est sans doute celle de la validité des résultats d'un modèle par rapport à ce peut être testé, utilisé, validé ou infirmé dans le réel. D'un point de vue scientifique, par contre, et, donc, du point de vue de la formation à la recherche, la question est plutôt celle de la validité ou de la pertinence de la modélisation. Plutôt que de s'interroger sur la nature des méthodes à transmettre, on devrait donc plutôt s'interroger sur la nature des processus de modélisation auquel il convient de former. Ceci suppose une conscience théorique en rapport avec la complexité du problème qu'il s'agit d'explorer.

Cette question est d'autant plus essentielle pour l'idée de doctorats en architecture que la connaissance de la conception architecturale reste encore embryonnaire et, surtout, échappe pour une large part à certaines logiques et habitudes mentales de la connaissance scientifique classique. Dès lors, la relation aux outils méthodologiques qui bénéficient, eux, d'une longue histoire liée à cette connaissance scientifique, doit être considérée avec circonspection et deux axes de recherche solidaires devraient venir prioritairement s'adjoindre, sinon se substituer à l'orientation centrée sur l'approfondissement strictement méthodologique.

Le premier porte sur l'approfondissement de l'intelligibilité de la conception : les opérations de l'esprit mises en oeuvre dans la conception et leur organisation procédurale. Cela suppose de quitter la sempiternelle alternative entre des travaux centrés sur le sujet lui-même et des travaux relevant d'un projet de connaissance scientifique extérieure au sujet. Ceci revient à chercher à produire une connaissance que l'on qualifiera, à la suite de J. L. Le Moigne, de "connaissance projective"[8)]. Cela revient aussi à s'interroger sur les modalités et les assises, tant scientifiques qu'épistémologiques, du travail théorique auquel il convient de former dans un doctorat. Pourra-t-on, par ailleurs, se satisfaire de l'expression de "doctorat en architecture" dès lors que cette connaissance peut susciter des recompositions disciplinaires de l'intérieur même du champ?

Le second axe prolonge le premier sur le versant de la modélisation et, par là, de la "méthode". Quels renouvellements la connaissance précédente permet-elle ou accompagne-t-elle en matière de modélisation ? Ne faudrait-il pas qu'elle s'accompagne d'une conscience épistémologique autant que de moyens scientifiques nouveaux qui, comme nous y invite également J. L. Le Moigne, ne caractériserait plus l'idéal de la modélisation par une objectivité des modèles mais par "une capacité du modélisateur à expliciter ses "projets de modélisation"; c'est à dire les finalités qu'il propose au modèle d'un système complexe qu'il perçoit a priori finalisé et finalisant"[9)]. Ceci supposerait, à tout le moins, d'approfondir, *du point de vue de la conception*, le dialogue avec l'informaticien (quitte à ce que celui-ci s'empare de nouvelles questions) et non l'inverse. Est en effet en jeu, ce qui ne pourra pas ne pas satisfaire les chercheurs concernés par la conception, le passage "d'une ingéniérie informatique à une ingéniérie systémique : privilégier le projet sur l'objet, le problème sur le besoin, l'articulation des interactions sur la décomposition en classes"[10)].

Notes :

1. E. Morin, "Théorie et méthode", in *Art Press International*, nr 20.
2. ibid.
3. H. A. Simon, *Sciences de systèmes, sciences de l'artificiel*, Dunod, Paris, 1991, p55-56.
4. ibid, p. 57.
5. Cf, par exemple, J. Gero "Visual emergence in design collaboration", *Revue internationale de CFAO et d'infographie*, vol 8, nr 3, 1993, Ed Hermes ; R. *Prost, Conception architecturale, une investigation méthodologique*, L'Harmattan, Paris,

1992 ; M. Conan *Méthode pragmatique de conception architecturale*, Editions du Plan Construction, Paris, 1992.

6. K. Marx, Le Capital, Gallimard, La Pleiade, p. 728.
7. Ph. Boudon, Ph. Deshayes, F. Pousin, F. Schatz, *Enseigner la conception architecturale, cours d'architecturologie*, Ed de La Vilette, Paris, 1994.
8. J. L. Le Moigne, *La théorie du système général*, PUF, Paris, 3ème édition, 1990.
9. J. L. Le Moigne, *La modélisation des sytèmes complexes*, Paris, Dunod, 1990, p. 65.
10. J. A. Bartoli & J. L. Le Moigne, *Ingéniérie systémique, de la conception orientée objet à la conception orientée projet*, GRASCE, Université d'Aix-Marseille III, 1994.

Making Vision Visible: Design Thought and Design Process

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Abstract
As indicated by the subtitle, this paper is about design thought and design process. The process refers to the design methodology as taught at the faculty of Industrial Design Engineering of this university. First, it is argued that as a consequence of a methodological focus on the design process as a rational problem solving activity, too little attention is paid to design thought, the designer's 'vision'. Second, the concept of vision will be viewed from a broad perspective. The personal vision of a designer is shaped by the knowledge and views of the culture and praxis the designer belongs to. In turn, this personal vision can affect the vision at those higher orders of organization. Examples will be given of this passive and active processes of influence.

Vision in design

Stemming from the paradigm of technical rationality, in dominant design methodologies design is seen as a rational problem solving process (e.g., Dorst & Dijkhuis, 1995; Simon, 1969). These methodologies strictly focus on a logical analysis of the steps that should be taken in the design process. One of these methodologies, developed by Roozenburg and Eekels (1995), has structured the way design is educated at our faculty. In trying to make their method as rigorous as possible, Roozenburg and Eekels stress the importance of an analysis of the sub-problems and the development of a list of quantitative requirements. In the resulting design solution a synthesis of the sub-problems is realized. This synthesis is, however, not effected automatically; "synthesis is the least tangible of all phases of the cycle, because the enigmatic phenomenon of 'human creativity' plays the most important part" (Roozenburg & Eekels, 1995, p. 91). Although it is correct to stress the importance of this 'intangible' aspect of the design process, we will argue that it should be given priority in the first phases of the process. To that end we will introduce the concept of 'vision'.

In their focus on the problem solving activity, Roozenburg and Eekels "ignore problem *setting*, the process by which we define the decision to be made, the ends to be achieved, the means which may be chosen. In the real-world practice, problems do not present themselves to the practitioner as givens" (Schön, 1983, p. 40). As a consequence of this disregarding of the process of problem setting, students tend to gather information in an unstructured manner and develop new requirements without being able to give priorities to them (Christiaans, 1992). We, therefore, propose that more attention should be paid to the formulation of the problem and the setting of the design goal in the first phase of the process. Such a representation of the ends and means of a design process can be denoted as 'vision'.

A second limitation of Roozenburg and Eekels' model concerns the program of requirements. Whereas they argue that this program must be developed to objectively evaluate the provisional design solution, they dictate that it should contain qualitative

requirements as well. These subjective criteria, concerning for instance the perception or impression of a product, are however only added to select the 'best' solution. We believe these qualitative aspects of the design goal should control the total process of analysis and selection and therefore form the vital element of the problem setting process, i.e., the generation of a vision.
Thirdly, a proper formulation of the design problem will contribute to the essential elements of the design process: the synthesis. "When we set the problem, we select what we will treat as the 'things' of the situation, we set the boundaries of our attention to it, and we impose upon it a coherence which allows us to say what is wrong and in what directions the situation needs to be changed" (Schön, 1983, p.40). Treated in this way, vision can be considered as an integrating principle that gives direction to the design process and integrates all knowledge into a coherent design solution. It is a knowledge structure representation that "should be the primary aim of design education" (Christiaans, 1992, p. 147); a 'synthesis in thought'.
Vision can therefore be regarded as the end-product of a creative thought process in which available knowledge is structured in a meaningful way. It is a coherent and qualitative image of what a product should look like, how it must interact with users, what functions it must fulfil, etc. Although the development of a vision of a certain product is a personal achievement, parts of that vision, or the underlying knowledge structure, will be derived from the 'world' the designer lives in and is therefore shared by others. We will now have a closer look at this dimension of vision.

Levels of vision

Although it is the individual designer who gives shape to his personal vision by designing a particular product, he is always part of a larger system with whom he shares elements of his view. First, he is a member of a certain cultural system, a loosely connected network of individuals in a particular time that share common beliefs, interests, desires, knowledge, values, experiences, concerns, prosperity, etc. Those elements that are shared by many in a cultural system can be structured into a collective vision, a collective view of how products should function, how they must be perceived and experienced. Such a vision is often apparant in a trend or 'Zeitgeist'. This highly abstract view is shared by many people and is expressed in a variety of designed objects.
In being part of such a cultural system, each designer is, to a certain extent, affected by this collective vision. This influence can be direct, but can also be mediated by a sub-culture of which the designer is a member. This sub-culture we call a 'praxis', a formal or informal organization of individuals who share common principles of belief, knowledge, etc. at a less abstract level than the culture as a whole. Examples of a praxis are: a company, a design-agency, a design school, or just a group of designers who feel connected on the basis of such shared beliefs. The views of these sub-systems are often more specific and can only be applied to a limited number of products.
Finally, it is the individual designer who integrates the cultural and/or praxis vision with his own personal experiences, knowledge and belief into a personal vision. This is eventually the type of vision that will be applied to solve a particular design problem. For every new problem a new personal vision will be developed. When this personal vision is new and 'appropriate', it can furthermore affect the vision at the other levels

of organization. This process is visualized by the upward arrows in the model of Figure 1.

This broad view of vision implies that vision can be understood at different levels of organization. At each level the vision is based on knowledge and understanding and determines the way we organize the things surrounding us.

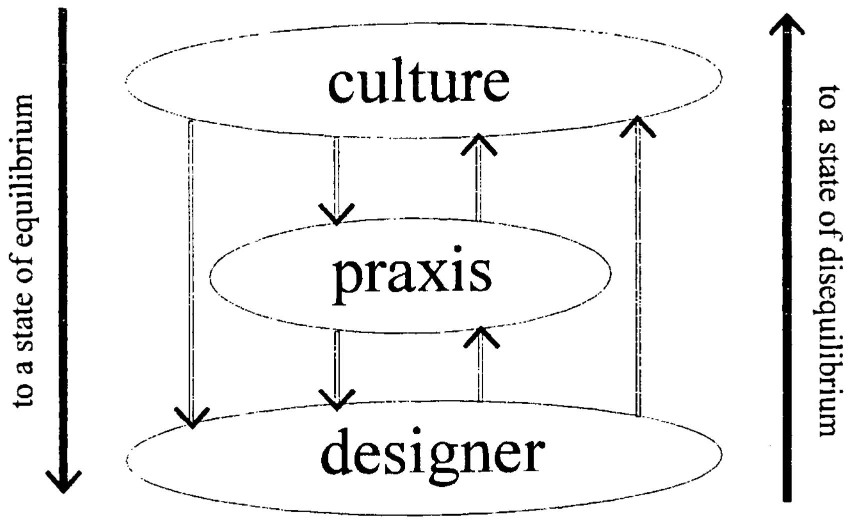

Figure 1: Levels of vision

A system's view

Our knowledge originates from all the information that has come to us and determines the way we organize this information to generate a 'perceptual whole', a Gestalt. This Gestalt is formed by the way we process, select, and interpret the available stream of information. This information is essentially of a subjective nature, but we can still distinguish three highly related aspects of it: (1) an absolute aspect, concerning the number of symbols and the degree of redundancy, (2) a semantic aspect, concerning the meaning, the way the information is interpreted within the framework of general agreement, and (3) a subjective aspect, that reflects the talent, personal experiences and opinions of the individual (Eigen and Winkler, 1989, p. 292). A human being, seen as an information processing system, can be represented by a model as shown in Figure 2. Absolute information is perceived, experienced and understood by relating it to semantic information (meaning, language, etc.). The processing of information can therefore be considered as a process of adaptation, an adaptation of semantic and absolute information on the basis of a subjective, personal view.

The reason for this theoretical account becomes clear when we link the notion of vision to this personal aspect of the human processing system. Vision can thus be regarded as the fundamental 'theory' from which all absolute 'facts' are explained, i.e., how we perceive and understand the world around us. This 'theory' comprises absolute knowledge, as well as all kinds of individual values and standards that could have been adopted from the culture or praxis the individual belongs to.

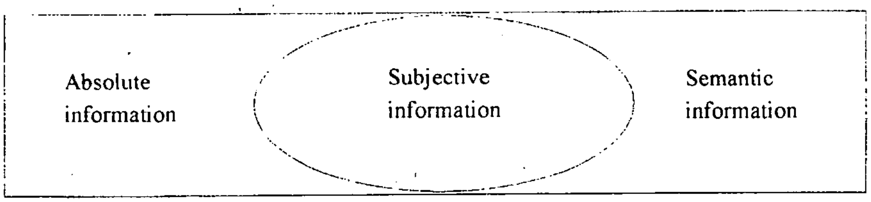

Figure 2: Human information processing (from Eigen & Winkler, 1989)

Now the three levels in the model can be described. In each culture, members share knowledge and meaning structures which determine a collective 'vision' towards the products surrounding them. This vision or world view is based on inter-subjectivity and tells us, in a general way, what products ought to be, what their functions are and how they must be perceived. In each culture, new products will therefore be understood on the basis of this shared vision. The same principle also holds for a praxis. Theories or views are formulated that are only valid within that praxis. This view is based on the agreements of opinion between each member of the praxis, whether it is founded on each individual's belief or imposed by a dominating force within the praxis (e.g., the director-general in a company). At the personal level, each individual (including each designer), consciously or unconsciously, applies his personal knowledge to develop a personal vision. This vision is, as a whole and in principle, not shared by others, but obviously reflects elements of the praxis and cultural vision to which the individual belongs.

The arrows in the model (Figure 1) signify processes of influence; the directions of the arrows indicate whether the process is passive or active (cf. Schön, 1983). A process of passive influence can, for instance, be understood in the following manner: a designer solves a design problem on the basis of common knowledge shared by other representatives of his praxis or culture. His vision is therefore not fundamentally different from the vision of those larger systems. In the design process available knowledge will determine his alternatives and choices. The image formation of this designer is affected by common ideas and concepts, and his attitude can be described as routine and directed toward an application of an established theory. This attitude does not lead to change, but rather to a preservation of existing values and knowledge.
A process of active influence, on the other hand, is characterized by involvement, a deliberate attempt to break the constraints of the common vision to develop a new and different one. This can only be achieved when the available knowledge is not

automatically applied. It is an active, intentional process that is enhanced by creativity, intuition and other 'subjective' thought processes. When this vision is not only new, but also appropriate - it appeals to changing needs of individuals or a society as a whole - it can be labeled creative and it can become the source of a process of change. A (radically) different view on things can elicit new knowledge, i.e., new ways to perceive or understand, and thereby alter the knowledge structure of a praxis and a culture. The vision at these higher order levels is then affected.

For an example, let us look at a praxis in the form of a company: Philips. The products Philips makes are based on a certain vision (or corporate identity), members of the company share a certain view of 'what good products are'. Designers from Philips can base their design processes on these ideas which leads to a further stabilization of the so called 'Philips style'. Moreover, the Philips' vision will be based, in part, on cultural knowledge. When passive influences are dominant, the praxis knowledge will remain stable. However, when cultural knowledge changes, e.g., due to changes within society or technology, a designer who acts in an active, involved way, will - again more or less conscious - pick up those changes and develop a personal vision that is radically different from the current vision because it is based on this 'new' knowledge. If he succeeds in translating this vision in a product, it will be perceived and interpreted in a different way by users; this product has a new identity and the interaction is understood with 'new' semantic knowledge. Think for example about the Philips-Alessi products; these products are based on a new attitude towards household appliances. These products have set a new standard and you do not need to be a clairvoyant to predict that in the near future this vision will affect the vision of the Philips praxis (more Philips products will be designed in this way) as well as the vision of the culture (other companies will design similar household appliances).
It can be concluded that active processes of influence are concerned with vision and change, whereas passive processes are characterized by 'theory' application and stagnation.

Vision today
Considering the proposed model of vision and the way it transfers within a cultural system, we will now briefly try to identify the prevalent visions in the world of design, architecture and culture in general. These visions can be conceived of as trends, views of products' goals and functions in the near future. We will describe two of these trends which are, to our opinion, reactions to the same problem observed in our materialistic society. Due to uncritical consumer behaviour, mass-consumption and over-production the environmental condition has almost reached its limits and resources are running out. "The result is that we live in a world overflowing with our own productions, a world in which objects besiege us, suffocate us, and very often distance us from another both physically and mentally" (Donà, 1988, cited in Bruinsma, 1995, p. 51). The first reaction to this problem is directed towards durability and sustainability of consumer goods. This solution is mainly based on an improvement of the physical or material object qualities. A second solution-direction can be characterized by changing the mental or social interaction with products. Most consumer goods are so alike and uninspired that they make us forget how to touch, feel, and think. In order to put a stop

to this worrisome tendency, we must return to 'humanize' these objects, to shape goods that are personal, friendly and really contribute to our well-being.
These two trends within the general cultural vision, and it is undoubtedly possible to discern more, are 'translated' by representatives of various sub-cultures into visions that characterize their praxis. To name just a few examples from the design world: The latest 'Doors of perception' conference was devoted to the question "How can information technology help us to *de*-materialize products and slow down our consumption?", "the design-association "Frog-design" works on the principle that 'form follows emotion', another cooperation called "Eternally yours" bases its designs on the idea of 'immortality', to device products that remain or even become more valuable in the course of their life-time, and Philips recently launched its new company slogan 'Let's make things better'. All of these approaches and principles are derived from the same general view to the world, i.e. the cultural vision.
Finally, individual designers are the ones who interpret the vision of the culture or praxis into a personal vision and materialize this vision into a new product. Typical examples of such products are: Philip Starck's TV encased in pressed wood waste, the paper lounge chair by Frank Gehry, the Renault Twingo and Alessi's home appliances designed for Philips. These single products do reflect the cultural vision, but in a way that is very specific for the designer. The products require a new way of looking at things and can therefore contribute to new knowledge. The near future will tell us whether one of these products does 'fit' that nicely to the needs of society that the personal vision of the designer is taken over by a praxis and maybe even by the culture as a whole. When this so happens, the vision of the system will be adjusted.

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Visual Communication in Architectural Design

Is seeing believing?

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Abstract

Photography, film, television and digital media are characterized as vehicles of architectural transmission and evaluated for their discreet and collective contribution to the evolution of architectural conception.

The relation of technological innovation to conventions of space articulation will be considered with eye toward historic developments in architectural design.

The author suggests that the line in architecture between the "real thing" and "representation" is more ambiguous now than ever with everday assumptions conditioned by the simultaneous abbreviation and expansion of time and space by photographic, electronic and digital technologies.

The author concludes that architectural representation is experiencing a fundamental shift in definition and function, and that the continued refinement of image-producing media with its increasingly sophisticated use by non-architects will have a significant effect on the nature of architectural conception.

Introduction

There is a lot of discussion these days about the relationship of architecture to technologies of communication (or, should I say, technologies of *transportation*.) More specifically, a great deal of discussion is generated around the technologies of image production, with the loudest noise at present coming from overoxygenated enthusiasts of the *virtually* real.

My interest in this discussion stems from a consideration of the genealogy of images; the largely unattended relationship between the kind of images we consume and the ways we construe the world. I am interested in the interrelationship of the mediums of the image world and their constituent technologies which, embedded with ideological strands, both formal and functional alter our conceptions, restructure our interests and change the things we think about. I am interested in the flow between visual field and virtual environment.

We live in an era characterized by the production and consumption of images. It is, in fact, safe to say that we prefer images to the real. Reality has always been understood in terms of images despite the best efforts of philosophers from Plato through Descartes to disabuse us of our attachment to these compromising apparitions. But while reality was once understood in the form of images, it is characteristic of the modern condition that we now understand reality *to be* image. This understanding, this perceptual relativity has been fueled by the evolution of representational media (starting for us in the West with the development of Renaissance perspective) and granted intense authority in this century by the image-making capacities of the camera and the computer. For all but the most ascetic of us, the narrative and compositional expectations we bring to our most unself-conscious activities (real and imaginative) are schooled to varying degrees by the images delivered to us through films, television, videos and computers; images described in the idiom particular to a medium which is predisposed to reveal the aspects, details and appearances it loves the most.

It is in architecture, the most *polysensual* and complex of mans investigations of the world and himself that the dominion of images encounters its most productive challenges. Architecture, for practical as well as expressive reasons can never be reduced to an art of pure appearances, completely detached from its other capacities and obligations. Architecture is about activity, expansion, inside/outside. It presupposes dimensional surroundings. The immobile acquirer of the snapshot image is only one of architectures charges. However, we now see that the activity, the expansiveness which architecture must invite, is taking on new meaning as electronic images make their way instantly and ubiquitiously in our lives and in the world. Architecture is in the midst of profound transformation, a process of irreversible modification whos agents are the images produced by photograhic, electronic and digital media.

I approach this subject not with the predictive aspiration of a theorist but rather the investigative instincts of the visual anthropologist.
It is a midst the following themes I will locate the objectives of my inquiry:

1. the diffuse effects on architectural conception of automated systems of representation (perspective, photography, cinematography, CADD and VR).
2. the ecology (descriptive, not prescriptive) of images in the symboic environment: preferences of dominant tastes or style.
3. the conditioning of visual awareness and habits of seeing by the technologies of the image world and the establishment of cultural forms, eg: realism, surrealism, hyper reality.
4. the correspondence (if any) between awarenesses obtained via the agency of the camera, the computer and our sensual intake of the world.
5. the force and predisposition of the media in question, and an account of the specifics of each medium toward identifying the appropriate method of study.
6. the architectural response to the reification of hyper reality.
7. a critique of representational practices and shifts in the uses of imagery.

Many avenues of thought can be followed in facing the issue of architecture and the technologies of the image world. The one that seems most pertinent is that touching upon the relationship between perception and representation. An account of the evolution of architectural images is also an exposition of prevailing and routinely polarized styles of thinking which characterize cultural life in general, especially the dialectic of certain *uncertainty* and the perennial compulsion toward absolutes.

There is no question that our repertoire of images, our visual lexicon has been altered by the influence on perception and memory of photography, video and digital logic circuitry. There is little agreement however about the ways in which our unmediated physical relationship, our sensual, encounter with the world, is further known through these images or to what extent these images have recalibrated the a priori encounter. As devices for understanding architecture, its meaning as well as its functional intent, images, that is physical signs, manufactured symbols of external communication as opposed to retinal or mental images, owe their power to the value we place on compression and isolation of raw visual data for legibility. "*...to comprehend with a single glance...*" writes Claude Levi-Strauss [Levi-Strauss, 1962] of the descriptive power of images. Images "*compensate in renunciation of sensible dimensions by the acquisition of intelligible dimensions.*" To make an analogue of the thing means that "*the thing itself can be taken hold of, weighed in the hand, comprehended with a single glance.*" [Levi-Strauss, 1962] It is the order imposed by a visual editor, the distillation through authorship which makes images so compelling.

Perceptual psychology reminds us that buildings, like images, are obtained incrementally (however unconscious we are of this) through the assembly of a synoptic mental picture. Even when on-site, touching and traversing the building, we never apprehend the "objective" shape, whole or otherwise. We assemble, piece by perspectivally distorted piece, the whole. Of course, the changes in the sequence of the images we experience on-site are orderly and coherent because we are in the building, but it is still a *synthesized* whole we consume. [Arnheim, 1974].

This is important to remember in our increasingly *aspatial* eletronic world where space and location have less and less functional meaning. Keeping a firm grip on the enduring physical gratification and sensual nuance of the haptic, acoustic and sinesthetic features of the architectural experience, there is also little point in confining our definitions of architecture to the physically confirmable and even more reason to look carefully at our assumptions about the images we use.

Media

Mc Luhan's famous aphorism "the message is the medium" is as irritating today as it was thirty years ago as much because of its partial validity as its misattribution. On the one hand it seems clear that representational mediums, far from mere bearers of expression determine our demands upon reality and are themselves "coveted substitutes for first-hand experience" [Sontag, 1977]. Architecture is created in media, represented by media and, quite naturally, conditioned by the media in which it is conceived, through which it is developed. But it seems equally obvious that any medium whether a pencil or digital logic circuitry is essentially contentless. Mediums are all about *process,* not substance.

The following glance at the world of technical apparitions initiates (without benefit of a unifying analytical method at the moment) my inspection of media images and their impact, whether amplificatory or obscurant, on our relationship to architecture.

Photography

One of the great promises and appeals of the modern camera since its appearance in 1834 has been the possibility of an unmediated relation between the real and its image. Photographs captured in a way that painting could not images which were accepted as another manifestation of the physical thing. There are however objective discrepancies between the way that the camera and the human eye focus and judge perspective. Far from an absence of distortion, the camera shapes and construes the the visual data it records and it is we who have become habituated to these peculiarly photographic distortions. [Sontag, 1977] Photography fosteres habits of seeing which are cool, dissociative, acquisitive. This is the perspective confered by distance. The motion, speed and perceptual relativity which found expression in photography, corresponded with the new apprehension of form, light and time described by contemporary physicists. Photography simultaneously closed and opened further the enigmatic distance between the *real*, its projection and our apprehension of it.

Photography was confirmed as an invaluable architectural tool (at least for archival, documentary purposes) in 1851 with the pictorial census of France's architectural population ordered by the Commission on Historical Monuments. E. Viollet-le-Duc (1814-79) considered photographs indispensible in the restoration of ancient buildings. Process verbaux irrefusables" he called them. Throughout this century photographs have been the primary vehicle of transmitting prototypes of modern architecture around the world.

The determined application of photography as an investigative design medium had its most interesting and profoundly influential flowering at the Dessau Bauhaus particularly in the hands of Lazlo Moholy-Nagy (1895-1946). His far-ranging media experiments sought to fix the essential dimensions of architectural experience on film and advanced the understanding of light, texture time and space in architectural representation. With the 1929 publication of his book *Malerei, Fotografie, Film; von Material zu Architektur* (subsequently published in English in 1947) a new vocabulary entered the architectural lexicon: simultenaity, multiplicity, penetration, serendipity, the *framed* view.

Cinematography

The essential correspondences between film and architecture as temporal, immersive and *becomming* were immediately apparent to Le Corbusier (1887-1965) who saw in film the perfect medium for conveying "le promenade architectural." In 1929 he collaborated with Pierre Chenal on a film called *L'Architecture d'aujourd'hui*, in which he moved from his villas of the 1920's to his plans of the city.

For architect-cum-film maker Sergei Eisenstein (1898-1948), film became more that a system of conveyance, of representation; it was an ideal analogue of the architectural experience, a way for the architect to express his intentions to the perambulator (the spectator) with explicit timing. For Eisenstein architecture was merely a "*potential film*" the physical participation with architecture easily substituted for by visual, psychological and autonomic responsiveness toward film. Eisensteins unfinished manuscript for *Montage and Architecture* (circa 1930) exhalts the "path" of the immobile film spectator following the spatial revelations, the architectural unveiling in perfect unison with the architect/director.

The filmic analogy has had a powerful influence on architectural conception throughout this century. Contemporary exponents of the cinematic in architecture include Bernhard Tschumi who's seminal Parc de la Villette in Paris is organized as a series of "cinegrams," discreet architectural units or scenes which, plotted along a path superimposed on a grid, reveal themselves as a precise set of architectural, spatial or programatic transformations. The language of film technique: montage, superimposition, distortion, fragmentation and so forth has become embedded in the language of architecture.

Television

After the lightbulb, television reigns as the most significant transforming medium in the education of vision and direction of taste (architectural and otherwise). It is the most successful purveyor of images man has yet created. The television has literal and symbolic correspondences to architecture, functioning both as a window and wall, as mirror and figure; scrambling the 'unassailable' architectural concepts of interior and exterior, isolation and sociability. The volume and the nature of image consumption, and the consequences of spectatorship twice removed from the source can only be pointed at here as primary contributors to the alteration the defining conditions of modern architecture. Assuming a revived relevance today are the efforts in the 60's of two adventuresome architectural firms: Archigram in Britain and Superstudio in Italy which were forged as culture labs hell-bent on reconcilling the definition of modern architecture with the electronic transformation of society.

Video

Video is, at present, one of the most important carriers of audio-visual information. Its dual nature as photographic and electronic make it a unique transformative medium. Because sound and picture are recorded and played back synchronously, video registers reality with more authenticity and immediacy than other mediums. It, in tandem with the computer, provides the merging of production and reproduction technology, thus a dramatic expansion of image-making capabilities.

Video fufills, in Walter Benjamins words, "*the legitimate demand that the individual today has to his own representation*" [Benjamin, 1974].
It is in its popular applications video contributes to the subversion or inversion of conventional architectural notions such as the private and public realms. While projects like Tschumi's Glass Video Gallery in Groningen/The Netherlands (1992) provide elegant dramatizations of the permutations of self-reflexive t.v/video experience, it is the pervasive consumption of low-brow video kitsch which has the potential to exert itself in lasting and profound ways on architectural design and conceptualization. To give one example, the phenomenal popularity of Nintendo, virtual play environment for a generation of children, may well be the source of changed relationships with and expectations of 'real' architectural space for the next generation.

Computer
This perhaps unexpectedly seductive picture medium is the product of a grid of abstraction conceived, ironically, to *overcome* images, that is, rationalism the Cartesian struggle for certitude in knowledge through a mathemetical reconstruction of the visual domain. With the modern computer we have the potential to fulfill Descartes dream of the complete mathematization of everything, and nesting in the same house an image maker capable of producing complex and compelling visual environments.

Computers are making our notion of light as a prerequisite for generating imagery obsolete. The boundaries between forms and their physical requirements are blurring. From the first awkward steps represented by "Sketchpad" (the first public demonstration of "interactive" computer graphics in 1960 by Ivan Sutherland at MIT) to "VROOM" a walk-in simulator which allows corroborating body sensations corresponding to the camera's path, presented at SIGGRAPH '94 (Special Interest Group on Computer Graphics) by the Electronic Visualization Laboratory of the University of Illinois at Chicago, computer image-making capabilities have expanded in range and potential with dramatic, cumulative power. The visual vocabulary being created is unique and problematic. For instance: what is the correspondence between the predictive capacity of the digital logic circuitry, Boolean algebra and the hyper reality of the images being created? And what about the involvement of creative *non*architects; artists, scientists, and the entertainment industry, in the development of an architecture of the digital age? Their groundbreaking if uneven work is a reminder that the professional architect has not always been the sole custodian of architectural evolution. Just as the architectural profession has ceded control of much of the building process to other disciplines, architects now are in the position of seeing other fields amass superior expertise in 3-d visualization technologies. "Electrotecture" as it has been dubbed emerges in the abstract geometry of super-computed models of chaotic systems, the full-screen worlds of industrial light and magic, the battlefields of the video arcade and the new three-dimensional communities of the net.

Mediarchitecture
As architects we must traffic in both illusion and reality. It is necessary that we discern the difference so that we may treat each adequately and confuse them advantageously [Akin,1982].

Digital technologies like the other image-producing mediums of this century, are challenging the traditional understanding of function, form and space in architecture. The basic, defining elements of spatial articulation are becomming metaphors for an invisible architecture. The potential for electronic media to promote sensual alienation, blanketing us with simulacra and diverting energy from the less glamorous architectural issues of shelter and civility is a part of the electronic future. There is a clear danger of an uncritical expansion of new media amplifying instead of assuaging the soullessness of so much of our built environment, oblivious to location and individual character. However, the possibilities for new incarnations of architectural conception through the synapses of digital logic are tantalizing. It is the fourth dimensional insousiance of new media that makes it so important, so rich.

Architecture is a sensitive point, a point of fusion in which new ideas in science and arts cross and influenced one another. Architects bear the same responsibility for making science as well as art visible. Paul Virillio refers, in his stimulating book *The Vision Machine*, to the architect as needing to become*"an artist of the interface between spaces, a man who can change levels of reality."* [Paul Virillio, 1994].

Finally, let me add a personal note. To the extent that computer theory replaces and is confused with design theory, it is misplaced. We are not Turings men, and human intelligence is not transferrable! Concepts spring from the mind not the machine. To quote Joseph Brownowski again: *"It has become fashionable especially among computer people to talk about problem solving as if this were the content of science. This is not the place to worry about how scientists should defend themselves from this impoverished attitude to their own imaginative work, but it is certainly the place to say that it is a very impoverished way of looking at one's own life. Neither art or science consists of just solving problems."* [Bronowski, 1978]

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Architecture of Instruction and Pleasure

A socio-historical and conceptual analysis of structure and change in the 'didaxis' of World Exhibitions during the 150 years of their existence

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Since it is impossible to give you a complete idea of even the main conclusions of my research project in only fifteen minutes, I have chosen to focus on three aspects. In the first part of my lecture I will tell you something about the researchmethod I develloped for this study, in the second part I will try to give you an impression of my findings by showing you a part of one of my case-studies, and I will end by making some remarks of a more or less conclusive nature.

On research

The crucial thesis of my dissertation is that World Exhibitions, seen from a socio-historical viewpoint, must first and foremost be understood as a didactical aparatus of a temporal nature meant for instructing the people in western societies about the utility and pleasure of the emerging modern economy and society which will be more industrial- (or nowadays information) and global-orientated and less craft- and local-orientated. Without exception the exhibitions do so by using the latest insight and techniques about education, and using the most updated media to make sure their exhibition will attract, delight, and instruct as many people as possible. The architecture and the spatial layout of the site have always played a keyrole in this process of instruction, so that one can speak of the emerging and development of a 'didactical architecture' of a temporal nature which is typical for exhibitions.

Although the subject of my researchproject is of a historical nature, this isn't an ordinary historical study. Ordinary history consists of the description of facts, plans and events in their chronological sequence; this nondiscriminative method will, however, never clarify the specific nature of any phenomena or in this case of the exhibitions and their architecture. Only when one stops describing and starts analyzing exhibitions as phenomena with their own characteristics, structure and change, in their respective socio-historical context, one will start to recognize and understand their instructional nature and their historical development. To find out if the exhibitions are indeed primarily of a didactical nature I analyzed them by interpreting them through a conceptual framework, lent from the communicationstudies, consisting of the following concepts: organization, ideology, 'didaxis' - including architecture, and public. By using the concept of organization instead of organizers I was able not only to give all the keyfigures their share in the authorship of the respective exhibitions, but also to reconstruct the process and logic of change and development which each exhibition went through from her initial planningstage till the day she opened her gates for the public, and even further till she was tored down. By ideology I mean to emphasis the fact that most organizers of exhibitions were not driven by a few lose messages or ideas but by a coherent and always reformistic view of a new human society. I coined the term 'didaxis' to express the fact that although the organizers of the nineteenth century exhibitions were convinced of the instructional nature of the exhibitions they didn't yet posess the scientific body of knowledge or theory to understand and reflect on them as a process of eductation where methods and means were tuned in to the learning-abilities of specific segments of the public. So with this study I have tried to reconstruct something they were aware of, but ultimately did not understand or master; in that way it is an anachronisme. Another reason why I prefered this new term above for example 'exhibitiondidactics', was that it doesn't connotate that exhibiting was the only means of instruction. Didaxis is the whole of means, techniques and methods which were used by the organizers to attract, educate and delight the public: from exhibiting, demonstration and lecturing till multi-medial shows.

The analytical character of my study is further heightened by not telling the history of exhibitons by describing them all during their 150 years of existence but, through periodization of its history with respect to their didactical form in five episodes, by the analysis of the the five most typical or innovative expositon exemplary for each of these periods. So, I selected the exhibitions of 1851, 1867, 1900, 1939, and 1970. By doing this, I am able to describe at the same time the didactical characteristics of each exhibition or period in the light of its socio-historical context, as the main developments the concept went through by putting up these exemplary expositions or episodes to each other. Lastly, to avoid anachronistic conclusions I used for my research only primary sources like documents, drawings and pictures from archives.

A case: the first World Exhibition ever

Now, I will try to give you an idea of the nature and importance of my study by taking one of the exhibitions I studied as a case. By analyzing the original plan made for the first World Exhibion ever held - the Great Exhibition of 1851 - I will show that this must be understood as an example of a 'didactical architecture' of a temporary nature, which effectively represents the national importance of the occasion. Spatial distribution of the program and routing of the visitors, construction and materialization, style and the iconographic program of decorations are all contributing at the education of the public by the exhibits. Next I will show how the original plan transformed in quite a different building as was foreseen, yet still basicly a didactical architecture, as a consequence of the typical problems of organizing and realizing a temporary worldwide exhibition .

It is common knowledge that the committee which the organizers had charged with the building of an adequate housing of the exhibition - the so called 'Building committee' - started its operations with an international competition. Less well known is that it in fact consisted of two competitions - one for architects for the architectural design of the exhibitionbuilding, followed by one for contractors in order to obtain the cheepest way of constructing the building. Moreover the first one was just a competition for ideas: the Building committee itself would make the ultimate design based on the most useful ideas from this competition. The winners of the first architectural competition were the French architect Hector Horeau and the Irish architects father and son Turner, both with wintergarden-like designs. Nevertheless the official design, made afterwards by the Building committee, had strange enough little resemblance with a wintergarden; it looked more like a mix of a museum and a railway-station. The design reflects litterally the professional tensions within the Building committee between architects and engineers. Still it would be an optimal exhibitionbuilding: its floor-plan and interior would be ideal for displaying; its construction would be economical, suited for exhibiting and of a temporal nature; and its appearance would be so monumental that it would fit the national importance of the occasion.

The major objective of the 1851 exhibition was to stimulate the industry of the world - with emphasis on the British of course - by spreading the newest insight on production-technology and productinnovation and surveying new international trade-opportunities outside the homemarkets. The exhibition-makers sought to obtain these goals by exhibiting a collection of specimens, of the cheepest, best and most innovative products of the industry from each country on the globe, at one place so that manufacturers, tradesmen, scientists and artists from all over the world could study there the state of the art on their respective field. The main educational method was the comparative study - obtaining more and new insight by comparising the specimens of daily production within one trade - aided by descriptive labels, cataloguetexts and drawings, verbal explanation by attendants and occasionally - espacially with machinery - by life demonstration of its working. For this comparative study it wasn't enough to exhibit each specimen with optimal visibility in mind as to facilitate their study, but it was absolutely necessary to discriminate and order them spatially by trade in classes, so they could be compared directly. So the specimens were to be installed on flat counters for best visibility, whereby each class of products was grouped together on as many running meter counter as was necessary, and they were clearly spatially separated from the next classes. By ordering these classes further in four grand sections the organizers were able to add to the collection an ideological dimension: by showing them in four groups according to the productionprocess - raw material and produce, tools and machines, industrial products, and art applied to industry - they added information about the economical, technical and practical use of each specimen and the trade they represented. To be sure the visitors wouldnot miss a thing and see them in this ideological perspective they prescribed an oneway routing through these classes and sections according to this productionprocess. As a result the spatial layout of the exhibits and the routing of the visitors through this exhibition would make the interior of the building an explanatory scheme and a narrative which would help the visitors to understand the practical and economical utility of the exhibited items.

Yet, as one of the architects put it, this explanatory tableau and narrative routing was not only meant to facilitate the understanding of the exhibits with respect to their technological and economical use, but also to enable the visitors to memorize these objects and the lessons they embodied better. This remark implies a clear reference to the tradition of classical rethorics and didactics: the art of memory. For the Greeks it was a way of memorizing a narration or argumentation spatially and visually by distributing the separate elements of the story in the form of dramatic visual symbols in the right order in a building the speaker is familiar with. When he subsequently walks in his mind through this building the speaker will recognize the elements of the story by the symbols and be able to tell it in the right order without forgetting a thing. In the renaissance philosophers used the same method to understand and memorize visually all the knowledge and the laws that order the cosmos by picturing these by means of symbols in a circular or semi-circular building or so-called theatre. To be short, the exhibition-building of 1851 was in fact such a 'theatre of memory'. Just like in these theaters one could oversee from the center of the building a tableau of universal knowledge embodied in classes of specimens installed on gently sloping floors around the student,. marked visualy and dramatically by symbols or so-called trophies, and the whole ordered by a cosmological law; in this case the laws of production as the fundaments of an economical and technical cosmos.

Naturally this oneway routing through the building served not only a didactical function but also more practical ones. In this case it should also guarantee the safety of the studying visitors, by preventing congestions, and offering, in case of an emergency everybody a direct exit out of the building at the end of each corridor, in stead of the four entrances, which remained thereby accessible for assistance. The same ambivalence caracterized the choise of an iron shedconstruction in a brick envellope of stone walls. The open iron column-construction in stead of a closed system of walls enables the light to illuminate all the specimens optimally, gives the visitor the crucial overview over the tableau and the accompanying index of trophees, and guaranteed a certain flexibility in regard to the running meters of counterspace for each class according to the number of exhibitor that would join the exhibition. On the other hand it was a type of construction much used in the railway-buildingpractice: it was cheep, could be fast build, and easily teared down and reused elsewere. And lastly an iron collumn constructionsysteem in a stone envellope was the most fireproof construction system they knew.

This constructionsystem however satisfied also the desire of the designers for monumentality and representativity. One regarded iron not as a material fitted for architectural use; primarily because it had no mass, so it couldn't direct a play of light and shadow or plasticity and monumentality which characterizes real 'stone-architecture'. The engineers knew from their railroadpractice how to solve this problem by wrapping the utilitarian shedconstruction in a stone envellope which the architect could give then the necessary representativity. So, in my view the building is concepted from the perspective of its interior as a theatre of memory or a museum and from a constructional-representational viewpoint as a railwaystation. Of course even this representative envellope was not free from didactical intentions: especially the monumental piece de resistance of the building - the circular entrance hall crowned by the worlds largest iron dome - was also meant as a specimen of the superior capabilities of British engineering. In this way this circus is perhaps the most ambivalent part of the building: as viewpoint over the cosmological tableau and its trophees it resembles the circus of the theatre of memory, as sculpture court it reminds of the museum, as turn-table for the transporation by rail of the specimens to their destignated places its railwaylike, as central observatorium for the surveillance by police it remembers of the panoptical institutions and prisons.

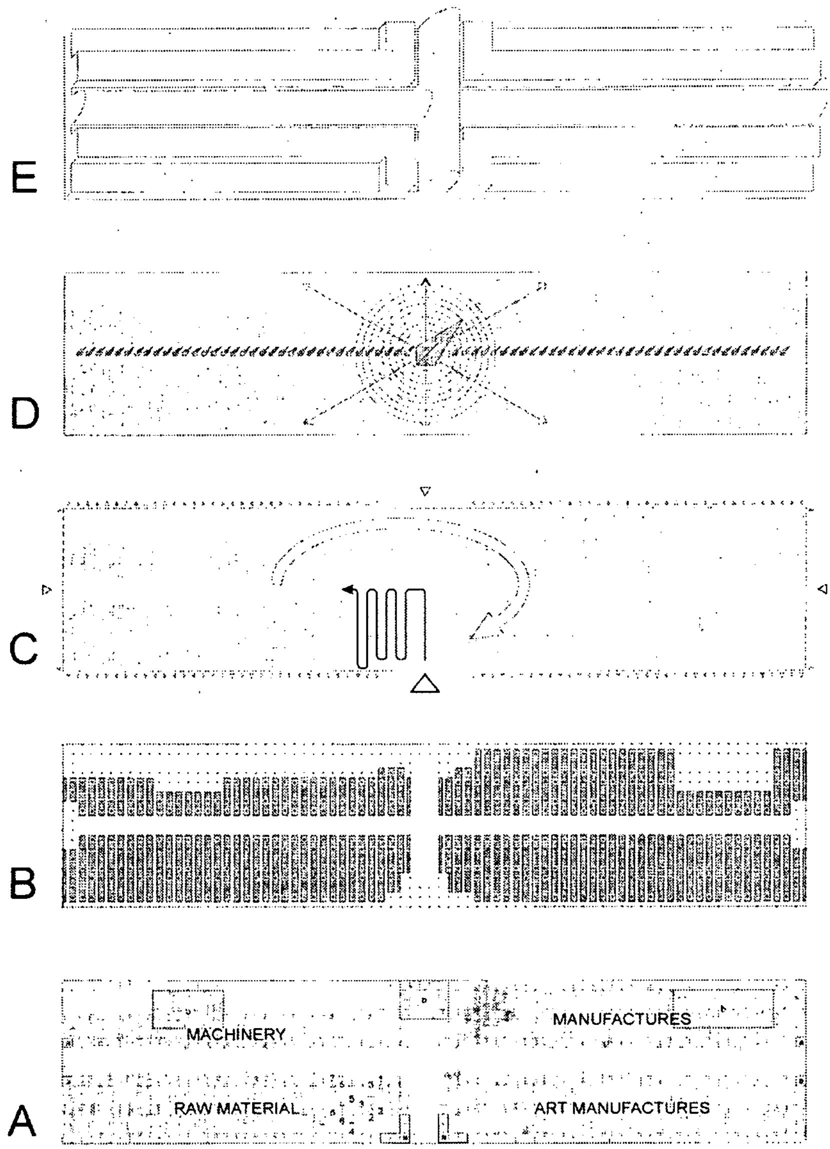

Figure 1: Analysis of the 'spatial didaxis' of the original plan of the Building Committee:
A. a clear spatial distribution of the exhibits in a classification according to the production-process; B. exposure of the exhibits on flat counters; C. prescribed oneway routing through the exhibition according to the productionproces; D. the spatial transparency garantees the visitors an overview over the tableau, while the index of trophees in the nave makes it possible to 'read' the classification like an index to the exhibition; E. the spatial articulation of the building akin to a gothic cathedral.
(a. Ticketboxes, policestations and offices; b. refreshmentcourts)

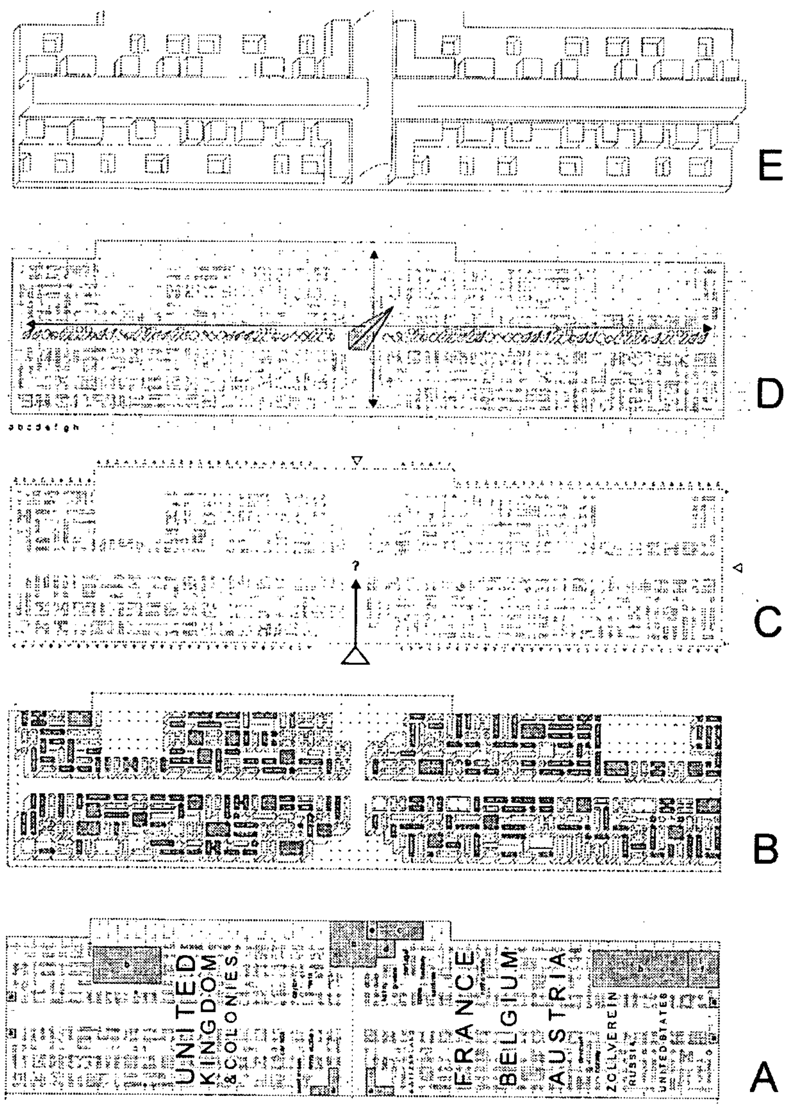

Figure 2: Analysis of the 'spatial didaxis' of the Crystal Palace:
A. a rather confusing spatial distribution: partly according to the productionproces, but basicly according to geography whereby the transept functions as equador and both ends of the building as poles; B. exposure of the exhibits in courts and galeries; C. without any directions about routing most visitors strolled first along transept and naves before they lost themselves in the labyrinth of courts and galleries; D. because the visitor couldnot get any overview and the trophees didnot function as an index to the exhibition at all the exhibitionmakers introduced a geographical system of latitudes and altitudes to help the visitors finding their way through the exhibition; E. with the introduction of extra galleries and lightcourts the building lost much of his resemblance to the gothic cathedral.
(a. Ticketboxes, policestations and offices; b. refreshmentcourts; c. dinnerroom for exhibitors; d. lecturerooms; e. Queen Victoria's boudoir; f. constructor's workshop)

However, when this project was published it arroused such a storm of public outrage and protest that it nearly wrecked the undertaking all together. The people found it monstruous and were suspicious it wouldn't be a temporal building at all, in which case Hyde Park would be spoiled for ever. Even within the organization and the Building committee itself there was much scepticism towards their own design. One especially distrusted the possibility to erect such a huge building in due time for the opening of the exhibition. Even if they managed to lay the more than one million bricks in the six months that remained till the opening, than still it would take months before the damp of the mortar would have been disappeared, and the exhibits could be installed without the danger of deterioration of its quality by fungus, molds, etcetera.

Officially it was Jospeph Paxton himself who came to a rescue with his proposal for a building entirely constructed of prefabricated iron columns and girders filled in with plates of glass - a mamoth version of the celebrated wintergardens he already had build in Chatsworth. More likely is that it were the sceptics within the organization who, knowing his work realised that this could be build in due time, asked him to enter into the second competition for contracting the official design of the Building Committee. In other words Paxton's input was never more than a new constructionsystem placed on the already existing groundplan of the Building committee. Something which is clearly confirmed by the fact that Paxton's famous scetsch only consists of two sections showing the constructionsystem and no plan at all. Eventually Paxton's constructionsystem was adopted by the Building committee because it promised to be ready in due time thanks to standardization and prefabrication of the constructional members, and the mechanization of the production of the parts and the assemblage on site - dutch contemporaries coined it 'stoombouw' or 'steambuilding'.

But Paxton's plan meant also a serie of new problems: it was more expensive, the wintergarden was climatological hardly suitable for exhibiting - the light would be to bright for exhibiting and it would be to hot to study - and most important the ironconstruction was not representative enough for the importance of the occasion. The climatologically problems were solved by replacing the glass in the lower part of the facade for wooden panels with therein iron lammella's whom could be centrally regulated in order to ventilate the building and lowering the temperature considerably. Subsequently they proposed a double roof-construction by covering the glass roof and upper parts of the glass facade on the outside with calicocloth. By doing this they did not only lowered the temperatuur but dimmed also the light. As a result the glasshouse now looked more like a wooden barrack, roofed with a huge tent; a manoeuvre which most certainly did not contribute to the solution of the representational problems.

Therefore one tried to give the wintergarden a more monumental character for which they referred to religious architecture. Rather conventional at first by giving the wintergarden a cathedral-like spatial order of arched cruciform passages with lower naves besides, completely with stained-glass windows on the upper level and huge organs on balconies above the entrances. A reference which was enhanced by detailing the collumns and pannels according to the gothic style. This however was more or less in line with contemporary conviction in circles of avantgarde-architects; if there ever was to be an iron-architecture than it would be for religious buildings while her slender characteristics may make her unfit for classical architecture - without mass plasticity is impossibel - it made her most suitable for gothic architecture. Iron made it possible to improve the traditional ephemerical and ascending qualities of this architectural order; to make the sublime gothic, which would give space and ceremonies a more metaphysical atmosphere as ever before.

Of a more radical character was the idea to make architecture out of iron and glass and stressing the religious ardour of the whole just by painting the structure in a highly symbolical scheme of primary colours: red, blue and yellow or gold. It was based on a scientific colour-theory and a history of style as a history of religious architecture. The theory teached that by painting the hollow parts of the collums and girders in another colour as the plain surfaces one got at least some plasticity even in this slender material. The proportion of the pigments in these colours was carefully calculated so that the whole gave the onfalling light a more white appearance by which the qualities and colours of the exhibits showed better off. The same blend made that the constructive elments in the depth of the perspective views along nave and transept tended to disappear in a bright blur; it heigthened the sensation of a infinite and ephemeral building. History told us that the birth of a new architectural order was synonym with the rise of a new metaphysics or religion. Always it meant the use of new materials, new esthetics and of course new colours. According to history rising cultures used always primary colours while perishing ones prefered secondary colours. In the opinion of the architect of the exhibitionbuilding the growth of Industry marked the origin of such a new belief and so a new architectural style should come into existence. So, what would be more suitable than making a monument for Industry out of industrial materials like iron and glass, assemble it in a industrial way, and paint it in the proud selfconcious primary colours of a energetic and victorious young culture ? In this way the glasshouse, annex theatre of memory and tent of calico was made fit for the occasion by transforming her in a monumental architecture with strong religious undertones. This resemblance to cathedrals gave the rational didaxis of the exhibition the rethorical persuasion of religious revelation.

For the architects this would have been the ideal exhibitionbuilding, but dificulties with the exhibiting countries and industrialists over the arrangement of their exhibits forced them to alter their design beyond this ideal. The exhibitors were against the originally foreseen cosmopolitan order of the exhibits because the easy comparison this made possible, would by nature not be profitable for the majority of them; only one could be best. Besides, most governments wanted to use the exhibition to stimulate the export of their native industry and pleaded for a concentrated coherent presentation of their performances. This meant an arrangement of the exhibition according to place in stead of trade. In the end the organizers of the exhibition gave in and ordered the exhibition according to geographical situation in stead of the productionproces. The transept became the equador and the ends of the naves poles; one half of the building became occupied with British goods - with the colonial ones along the equador - and the other half to foreign products - with again the most southern ones along the transept. A visit to the exhibition became a trip around the world. This sensation was heightened by the introduction of a geographical system of latitudes and longitudes, painted on the heads of the columns, to help the visitor to find its way through this map of the world.

Most important was, however, that the goods were no longer showed in the ideological perspective of economical and technical utililty by ordering them according to the production process but now became symbols of national prestige and cultural unicity by displaying them according to nation.

Allmost accidently this interpretation was stressed by another development. When the goods already arrived it became appearant there would never be enough floor- and wallspace to install them all. So the builders were forced to add an extra gallery and to exhibit the biggest weatherproof products outside the building itself. To increase wall-space they had to replace the glassfacade along the groudfloor of the building for wooden panels, and in stead of laying out everything on flat counters they were forced to erect wooden partitions which destroyed the spatial transparancy of the building. But these partitions together with the lightcourts, created by the introduction of the second gallery and their connections, gave the architects new creative opportunities. Possibly inspired by the new geographical or cultural arrangement of the exhibiton they transformed the transparent soap-bubblelike theatre of memory filled with flat counters in a closed landscape of museumlike chambers and galleries, which were decorated according to the local culture as to strengthen as a scenery the etnographic unicity of the products exhibits within it. In a way this habitat-presentation transformed the exhibitionbuilding now in an etnographic museum for economically inspired etnography.

So in the end the Crystal Palace was far more than just the birthplace of the functional æsthetics of the engineers or of Modernism as Siegfried Giedeon wants us to believe, it was at least as much a monument of contemporary romantical architectural thinking: a didactical architecture which uses symbolism as well as more rational means to convince the visitor of the ideas it embodies. She was a strange blend of engineering constructions like railwaystations, the creations of practioners like the hothouses and tents - primarily referred to for speeding up the buildingprocess, ánd didactical architectural precedents like the theatre of memory - to memorize and understand more easily the exhibited lessons, religious architecture - to give these lessons the persuasive power of a revelation, and the etnographic musem - to help explain the cultural or national aspects of these lessons. So the result wasn't the ephemerical translucent soap-bubble of glass architectural-historians wants us to believe, but a blown-up glasshouse with the closed appearance of a wooden barack roofed with a calicotent, bestowed with a monumentality derived of religious architecture, pervaded with traces of the symbolism and cognitive order of a memorytheatre, filled in with a labyrinthical interior of habitat-courts and -galleries similar to an etnographic museum.

Some remarks of a more or less conclusive nature

It will be clear that a fictional visitor of the 1851 exhibition who would come to a contemporary Expo would find so little similarity that he probably wouldn't recognize it as a legacy of Crystal Palace. In stead of a museumlike place where technological and commercial information and knowledge of private industrialists is visualized and spread, it has nowadays become a funpark-like environment were primarily countries try to give the public an image of their culture and society in which economical and technological aspects are only of secondary importance. They understand their public no longer as working human beings, but as consumers of goods, information and signs or images. The core of the didaxis is no longer the authentic material 'mute' specimen but, in stead of the real, an immaterial multi-medial fictionalized realitylook-a-like. The architecture of the exhibition is no longer based on precedents from the world of museums, cathedrals, palaces, and memorytheatres, but from the realm of the cinema, the theatre and the themepark.

By finishing my lecture with this brief comparison of the differences of the 1851-exhibition with contemporary ones, I hope to underline the value of my study and the research method I develloped. Of course the main objective of my study is the analysis of how society conceptually understood an exhibition in the succesive stadia of her historical development, and of how architects develloped a typical 'exhibition-architecture' with a didactical nature. By doing this I hope my study will also be of help to architects and planners of future exhibitions to understand what a World Exhibition should be in the current socio-historical context. Beyond this my study is also a plea for a new kind of architectural history as a kind of conceptual or analytical study of the historical development of architectural or urban questions. Herein architecture will be pictured as the synthesis of personal craftmanship, the disciplinary state of the art in architecture, planning and construction ánd the social requirements it has to fullfil; all within the limits of a specific socio-historical context. Such kind of studies could help architects by teaching them the history of the problems they have to solve, to comprehend their nature fully, and thereupon to understand thanks to this new analytical and historical insight truly what this question means today, in stead of making up amusing but nonsensical programmatic phantasies about it as if the architect is just a dilettante or an entertainer.

Design Theory and Methodology

The New Output of Traditional Design Methods

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Abstract
"How does the designer think and what is the result of this process?"
Contemporary designer thinks in the same way his predecessor from the 15th century did. He chooses, evaluates and chooses again. Contrary to the opinions existing in the theory of designing, it is not a linear process. Different means are used in creation process. They function on various levels, not always positioned on one plane, nor on one axis. Designer's thinking is characterised by simultaneous consideration of many contrary opinions. As we deal with 3-D imaging, we need some graphic means of presentation to show the full potential of this process. In a traditional designing process both drawings (2 and 3-D) and models are used to present the space. Static is their characteristic feature. This stands in opposition with the dynamic character of the designing activities. That is why the architects have been looking for means allowing to change the way of presentation of architectural form.
Computers have changed the production of presentation drawings in architectural offices, but they have not had much impact on architectural design. Fortunately nowadays it is possible to get fast animations with no need to use special software. In my opinion there is no doubt that computers in general, and CAAD in particular, will change the practice of architecture. Is it all right? What should adapt to what? Architectural designing to CAAD, as the producers of hardware and software want, or on the contrary, as the architects would like to see it? Maybe the cyberspace gives us a chance to answer this question.

Designing is a creative action aiming at solving the problem. It includes various activities. It is connected with the question: "How does the designer think and what is the result of this process?"
In the architectural creation process there has always been an inclination to improve the methods of designing in the way of "objectivization" of designing process. Objectivization which would explain why we do design in this way and not the other. In spite of the trend to the total objectivization (Vitruvius, Alberti, Palladio), the results appeared to be still subjective, i.e. they included methods of designing typical of the one and only one architect.
It is in agreement with description of designing by T. Kotarbinski. "One who designs IMAGINES ONESELF this or that; THINKS (not affirms) it to be this and that, and then he thinks again it to be in a different way; MOTIVATES, that if it is done in this way, it would be so and so, and if in that way - differently again; EVALUATES, if in such and such a case it would be right or wrong, and in what a way, to what a degree, and in what a case it would be better; (and) finally CHOOSES, that is decides to act in this, not in a different way to succeed in one's object"(Kotarbinski, 1986).

Contemporary designer thinks in the same way his predecessor from the 15th century did. He chooses, evaluates and chooses again. Usually designing was considered as a linear process, with one stage after the other.
If we assume designing to be a process, we can treat it as an iteration procedure. Iteration designing considers a designer and a user to be the main partners in a game. (Asanowicz A.,1995) As an example I would like to quote here my student's answer to the question"How were you designing your house?"

Stage I	- creation of a program and defining the way for the home to function, determining the importance of particular elements (a fireplace, a table in the dining-room, kitchen ...).
Stage II	- the stage of consultation with my wife (a very difficult stage).
Stage III	- introduction of corrections after consultation.
Stage ...	- stage II and III was repeated several times
Stage X	- my wife is given the project to design.
Stage XI	- the stage of consultation my wife - me.
Stage XII	- the project is taken back from my wife.
Stage XIII	- the project is made without wife's help.
Stage XIV	- the stage of confirmations and decisions - wife's signature acquired.
Stage XV	- statement: the project is good but it could have been better.
Stage XVI	- see stage I.

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Stage C - project drawing.

Generally the morphology of the design process can be presented as follows (E.V. Krick,1969)

The design process

Existence of the problem to solve

Shaping of the problem
Analysis of the problem
Searching for solutions
Decision

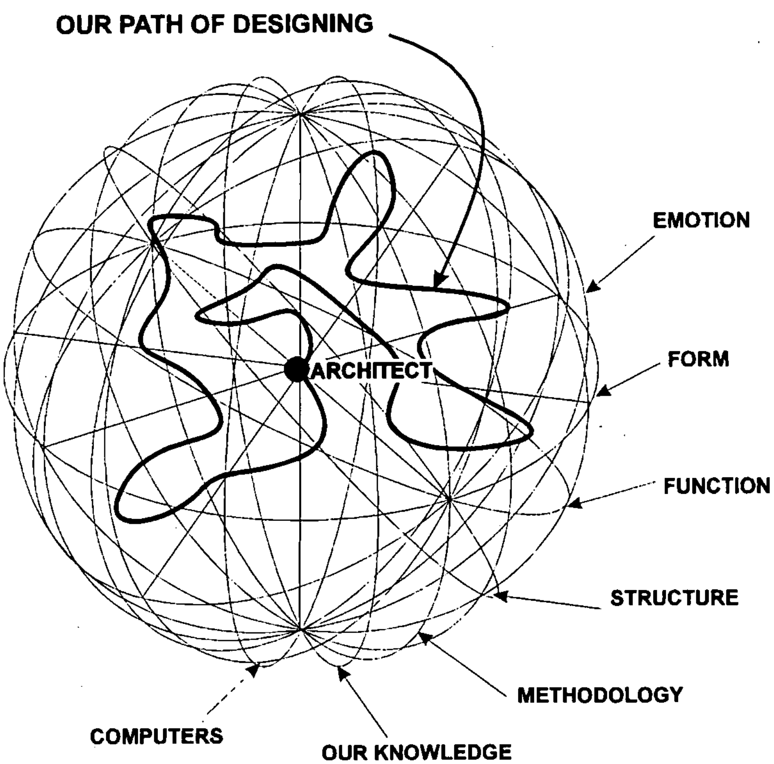
Technical documentation
Detailing drawings, calculations,
description, model

In this traditional designing process traditional means of presentation are being used. 2D drawings - projections, intersections; 3D drawings - axonometries and perspectives; models are made. CAD programmes (Computer Aided Design, according to the optimists, or Computer Aided Drafting, according to the pessimists) did not change the situation. Suffice is to mention "Progressive Architecture", 1993, where under the common title "Autodesk for Architect" subsequent stages of designing in the context of Autodesk software are discussed.

Concept
It is possible to get project off to an efficient start by taking an sketching package, or techniques such as scanning or digitising to bring paper drawing into an electronic format.
Design studies
Once the parameters of a project are determined, it is possible to begin creating drawings in both 2D and 3D, allowing architects to explore a border range of design solutions at an early stage of the process.
Design co-ordination
Once the initial design sketches and studies have been done, the design professional begins to generate hard information about the nature of the project. At this point, it is often necessary to work with other disciplines.
Presentation
At this point in the project, the design is precise enough so that the architect can create rendered 3D models that give the client a sense of what the finishing building will look like. (Progressive Architecture,1993)
As we can see there is no difference between the old and new way of designing. Suggestion made by the software companies is limited only to the replacement of a pencil, drawing pen and a brush with a computer mouse and programmes imitating (emulating) the pencil, drawing pen and the brush. It is not enough to talk about the changes in the designing process. We can only talk about the changes of tools in designing, and not the changes in the methodology of designing.

As in traditional designing process drawings and models are used to present the space. Static is their characteristic feature. This stands in opposition with the dynamic character of the designing activities. That is why the architects have been looking for means allowing to change the way of presentation of architectural form. One of these methods was the endoscopy as a medium for the exploration and representation of architecture and space. However it only enables the perception of the final project. A model must be built first and this is the major drawback of this method. Application of computer technique has eliminated such a disadvantage, though not completely. Dynamic presentation of architecture - computer animation or virtual reality - demands also the project to be in its final stage. Another question is the special software necessary to this kind of presentation. Computers have changed the production of presentation drawings in architectural offices, but they have not had much impact on architectural design.
What is its cause? It seems that one should not look for its cause in the discrepancies between the designing tools and the designing process, but rather in the inadequacy of the theory of designing to designing as such.
Contrary to the opinions existing in the theory of designing, designing is not a linear process. Different means are used in creation process. They function on various levels not always positioned on one plane, nor on one axis.(Asanowicz, 1993)
Designer's thinking is characterised by simultaneous consideration of many contrary opinion.

"... every human being is simultaneously a poet and an engineer (...). Only step by step do we learn to understand what we lose trying every day to be ONLY and EXCLUSIVELY "sensible", ONLY "scientific", ONLY "logical", ONLY "reasonable", ONLY "practical", ONLY "responsible"". (Maslow, 1962)
Contrary to the opinions existing in the theory of designing, designing is not a PROCESS. It is an ACTION in which the sequence of particular functional components is of no crucial importance. The creation activity is MULTIPLANAR. Not only are the values of separate variables related within their own limits but also between the particular variables. The scheme of this system can be presented as follows:



The statement above explains, why we are not satisfied with the introduction of computer techniques in designing. New media demand new process, and the new process demands new media. On the other hand, in my opinion there is no doubt that computers will change the practice of architecture. CYBERSPACE is a chance for the change. (Anders, 1994)

Cyberspace is a graphic representation of data abstracted from the banks of every computer in the human system. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. In fact, the many dimensions of meaning and "existence" in cyberspace have led to a cyberreal architecture that is sure to have dramatic consequences for the profession Although cyberspace will never replace traditional architectural work, the electronic realm opens huge territory for architectural expertise at a time when conventional career paths are hard to find.

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A Virtual Office Support System for Concurrent Design in Architecture

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Abstract
The proposed study will develop a tool to assist in accommodating the growing needs in contemporary architectural practice for the integration of multiple technologies and points of view in building design, a phenomenon parallel to the advent of concurrent design in other engineering professions. Two case studies will be undertaken. These case studies will result in the creation of a model of contemporary building design decision making as it is presently distributed between the architect, the client, and the other consultants and parties to the project. In particular, the relative position of the architect in concurrent architectural design will be examined. The research draws from (1) dialogical modeling (2), argumentation theory (3), the paradigm of parallel and distributed processing computer architectures, and (4) scheduling techniques to model the transmission of messages between agents in the design process, and the ways in which the messages, and their organization, are used to communicate and distribute design decisions, design knowledge, and task scheduling in order to further the design process.

Based on this model, a Virtual Office Support System for Concurrent Design in Architecture will be developed. This support system will assist the various agents in the design process to integrate the results of each other's design decisions, and to monitor and distribute information and tasks in a more efficient and effective manner. The support system will be designed to be of particular value in moving information from the agent generating it to agents requiring it in a prompt manner. The support system will be developed to the level of computational theory.

Introduction

Traditionally, architects were able to design buildings entirely within their office, seeking the assistance of other agents on only a few discrete issues, and this very often informally[1)]. Such agents worked within a specific domain of building design and a specific layer of the building fabric. The tasks of these agents were discrete and relatively independent of both the architects' task and the tasks of other agents. Thus there was a relatively small amount of information to pass between the other agents and the architect, and very little effort was required to integrate the work of these agents into the architectural design. Today, this is no longer the case. Even ordinary buildings require increasingly diverse teams of architects, engineers, quantity surveyors, client representatives, public authorities, legal experts, artists, environmental impact assessors, users, and other specialized consultants. In the Almelo library project by Mecanoo Architekten, one of the cases used in this project, 15 distinct agents took part in the design. Thus, instead of a practice of design in which architects were essentially the sole authors of a design, architects now find themselves practicing as members of increasingly large multi-profession design teams. These agents are often tied to each other through contractual or sub-contractual relationships. Thus the consultation and interaction between agents in the building design process has become increasingly formalized. In addition, many levels of approvals are required during the design and construction process. These approvals often require extensive alterations to the design, and several episodes of consultation. Thus the contemporary building design team consists of agents who interact throughout the design and construction of the project.[2] The design activities of the agents are no longer confined to specific layers or zones within the building, but interact with other elements in such a way that each agent is dependent on the decisions and knowledge of the other agents.

As a result of these changes, a new form of architectural practice is evolving. Similar conditions have developed in other engineering fields such as aeronautical engineering and product design. Here a body of research and techniques have been developed under the name of concurrent engineering, or concurrent design. As yet, this form of practice has no name in architecture, nor has there been much research exploring it. The proposed study will explore the phenomenon of concurrent design in architecture and develop a Virtual Office Support System for Concurrent Design in Architecture.

Problem Definition

As mentioned above, the nature of architectural practice has been undergoing a series of rapid changes. These changes necessitate a rapidly increasing degree of communication between a wider variety of design agents. The integration and coordination of design decisions and a knowledge generated by this team of designers is becoming a much larger portion of the architect's task. It is also becoming the greatest source of problems, inefficiency and error, both in the design process, and later, in the design product.

At the same time, there is an increasing pressure from the development industry and institutional clients to shorten the design and construction processes. This has created the need both to overlap design and construction, fast-tracking, and to compress the design process itself. Thus the members of the design team are placed in a position where they must carry out their design work simultaneously rather than in successive steps. Each design agent must proceed based on anticipations of the results of the decisions of the other agents; considerable effort must therefore be devoted to the integration of the decisions of the various agents.

These new demands, of complexity and speed, require the development of new forms and techniques for information management, integration and coordination, as well as advanced tools for scheduling and managing the design process. There is, therefore, a great need for research into design tools, both cognitive and computational, that will assist the architect to deal with these new challenges.

Contribution
There are a number of distinct qualities of the architectural process that make it sufficiently unlike mechanical, electrical, aeronautical, or product engineering that the results of investigations into concurrent design in these fields cannot be directly applied to architectural theory, methodology or practice. Chief among these differences is the wide range of belief systems held by the participants in architectural design. In addition to architects and engineers, architectural design increasingly requires the active participation of the client, government representatives, artists, community representatives, environmental impact assessors, and others. The wide range of participants, and of belief systems maintained by the participants creates a condition where the desires, norms, and even the facts held to be clearly self-evident by individual participants may well be considered to be irrelevant, questionable, incoherent, or even false by other participants. In addition participants may have widely divergent notions of what constitutes a successful project. The communication and integration of these various points of view is therefore one of the most significant problems facing the architect in the coming years.

While there is a considerable amount of research in concurrent design in several engineering disciplines, there remains a need to investigate how concurrent engineering procedures can benefit architects. This project will attempt to fill in this gap, and show how the concept of concurrent engineering is applicable to architectural practice.

In addition the research will produce a new more sophisticated model of the communication between experts in architectural design that can encompass both the wide variety of belief systems held by agents and the variety of modes of communication and group design decision making (both synchronous and asynchronous). In addition, and as an advance over other models of expert group design decision making, the new model will describe the decision making process as it occurs in parallel, as a result of the independent activities of the agents, rather than as a result of the agents working together.

Concurrent Design in Architecture

Concurrent Design
As mentioned above, several other engineering professions have encountered the twin challenges of complexity in the design team, and the contraction of the time allowed for design. The response of these professions to these challenges has been to develop a set of practices known as concurrent engineering. Concurrent engineering is the process whereby a design project is carried out 1) in multi-agent teams and 2) in parallel. Concurrent design differs from the conventional picture of architectural design in both these aspects. Taking these two aspects in turn:

1) Concurrent Design is (i) a multi-agent process, where the agents are independent consultants or firms possessing differing belief systems and (ii) a process in which the agents are not gathered together "under one roof", but are distributed in different offices, often in different cities, and belonging to different firms or organizations. All agents are seen to be essential participants throughout the design process,

rather than simply consultants who have expertise in a local problem, which can be solved independently of the rest of the design task. Thus the design is the result of a heterogeneous group decision making process.

2) Concurrent Design is a parallel rather than a sequential design process. In the conventional notion of design, specific local tasks are delegated to consultants. The architect then waits for the results of the consultant's work, before resuming work on those aspects of his own design task which will be influenced by the consultant's results. In concurrent design, the various agents proceed with their tasks in parallel, without waiting for their colleagues to complete their relevant design work.

Thus concurrent design requires 1) effective communication and integration of divergent design beliefs and belief systems, and 2) effective techniques for scheduling and managing the flow of tasks and information between the agents in the design teams.

Parallel processes require a great deal of coordination, integration and anticipation of the design decisions made by the various agents on the team. Concurrent design therefore creates the need for essentially novel approaches in methodology. The distribution of design decision making, relevant design knowledge, and resources creates a distinct design environment and a need for expressing design reasoning in a more explicit and complex manner. The multi-agent aspect of concurrent design requires us to employ a dialogical reasoning model in order to properly describe the conflict and resolution of differing beliefs and belief systems.

Despite the fact that the various agents possess differing belief systems, collectively they possess the design world of the project.[3)] This design world contains the sum total of information describing the design task, the knowledge required to achieve the task (constraints, performance criteria, disciplinary knowledge, etc.), the knowledge available to achieve the task, and any scheme(s) representing partial solutions to the task. At any moment the design world is in a particular state. Any change in the knowledge of any agent, or in the current scheme(s) constitutes a change of state of the design world. In order to commence work on a sub-task, an agent must have access to a description of the state of the design world. In conventional approaches to design methodology, it is assumed that the agent(s) in the design process have access to the entire design world. In concurrent design, however, the state of the design world will change during the course of completing any sub-task, so 'errors' will necessarily be introduced into the process, and will require an integration process to eliminate.

Thus in concurrent design we can no longer afford to assume that there is no difficulty in distributing and integrating the knowledge and design results between the different stages of the design process. With a single designer or a single design office we can normally assume that any questions concerning previous decisions or knowledge not immediately available can be quickly resolved, the entire design world is easily accessible at all times. In concurrent design the distribution of the design task in space, and the compression of the task in time creates a condition in which it is difficult to know all the recent changes made by the other design agents.

Comparative Case Studies

A comparative study of two cases will used as a heuristic device for creating a model of contemporary building design decision making. The cases will permit the examination of specific instances of concurrancy in contemporary practice. The comparative study will also entail a diagnosis of the two cases to identify where delays and accelerations of the design process have occurred and the causes of these. From this we will be able to develop criteria of adequacy for the support system proposed below.

The case studies will follow G. Easton's' Seven Step Method.[4]This method follows a progression of logical steps in order to analyze a case:

i) understanding the situation,
ii) diagnosing problem areas,
iii) generating alternative solutions,
iv) predicting outcomes,
v) evaluating alternatives,
vi) rounding out the analysis,
vii) communicating the results.

This method, originally derived from legal and management studies, concentrates on the diagnostic aspect of case studies. However, the diagnosis of problems identified in nominally successful cases may lead to the identification of systematic limitations and inefficiencies in the general practice of the profession investigation.

The two cases have been selected in order that they be comparable, and are also typical of architectural projects in general. They are a laboratory for the French École des Mines by Jacques Ferrier, and the Almelo public library by Mecanoo Architekten in the Netherlands. These two cases were selected initially on an opportunistic basis: the coincidence of the ongoing joint research project with the French Ministere du Logement provided a resources with which to build the databases on which the case studies will be based that would not otherwise be available for this project. However, these two cases offer additional advantages. Both are projects for the public sector, and both projects were described by the architects as having run smoothly with few problems beyond those ordinarily encountered. Thus any delays or accelerations detected in these project should be of a relatively common sort, and the insights gained from the study thereof should be widely applicable. Finally, the architects were very enthusiastic about this line of research, and were willing to provide complete and continued access to their records.

No two cases can be expected to provide examples of all the potential advantages or failings of a form of practice. The case studies will, therefore, be supplemented by a review of the literature on contemporary architectural design practice. The results of this literature review will be used to supplement the case studies as and where required.

Modelling Communication in Concurrent Architectural Design

Model Making

In order to build on the comparative analysis of the cases, it will be necessary to construct a model of contemporary building design decision making. The purpose of a model is to describe, explain and predict a class of phenomena. In this project the model is intended to describe, explain, and predict the concurrent character of contemporary building design. To do this two separate modeling techniques will be allied: dialogical modeling and an analogy to parallel and distributed processing. The design process will be assumed to be conducted by a set of agents, these are the organizations, firms or agencies party to the design process. The process will further be assumed to be undertaken by these agents separately, that is they will come to an agreement about the division of the task into sub-tasks, and carry out these sub-tasks individually. The results of the sub-tasks will then be integrated, and further sub-tasks undertaken, until the project is completed. this process of identification and assignment of sub-tasks is assumed to be a dynamic process allowing for adjustments to be made continuously to the plans for executing the work.

The model will concentrate on the messages used to communicate the status of the agents, the current state of the design world, changes made to the design world, and the status of both sub-tasks and the task as a whole. The intention is to describe and explain how these messages facilitate the design process, to develop a cognitive map of the design.

The model will be used to predict the behaviours or situations that can either retard or accelerate concurrent architectural design.

The model will not, however, examine the operations within each agent. Each agent will be treated as a 'black box', an unknown, hidden entity about which we must make only limited assumptions. Of course, since there are many forms of engineering practice, this black box treatment of the agents preserves a desirable generality in the model. We will not, therefore, make any statements about the size of agents, the number of people assigned by an agent to the project, or scheduling and communication problems internal to the agents.

The model will rely on the application of two distinct techniques. The first is dialogical modeling. This is a modeling tool that permits the characterization and evolution of opinions and beliefs as they are deployed by agents in a dialogical process such as group design decision making.

The second technique is the application of the paradigm of parallel and distributed processing systems. These are systems of computers which undertake a large computational problem by dividing into smaller tasks which are distributed among the individual computers and solved in parallel. This analogy will provide a minimal cognitive model of a parallel reasoning process. Problems such as the scheduling of tasks and the distribution of information to appropriate tasks, and therefore to appropriate processors, have been well characterized in the computer architectures, and these models can be applied to Concurrent Design in Architecture in order to identify and describe the difficulties to be overcome.

Dialogical Modeling

Dialogical modeling permits the representation of patterns of argumentation, reasoning and justification occurring within dialogical processes such as group decision making. Each speaker's statements are diagrammed in a manner that permits the representation of the underlying argument structure, backing, and bases. Dialogical modeling is useful in attempting to recreate and understand the differing points of view of the participants in the reasoning process. Given that, in concurrent design, the agents have a variety of points of view, the ability to model the reasoning underlying their statements will be especially valuable to any attempt to understand the impact of their particular contributions to the design reasoning process.

In this project the dialogical modeling will be applied to the messages taking place over greater lengths in time than normally considered.

Parallel Processing

A significant body of research into the distribution and coordination of tasks, and the integration of their results exists in the field of distributed and parallel processing. As the commercial demand for increased computing speed and power became clear in the 1970's it was also becoming clear that simply making faster and more powerful computers or microprocessors was not going to provide sufficient results. Several scientists perceived that instead of attempting to increase a single computer's power by a hundred-fold, one might gang one hundred conventional computers together to obtain similar results. And while the method is not 100% efficient, computer networks consisting of conventional microprocessors are at the heart of many of the most sophisticated and powerful computer systems now available.[5)]

In parallel processing a task is divided into smaller 'sub-tasks' and distributed among a set of processors. The processors achieve their sub-tasks simultaneously. The results of the sub-tasks are integrated, and the task is completed. In most parallel processing applications there are more sub-tasks than processors and many of the sub-tasks require information obtained from the results of prior sub-tasks. Thus any parallel processing system must solve two operational problems. First, it must schedule the tasks in an ordered sequence that makes efficient use of the available processors. Second, the system must route the information needed to complete each sub-task (including instructions and all pertinent data) to the appropriate processor

There are two basic types parallel processing systems based on the approach to communication between processors, shared memory systems and message-based systems. In parallel processing systems which use a shared memory (a sort of a common archive) to communicate between processors, the routing of information is not a significant problem. Individual processors obtain all necessary information from a central memory, and send their results to the same memory store. Some attempts have been made to develop the equivalent of shared memory systems for multi-agent design teams. These attempts, however, have floundered on the basic problem of allowing more than one agent to work on a given record or file simultaneously. This problem has been studied continuously since the late nineteen sixties, and has yet to be satisfactorily solved. Nor has a useful technique for automatically integrating the changes made by multiple agents in design records, been developed.

In addition, reflecting their distinct belief systems, agents prefer to use a wide variety of domain specific representations. Even when agent use the same CAD program, the layering systems used are often so divergent that drawings cannot be simply read off a disk, and are normally re-drawn by the receiving agent

A more promising line of research is the possibility presented by message-based systems. In message based parallel processing, processors communicate with each other by sending messages through the network of processors. The information and routines required to perform the computational tasks are stored in local memory in each of the individual processors (as if in a series of local archives). As the network is rarely completely connected (that is each processor is connected to only a few others) messages must contain addressing information that allows them to be directed to their destination. This information may be the address of the destination processor, or may be a description of the contained information that allows each processor to determine the 'most likely' destination of the package, and further it in that direction.

Support System Development

In order to compensate for this difficulty in knowing the state of the design world, we will exploit an existing system for controlling the distribution of information and results in parallel problem solving processes and apply it to the architectural process. The advantage of basing our model on parallel processing systems in computers is that the computer techniques have already identified the minimum information necessary to achieve efficient distributed and parallel processing. Thus we will have a 'working' model in the sense that by using the computer models, we will ensure that we capture enough features in our model to represent the processes (in an abstract, theoretical manner). At the same time, additional features identified in the cases will be immediately attributable to the social aspects of the process, and may therefore be properly represented.

In concurrent architectural design, there is, in principle, no reason not to have a completely connected network. In practice, however, the contractual relationships between agents often create a situation where agents interact with only a few of their colleagues. Thus some messages will need to traverse at least one agent to get to their destination. This, however, is a slight distortion of the case, as messages are rarely addressed to specific destinations (other agents who need the information contained in the messages), but are issued as results to the agent's retainer (the agent who contracted the sender), who has the responsibility of determining and executing any further dissemination. The situation is further complicated by the fact that often no one agent has the full responsibility for scheduling. This may be determined collectively, but will be revised constantly in response to the development of the design and the occurrences of difficulties or delays. Thus the team and its agents will engage in a constant process of dynamic scheduling.

Thus a message based approach is proposed. This is an approach based on the transmission of messages indicating the changes in the design, and the design problem space made by each of the agents. The key problem in message based systems is routing, that is seeing that each agent receives all messages regarding relevant information in a timely fashion.

Evaluation of the VOSS

In the development of any tool, a procedure must also be developed for testing and evaluating the tool. This requires the development of a set of criteria of evaluation. The comparative case study will also be used in conjunction with the literature review to generate a realistic set of criteria of evaluation. These criteria must address issues such as (1) validity, the theoretical validity of the principles underlying the tool; (2) effectiveness, the degree to which the tool actually achieves the tasks it is designed to handle; (3) efficiency, the reduction in resources required to achieve these tasks when using the tool; (4) reliability, the degree to which the tool continues to perform satisfactorily under a wide variety of conditions, and (5) robustness, the degree to which the tool resists situations likely to cause failure.

Each of these issues will be addressed individually, and criteria of evaluation developed which will be used to test the Virtual Office Support System. As the research project proposed to develop the tool to the level of computational theory, these test must remain on an abstract level.

Conclusions

This research will provide a number of results with concrete applications. First, the Virtual Office Support System for Concurrent Design in Architecture, once realized as a software application, will be an extremely useful to professional architects. This tool will assist in maintaining a smooth flow of information and continuous scheduling of tasks, minimizing opportunities for misunderstandings, backtracking, and error while at the same time accelerating the design process. These principles may also be useful in guiding architects in their choice of commercially available automated information management or scheduling systems.

Second, the principles behind the support system will be immediately available to practicing architects, who may use them to assist in the management and organization of design projects.

Third, the model of contemporary architectural practice will be available valuable insights for those interested in the development of systems for the representation of design information in a multi-professional context.

Notes

1. See, for example, Dana Cuff, (1991), *Architecture, The story of practice.* MIT Press. Cambridge, MA.

2. In this study, 'agents' refers to organizations or firms rather than individual people.
3. For a more complete account of the concept of a design world see D. A. Schön (1983) *Reflective Practitioner.*
4. Easton, G., (1992), *Learning from Case Studies*, 2nd ed. Prentice Hall. New York.
5. See Reed, Daniel A. & Richard M. Fujimoto, (1987), *Multicomputer Networks, Message-Based Parallel Processing*. MIT Press. Cambridge, MA.

The Designer as a '*Hox* Gene':
The origin and impact of vision in the evolution of design

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Abstract
In describing design history, evolutionary explanations in terms of variation, selection, and fitness received much attention. The most important of these approaches are discussed. Special attention is devoted to the nature of the variations (random versus 'intelligent'), the direction of the process (directed versus undirected) and their implications for a design method. The central problem is: can an evolutionary approach account for the radical changes observed in the history of design? This problem is discussed with respect to (1) recent discoveries in the field of genetic biology and (2) Martindale's theory of cultural evolution. It is concluded that the activities of a 'visionary' designer, i.e., to develop innovative and integral design solutions, can be interpreted within an evolutionary framework.

In their effort to predict the future course of human artefacts within fields of design, art and architecture, theorists are often inclined to study regularities and trends in history. This so-called 'historicism' (Popper, 1957) can, theoretically, reveal two kinds of pattern: a cyclical pattern of characteristics that repeat itself over various cultures and a continuous 'evolutionary' pattern throughout history. Whereas both theoretical patterns carry the advantage of a determinism, and can thus predict future developments, the latter evolutionary theories received most attention in design history. These theories try to explain the course of history by drawing an analogy with biological evolution. Although these approaches have proven to be helpful in guiding theory and research in design, we will discuss some of their shortcomings and present an alternative approach. That approach is also evolutionary, but does justice to 'visionary' designers who deliberately try to break off the gradual course of evolution by introducing radical changes. This paper will close with some thoughts on the characteristics of a 'vision' and possible ways to derive at one.

Natural selection
According to Darwin's influential theory of organic evolution, principles of variation, selection and preservation determine the evolution of all species. In short, through spontaneous changes from within, organisms vary in all sorts of ways. All these variations are passed on from generation to generation, but by a process of natural selection these variations are 'tested' against their surrounding environment. By this selection only the 'fittest', those which constitute improvements relative to their particular environment, are preserved (the 'survival of the fittest'). In this way, beneficial characteristics are indirectly inherited. The forms of organisms therefore gradually adapt and adjust to their environment. Darwin's theory is essentially based

on the concept of 'trial-and-error'; many variations (trials) are generated and by selection those that do not 'fit' (errors) are detected and removed.

The analogy

Anthropologists and archaeologists were the first to study the analogy between Darwin's principles and the evolution of artefacts (Steadman, 1979). First, they equated heredity with copying; new artefacts are as exact as possible copies of old models. Through social stability and conservatism in methods, designs are stabilized and radical changes are prevented. Slight variations of form creep in slowly and these are all tested in use. When a variant turns out to be more appropriate (it confers greater fitness), it is retained. It becomes a new example to be copied.

This literal interpretation of the analogy was, among others, adopted by the 'Purists', e.g., Le Corbusier and Ozenfant, who claimed that mechanical evolution and natural evolution are similar processes and conform to identical natural laws. Given certain conditions of functionality and economy, they argued, forms of objects will evolve automatically towards some standard universal type. The aesthetic qualities of both organisms and machines are therefore *incidentally* produced in their evolution, and not consciously sought. The difference in the *fine* arts is that there the artist has deliberate aesthetic intentions to achieve the similar results. The (Purist) theory may have a certain plausibility when applied to simple tools that function as a continuation of human limbs, like the toothbrush, the tobacco pipe, and a cup. In fact, exactly these examples were chosen by the purists. As can be often observed in this and related theories, they tend to be confirmed by very selective examples.

In considering the analogy we must keep in mind that the individual artefact is only one example of the general type and it is the type that is transmitted in copying. "It is not individual artefacts which evolve. It is abstract *designs*, of which particular artefacts are concrete realizations. The distinction corresponds to that made in biology, considerably after Darwin, between the *genotype*, which is the 'description' of the species transmitted through biological heredity, and the *phenotype*, which is the physical embodiment of what is described in the individual organic body." (Steadman, 1979, p. 81). These genotypes are embodied in and put into effect by genes, the substances that control the development and growth of individual organisms, the phenotypes. This is however not a fixed process; conditions of the environment can initiate small variations. We will return to this analogy with organic biology later on.

Problems with the analogy

The analogy with principles of Darwin's theory has been criticized in several respects. Firstly, a strict Darwinian approach seems to imply that designers should be nothing more than copyists; if they undeliberately manufacture variations through a process of 'trial-and-error', appropriate variants will come up and be selected. This suggestion, that a gradual process of evolution could result in as good or better forms than those devised by the free play of imagination is an affront to the sense of the role of creative individuality. "Technological evolution *differs* from biological by virtue of the participation of the mind of man and his *active intellectual intervention* in the process.

Man introduces that intention and purpose which is lacking from the uncontrollable chance nature and 'fatalism' of organic evolution" (Steadman, 1979, p. 134).
Campbell (1960) however convincingly argued that a random process of generating thought trials underlies all creative achievements. This is not to say that it is a passive machine, it is rather an active generation. Moreover, it is in the process of selection on the basis of internalized selective criteria that the process becomes 'intelligent'. Individual differences in creative intellect in this 'blind-variation-and-selective-retention' model are therefore either due to differences in the number and range of variations produced or to differences in the selective criteria (including the accuracy and detail of representations).
A second, and related, criticism concerns the lack of direction of the evolutionary process. As argued, a strict Darwinian approach holds that the variations in the form of an artefact are introduced accidentally and are undirected. This could lead to the view that the real effective 'designer' is the 'selective' process. However, "the [design] process *appears* to be a directed and purposive one, because only those variations are preserved which *turn out* to be adaptive when subjected to selection" (Steadman, 1979, p. 186).

A possible solution is offered by Lamarck's theory of evolution. According to Lamarck, to satisfy the new needs which are continually arising, organisms *actively* adapt to their environments; direct effects of the environment elicit changes in the organism. The thus 'acquired characters' are preserved by inheritance. Although discoveries in genetics have refuted Lamarck's theory as an explanation of biological evolution - changes in the protein molecules as a result of adaptation cannot effect an equivalent change in the hereditary material, the genes - it turned out to be applicable to cultural evolution (Steadman, 1979). It clears the way for designers who undertake deliberate efforts to adapt their artefacts to their changing environment.
A third critique has to do with the fact that a Darwinian approach does not account for revolutionary changes in the course of design history. The evolutionary theory seems to hold that the process is, in principle, gradual and "the craft evolution provides many examples of nicely graduated series in which the changes in the forms of artefacts are small and slow. It is nevertheless easy, ..., to point to abrupt transitions, radical innovations, large jumps which serve to break these sequences and which leave the analogy with biological evolution rather hard to sustain" (Steadman, 1979, p. 231). Recent discoveries in the field of genetics can, however, explain these radical changes.

The designer as a *Hox* gene
According to an analogy with genetic material, designers can be conceived of as 'genes'. Through learning and communication they have inherited the genotypes of an artefact and, in interaction with current conditions of the environment, they create a new artefact. These artefacts (the phenotypes) are variations of the same theme (the genotype) and will, sometimes, contain small improvements. This part of the analogy is in accord with the 'unselfconscious' process as described by Alexander (1964). In this process the main function of the designer is to recognize 'misfits' - evident functional failures - of these objects in use. "He reacts to misfits by changing them; but is unlikely to impose any 'designed' conception on the form" (Alexander, 1964, p.77). The changes this type of designer makes, the 'variations', are error-correcting only and

do not anticipate the results of selection. A similar view of a designer's method was recently defended by Petroski (1992) who summarized Alexander's description to the maxim 'form follows failure'. Although this type of re-designing will always continue and certainly serves some functional goals, it is a rather narrow sketch of at least some designer's special abilities. Did Starck re-design the failures of the traditional lemon squeezer when he designed his famous spider or spacecraft-like juicer?
This type of design process has two apparent drawbacks. The first, as noted before, is that it does not provide for radical changes or large jumps. The described design activity leads to marginal improvements within a gradual process. Second, elements of a design are often causally interrelated (a design is a complex system) and the correction of one failure will often lead to the appearance of another one. Moreover, the solution previously arrived at will loose its overall, Gestalt-like quality which could prevent successful adaptation (Steadman, 1979).

But how can an evolutionary explanation account for such gross changes and also guarantee that the coherence of the various elements is maintained? Recent discoveries in the field of genetic biology have identified a special family of genes, the homeotic or *Hox* genes, which stand on top of the genetic hierarchy and determine the main body pattern (Carroll, 1995). By regulating, directly and indirectly, large numbers of genes, they control the morphology of different body regions. Next to this regulatory task of preserving an overall structure, the *Hox* genes can also disturb the established order and thereby pave the way for new (r)evolutionary ideas. We propose that 'visionary' designers function as *Hox* genes in the evolution of design. On the basis of a vision, they are capable of a mutation or recombination in the genotype (the archetype), thereby imposing major changes to the structure of the phenotype (the artefact or 'prime' object; Kubler, 1962), which possesses a degree of novelty and original invention in its form. When this new artefact is selected, it produces the underlying structure for further evolutionary change.

To accept this view, one must believe that, in principle and contrary to what the purists declared, a variety of forms can serve the same intended purpose almost equally well (cf. Alexander, 1964). This does not mean that function does not put constraints on the arrangement of the designed object. In fact, requirements can be very severe and the possible variety of forms will be greater for one object than for others. "The point is, rather, that design problems are not 'objectively' determined in the first place, but are created by cultural values and human purposes. The designer or client may change these purposes at will." (Steadman, 1979, p. 195). Even the choice of optimal efficiency is a cultural one.

Important in this respect is the notion that these choices can be *consciously* made to adapt to a changing environment or, to elicit changes in the environment! A 'visionary' designer does not *have to* rely on his or her intuition, but can deliberately (by his internalized selection criteria) change the course of an artefact's progress. Alexander (1964) was one of the first to advocate such a rational, explicit design method to replace intuitive individualism.

We have argued that both an error-correcting designer as well as a visionary designer have their counterparts in genetic biology and that an evolutionary analogy can therefore sustain.
By introducing a conscious design method, however, the question remains if this is still compatible with an evolutionary approach; how can a 'selfconscious' design method achieve the results of the evolutionary design process? Alexander (1964) proposed a systematic design method which will produce results equivalent to evolution by simulating its mechanism. In this way the evolutionary process becomes directed again. Although this orientation seems incompatible with a Darwinian approach, Martindale recently proposed an alternative (Darwinian) theory of cultural evolution which allows for direction (Martindale, 1986). The crux is in the selection mechanism: it is based upon hedonic instead of natural selection.

An evolutionary theory based on hedonic selection
With regard to cultural evolution, many theorists have adhered to an analogy with the post-Darwinian approach by Spencer. Following Lamarck, Spencer saw the generation of new characters as a result of adaptation to the environment. His theory is directional in that, through differentiation and specialization, progress comes about (leading to a kind of typological thinking as we saw for the purists). The popularity of his theory can be attributed to the idea that random (no preferred orientation), and thus unintelligent, variation is difficult to accept for most of us. Nevertheless Rindos (1985) recently argued for a strict Darwinian approach to be applied to cultural evolution. The argument is defended that even in the cultural domain variations are basically undirected and heritable.
According to Martindale (e.g., 1986*a*, 1986*b*, 1990) however, adherents of a strict Darwinian approach have overlooked the possibility that the major selection criterion in cultural evolution is not the analogue of natural selection or fitness, but rather that of sexual selection. He convincingly demonstrates why a selection mechanism on the basis of sociocultural fitness fails to explain cultural selection. People, Martindale argues, select from cultural artefacts, not because of greater fitness, but 'simply' because one object brings more pleasure than the other. This applies even to highly functional objects such as axes; people select steel axes over stone axes because "they accomplish the same ends as stone axes with less effort" (Martindale, 1986*b*, p. 50). The introduction of this criterion allows for directed evolution because, as in biological hedonic selection, the *selection* (not the variants) proceeds in a certain direction until some check is imposed by the social environment. The selection mechanism (and the inheritance) of cultural traits is a matter of learning.
In brief, Martindale proposed the following theory. Because the selection criterion for cultural goods is 'pleasure', artists and designers try to produce artefacts that are maximally pleasing. Pleasure is in an inverted U-shaped manner related to the arousal potential or impact value of a stimulus (Berlyne, 1971). Stimulus aspects that contribute to this arousal potential are, among others, collative variables, such as novelty and complexity. Through repeated exposure to a stimulus, however, the stimulus loses its arousal potential and pleasingness decreases, a process called habituation. To overcome this effect, successive designers must produce artefacts with increasing novelty, complexity, etc. This is the directional pressure. It is interesting in this respect that Martindale hypothesizes that this pressure might lead to oscillations in

systems with a short 'memory', such as the clothing fashion. "Evolution can occur only when the environment permits it" (Martindale, 1990, p. 55). In the high arts, architecture and most design fields however, "the rule seems to be that repetition of previously used traits is not allowed" (Martindale, 1986*b*, p. 51). In analytical studies of many art forms, such as British poetry, Italian painting and Gothic architecture, Martindale (see 1990, for an overview) demonstrated that arousal potential increased linearly over time.

How can designers increase the arousal potential of their artefacts? From studies of creative thought (e.g., Campbell, 1960) we have learnt that a state of mind characterized by free associative and undirected thought increases the probability of novel combinations of mental elements, i.e., of variations. In order to become more creative than their predecessors designers must regress to this state of 'primary process cognition (or primordial content). However, at a certain moment further regression is impossible or counterproductive. A designer must than adopt or invent a new style to continue to increase novelty or complexity. This process involves less primordial content and more conceptual or analytic thought processes. As a result, the amount of primordial content shows a cyclical pattern over time. Again, Martindale provided much evidence of such a cyclical pattern in the evolution of different art forms.

Vision in evolution

The above considerations lead to the following characteristics of two types of designers and their position in the evolution of design. First, most designers, the 'genes', will deal with the quest for novelty by adding small changes to existing design solutions. Their artefacts (the phenotypes) are variations of a particular archetypical style (the genotype) which is inherited through a large number of members of the same stylistic family. Hypothetically, these designers can increase the impact value of an artefact by (1) small functional improvements (the error-correcting method), or (2) increasing the novelty, complexity, or other arousal heightening aspects of the design. Whereas the first approach requires conceptual/analytical thought (what errors need corrections?), the second is realized by a regression to primary process cognition, i.e., free associative thought. Both strategies, however, have their limitations. As argued before, the error-correcting method runs the risk of destroying the Gestalt qualities of the original design solution, the regression method will at a certain point reach its processing limit. What's more, both methods will generate solutions within the narrow bounds defined by the characteristics of the archetypical form. Radical design solutions are therefore prohibited.

To break out of the above patterns, some designers are able to introduce a new style which differs radically from the prevalent archetypical style. These designers can be conceived of as *Hox* genes, they disturb the existing order and thereby pave the way for radical change. As argued, innovation alone is not enough. The proposed changes must also embody Gestalt-like qualities, i.e., they must reveal a coherent order. According to Martindale's theory, designers achieve this by analytical or conceptual thinking. But how does a designer know what new order will be the right one? Following Martindale, a new style will be successful if it links up with the selection criteria employed by the future cultural system. A designer's task will therefore be to foresee the changing needs of a society. He can analyze the developments within the cultural

and social system and on the basis of this analysis, develop his personal view of what changes are needed or expected. This is what we call 'vision'.
Vision is therefore defined in analogy with Lamarck's (and Spencer's) theory; artefacts must adapt to changing needs and environmental conditions. In Simon's (1969, p. 6) words, "fulfillment of purpose or adaptation to a goal involves a relation among three terms: the purpose or goal, the character of the artifact, and the environment in which the artifact performs." According to Simon (1969) and Alexander (1964) a visionary designer constructs a mental picture of the intended design and then tests the future adaptation of this representation; "... a conceptual interaction between the conceptual picture of the context which the designer has learned and invented, on the one hand, and ideas and diagrams and drawings which stand for forms, on the other." (Alexander, 1964, p. 77). Alexander furthermore proposed that this mental picture should be made explicit into a 'formal picture' that exemplifies the imagined interrelationships between the structure of the designed object and the structure of its environment. Vision thus will serve as an internalized selection criterion in the process of idea or picture generation and in the design process thereafter. Such a conscious method is only possible when the cultural evolution is, to a certain extent, directed. We have argued that it is.
A possible objection to this method might be that certain features of artefacts are, in principle, beyond the reach of scientific predictions, such as the aims which they serve, the ways they are evaluated aesthetically, etc. These evaluations depend on the relation between observer and object and this relation is continually changing due to transformations in the cultural structure (Steadman, 1979). The appearance of every new work, alters the context in which we understand and appreciate not only that work itself, but in principle all other works as well (Gombrich, 1979; Kubler, 1962). However, this aesthetic relativism does not imply that there are no 'laws' governing the aesthetic (inter)relationship between observers and objects (see e.g., Hekkert, 1995).

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Architectural Framework

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This paper is written to give an impression of my doctoral research. The study deals with the concept of which I would like to label 'architectural framework'.

In his text 'The Poor Little Rich Man' Loos introduces a rich man who has his architect design his home, its interior design and even his slippers. Loos describes how the man is literally terrorized by the architect's desire to design everything. In the end, he finds himself having less and less space of his own[1]. Loos's polemic is based on moral motives and aimed primarily at the Secession architects although his text can also be understood within a broader context. There are numerous situations, for example, in which it is not only undesirable but even impossible that a designer's hand should control everything.

Design of the built environment takes place at various levels of design. Decisions are taken at the levels of the organization of the city and urban space, the overall configuration of a building, the main supporting structure, the façades, the access system, and the interior design and furnishings. The requirements a particular level of design has to meet are sometimes contrary to what another level requires; sometimes decisions of a different level are not taken at the same time, in other cases a designer may not be participating at all the levels. It is even more difficult for designers to control the final use and appearance of a building once it is delivered.

When a design with two levels of design (or two parts of a design) 'changes hands' accordingly, it may be necessary to introduce as much architectural separation as possibble. The separation of two levels of design can be realized by using one level as a basis to define a clear framework for the other. The moment this framework has an architectural form or meaning it can be indicated as an architectural framework.

Such an architectural framework can be manifest in many ways. It can be represented as the screen of a double façade, or the domino skeleton of the plan libre (Free Plan). Sometimes the framework will adopt a more abstract form, as is the case in the system of building lines and agreements about parcels of land in seventeenth-century Dutch town planning. In all these cases there is a clear framework which allows the designer himself, other designers or the users to act freely without affecting the concept defined by the framework.

Examples

Using a few examples I shall describe this idea in general. My essay is to the application of architectural frameworks in the design of a building in the city. Architectural frameworks for the design of a building in the city can be defined at two levels, one linking the building and the city: the façade, and one level acting as an intermediary between the often rigid building and the human activities in this building (hereafter called 'use'). This second level not only includes interior design and furnishings, but can also relate to those elements which define the layout of the space; this latter category again includes the façade.

Plan libre

One of the first examples which shows an attempt to separate two levels of design is Le Corbusier's concept of his plan libre. The structural system of the domino skeleton in the plan libre is defined as an architectural framework in which the architect himself or the user is free to detail form and finish of the space[2].

Although Le Corbusier, with the exception of his visionary design for Algiers, mainly uses the domino principle in the plan libre to create his own freedoms in the design (as in the designs for the white villas), we can see that it is precisely this opportunity to create a freedom for others that has inspired countless architects.

SAR

One of these architects is the Dutch architect and researcher Habraken, cofounder of the Stichting Architecten Research (SAR) (Foundation Architects' Research). Habraken stated: 'A dwelling is not a thing that can be designed or made. A dwelling is a result. The result of a housing process. The last act in this process is that of the occupant who goes to live there. The act of living is the only one act which makes a dwelling of something (a space, a building, a hole in the ground)'[3]. In this view society is given a support in which, whilst living there, an individual occupant creates a dwelling with objects for the home whether factory-made or not.

This concept is worked out by the SAR and emphasis is put on technical detailing and standardization. As a result the support loses its quality as an architectural framework.

Carcass dwelling

Following Habraken's ideas the Dutch architect Haaksma developed the carcass dwelling[4]. In his search for the relation between a building and its use he developed a concrete support shaped like a honeycomb structure consisting of two storeys each with an open zone in the middle to provide space for vertical traffic facilities such as stairways and pipes. Voids can also be created in this zone, they can be finished with a removable wooden floor if they are not needed.

The carcass dwelling gives the abstract concept of the SAR a clear architectural feature and in doing so an architectural framework. In this framework the occupant can complete the home as they prefer with various industrial or hand made objects and materials. Unfortunately, the experiment has never been put into practice in this form.

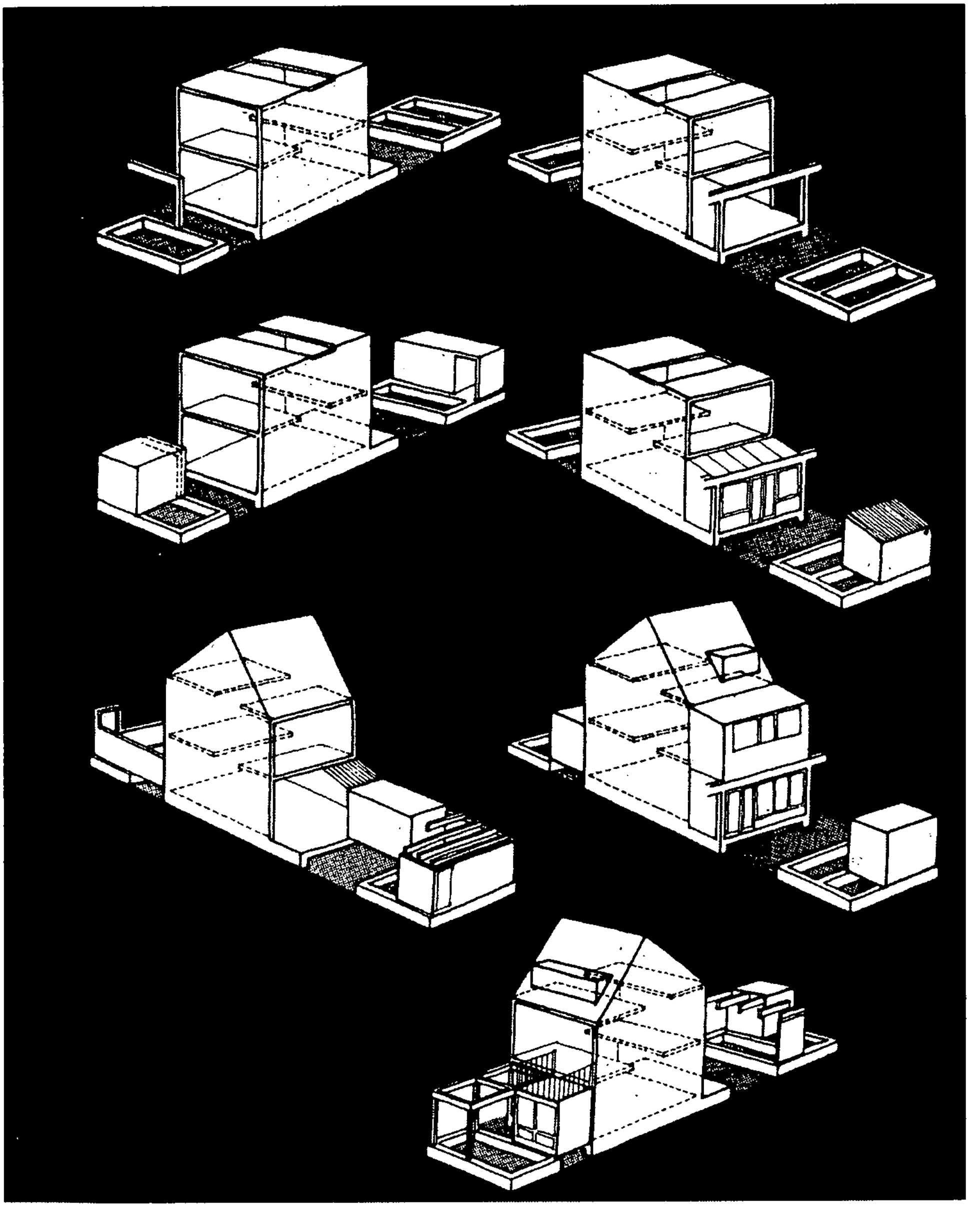

Figure 1: Carcass dwelling

Nemausus

The French architect Jean Nouvel designed the Nemausus housing project in the city of Nîmes in South France. The underlying idea of this project is that 'a good dwelling is a big dwelling'[5]. Nouvel as usual carried this starting point through with iron consistency. In order to offer as much space as possible at standard budgets Nouvel designed dwellings with a minimum finish. Interior design is limited to a staircase only and a minimum of sanitary facilities. There is, however, just enough interior design to call it a carcass dwelling.

Compared with the usual standards in social housing one finds that Nouvel provides no more than a framework in which life, living in a dwelling, can take place. In order to give this framework more architectural emphasis Nouvel has the bare concrete walls of the interior painted with murals.

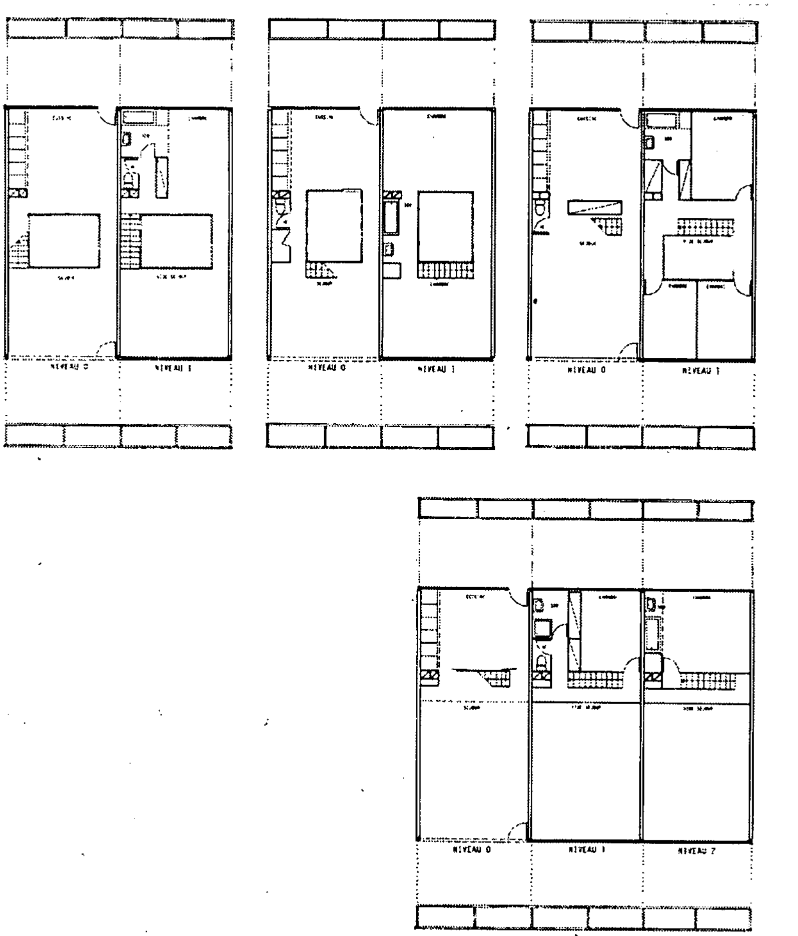

Figure 2: Floor plan Nemausus Jean Nouvel

Building line

Whereas the relation between a building and its use is often manifest in a very concrete and material appearance, a building and a city can have a more abstract relation. For centuries an accepted principle in town planning has been the creation of a framework which enabled other participants in the building process to detail part of the built environment. The seventeenth-century expansion of the city of Amsterdam is based on such a principle. At the beginning of the seventeenth century locations and widths of the three main canals on the western border of Amsterdam were defined on the basis of an integral plan. The land between these canals was issued as private parcels of land. They had a fixed width and building was allowed from the building line to a given length (for instance 110 feet on the west side of the Herengracht) in a manner that suited the purchasers[6]. This simple system of building lines and widths of parcels of land in combination with the prevailing typology of buildings ensured a consistent image of urban space.

Berlage

This system was common practice until this century. In the twentieth century ideas on the relation between a building and the city underwent two profound changes. The first change is marked by Berlage's plan for a new southern district in Amsterdam. In this plan the architectural unit to shape the city is no longer the individual parcel of land but the building block[7]. The accepted instruments of building lines and widths of a parcel of land make way for detailed planning rules per block. Rules which cover the building volume, height of the gutters, the pitch of the roof and even the rhythm of the façade. The prevailing typology of buildings was swept away for a defined architectural style: the Amsterdamse school. This comprehensive system of regulations brings us to the period of urba aesthetics.

The Modernists

A second change in thought on the relation between a building and the city is marked by the emergence of the urban design of the Modernists. The development commences with opening the traditional block and reaches its peak with the appearance of the object-related building. The point-by-point organization of the supporting structure in the plan libre creates the possibility of separating the support and the form of a space, and likewise the introduction of the object related building brings about the possibility of departing from the relation between a building and urban space.

After the Second World War, in part through the influence of urban renewal, the old concept of the city with block and façade wall attracts renewed attention. Urban aesthetics as an instrument returns. The exceptional role attributed to the façade as an intermediary between the city and a building is apparent from the way some old façades are dealt with. For instance, façades that are not listed as monuments but thought of as important contributions to urban space are hoisted and entirely preserved whereas the buildings behind them are demolished. Such a façade serves as the architectural framework for the building that is to be designed behind it.

Makuhari

The façade plays a comparable role in Steven Holl's design for a housing block in the Japanese new town of Makuhari[8]. The town planners' intended to have each block detailed by three architects under the supervision of one coordinating architect. It was hoped that this would guarantee variety. Holl, however, adopts another route. He designs the surrounding shell with openings for doors and windows in the block he supervises. In doing so he determines form and quality of the public space. What remains for the two other architects is the design of the dwellings in Holl's framework. This example is different from the previous one in that the preserved façade is a given physical framework already present before the building behind it is designed. In Makuhari, the façade and the building behind it are constructed at the same time. The façade in this project derives its strength as architectural framework from the rules imposed by Holl.

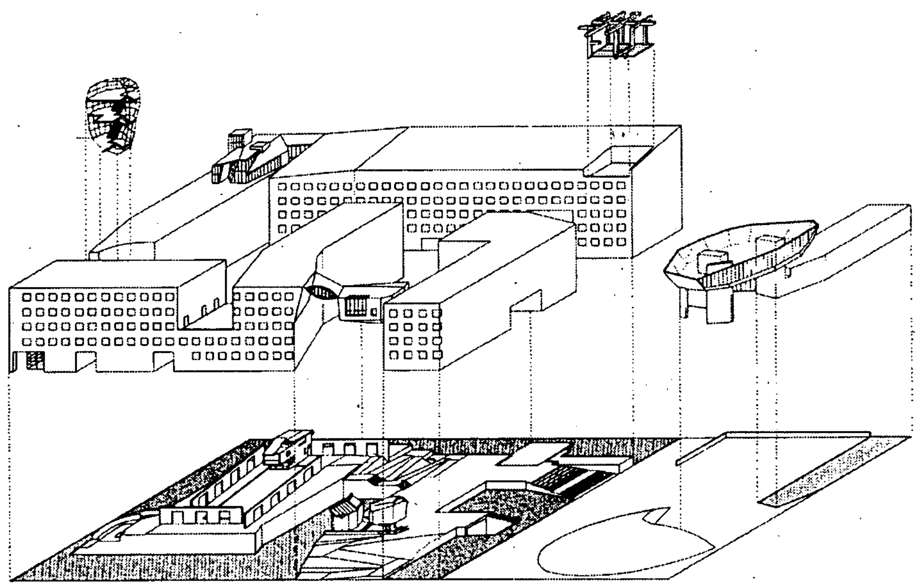

Figure 3: Makuhari project, Steven Holl

The double façade

An aspect which is not expressed in Steven Holl's project is the ambiguity of the façade. On the one hand the façade has to meet requirements based on the use of the dwelling and on the other, it forms urban space together with other façades. Additionally, the programme of dwellings behind the façade break through it via windows, balconies and loggias. To accommodate this ambiguity the Peruvian-born, Paris-based architect Henri Ciriani uses the double façade, a type of façade which takes this conflict into account. This façade first appears in Ciriani's design for a residential building in St Denis, a Paris suburb[9]. The double façade of this residential block, which has the pretty name of 'la cour d'angle', hides part of the untidy façade of the dwellings behind a concrete grid. Balconies have been placed on the street side in the zone between the grid and the façade of the dwellings.

The balconies which usually give the façade its untidy image are thus hidden behind a shell which at the same time forms the border of urban space. This principle enables the architect to separate, within limits, the form of urban space from that of the residential block.

Whereas in Holl's case the form of urban space is predominant and dominates the dwellings, Ciriani uses his double façade as a means of separation, making the façade function a two-sided framework, which relates to urban space and to the dwellings behind it.

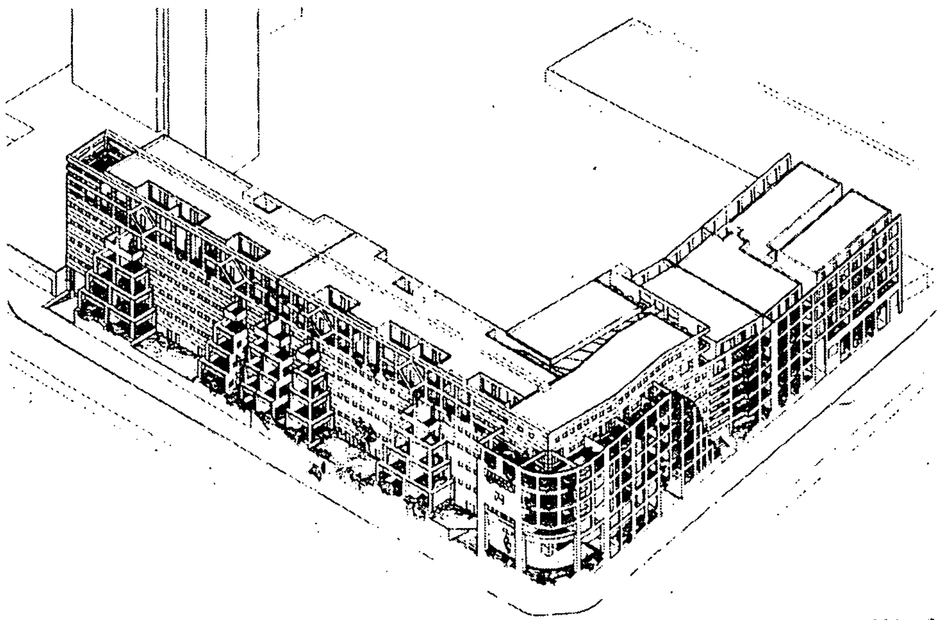

Figure 4: Cour d'Angle, Henri Ciriani

Lille shopping centre
The programme of shopping centres - commercial activities - also breaks through the façade. The articles displayed in shop windows or even at front doors determine the street scene and as a result the quality of urban space. In the Lille shopping centre (part of the OMA plan for Euralille) Jean Nouvel has designed a building with such architectural strength that it can compete with the colourful flow of the images of shopping[10].

Nouvel uses two means in particular: the roof and the framework around the shop fronts. He creates with them a continuous image, which frames the multitude of individual shop fronts and windows with their displays. This continuous image is determined first of all by the sheet steel covering of the steel skeleton. The grey enameled covering between and above the shop fronts returns consistently and as a framework litteraly used. In order to increase its architectural expression this framework is provided with small decorative elements. A decoration consisting of small vertical metal strips which adorn the horizontal frames (friezes) over the shop fronts with repetitive triglyp motifs.

The second element which functions as a link in the architectural framework is the large roof with grey grids. This roof which is an elevated structure covering the entire shopping centre forms a metaphorical framework for the shops beneath.
Besides these two means, the clear, spatial structure of the centre also plays an important role. As a consequence there is never a moment that people, advertisements or a display of goods 'silt up' the space.

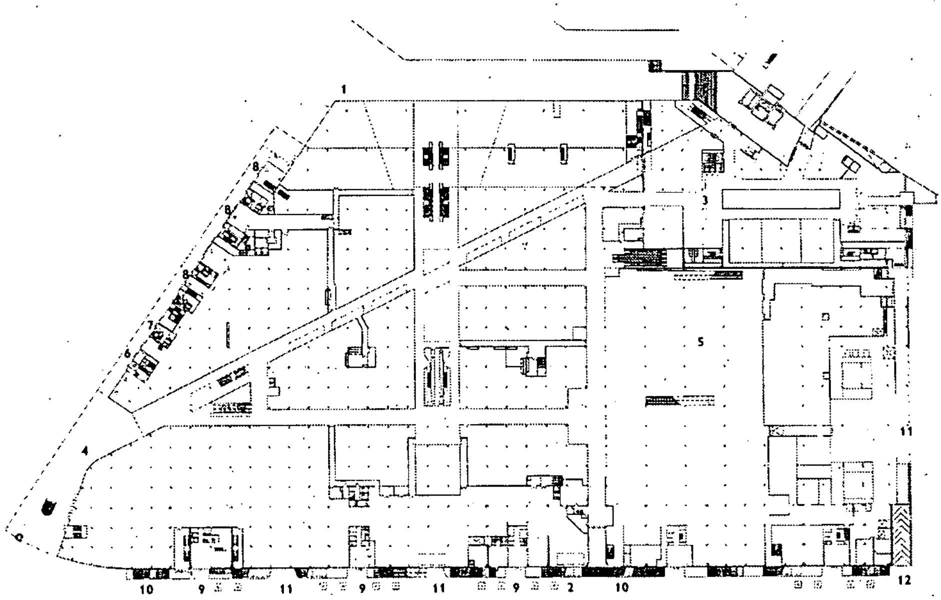

Figure 5: Floor plan shopping mall Lille, Jean Nouvel

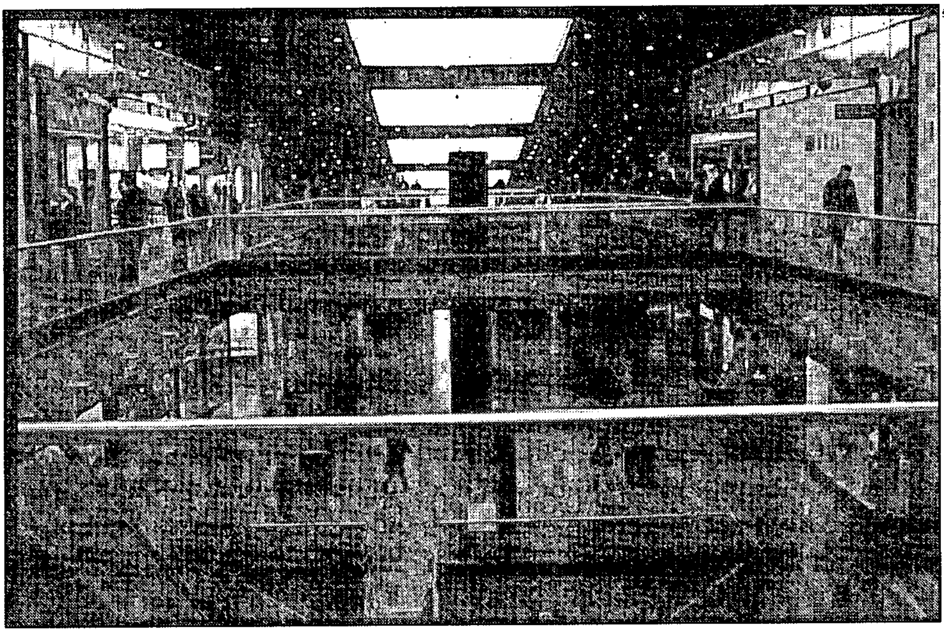

Figure 6: Interior shopping mall Lille, Jean Nouvel

In this text I have restricted myself to a few examples. However, on the basis of these examples a number of theses can be put forward about the principle of the architectural framework. For instance that a distinction can be made between the types of framework, such as those which only consist of a system of agreements and rules, and frameworks that are physically present (of which an extreme example is the preserved façade). There are frameworks that only play a role in the design process, such as the shell of the residential block in Steven Holl's project, and there are frameworks which in course of time regulate other ones. The carcass dwelling as well as Jean Nouvel's design for the Lille shopping centre resort under this latter category.
This last category will often relate to defining the framework of a building and its use, while the framework of a building and urban space is usually a system of rules. Here again the preserved façade is an exception.

Notes

1. Adolf Loos, Spoken into the void Oppositions books MIT Press, Cambridge Massachusetts, 1982, p. 125. Translation of: The Poor Little Rich Man, Neues Wiener Tagblatt, 26 April 1990, Vienna.
2. Willy Boesiger, *Oeuvre complet*, band 1, Les éditions d'architecture, Zürich, p. 128.
3. N.J. Habraken, 'Aap noot mies huis' *Forum* december 1966, p. 2.
4. Sjirk Haaksma, *Project woning en woonmilieu*, Gemeente Delft, Delft, 1973.

5. Olivier Boissière, *Jean Nouvel* Studio Paperback, London, 1992, p. 70.
6. Ed Taverne & Irmin Visser (red.), *Stedebouw* Uitgeverij SUN, Nijmegen, 1993 p. 82.
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8. Michel Jacques and Annette Nève, *Steven Holl* Artemis Verlag AG, Zürich, 1993, p. 72.
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10. Dave Wendt, *'Esthetische duizelingen*, De Architect April 1995, p. 51.

Materialisation and Production of Design

Developing a View on the Communication of Building Product Innovations to Architects

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Abstract
This paper looks at the process by which architects become aware of building products that are perceived as new to them, 'building product innovations', and the factors which influence this communication process. It is concerned with a part of the design process, detail design, that has been ignored by the design methods authors and on which little research has been published. The paper draws on the large body of diffusion literature and gatekeeping literature as a framework, whilst the study of an architect engaged in the detail design process forms a case study for discussion.

Introduction
The number of building products that are potentially available for selection by an architect is extensive. Every year new products are introduced by manufacturers in response to competition, new regulations and changes in architectural fashion. In addition to these "new" products, there are numerous minor product improvements which are constantly introduced by manufacturers to prolong their product's life cycle. These new products and product improvements, like the established products, are all dependent upon decision makers in the building industry for their selection. A process generally referred to in the building industry as 'specification'.

Although the architect's responsibility for building product selection has declined in recent years, they are still the most influential and important 'specifier' of products in the British building industry, (Barbour Index 1993). Architects have been described as 'licensed specifiers' (Pawley p5 1990), and their influence over the majority of product selection is well recognised by the building product manufacturers who bombard architect's offices with their trade literature.

Building Product Selection
Detailed research into the selection of building products by architects was carried out by Margaret Mackinder (1980), who gathered information about detailed design decisions from diaries filled in by participating architects. From this information Mackinder (p119 1980) observed that architects frequently used 'short cuts' based on their own experience in order to save time, reporting a strong preference for certain materials and components that they had used previously, drawn from their personal collections of literature.

Goodey and Matthew (1971) had already drawn attention to architect's personal collections of literature, which Mackinder (1980) described as a 'palate of favourite products'. One third of those interviewed by Mackinder (p120 1980) noted that it was office policy to avoid the use of anything new unless it was unavoidable, preferring to stick to their palate of favourite products when selecting building products.

Although architects acknowledged that new materials and components needed to be monitored in case there were advantages in terms of cost or performance (Mackinder p120 1980) there is little evidence of research into the process by which architects become aware of products that are perceived as new to them, 'building product innovations'. This paper investigates the communication of building product innovations to the architect's office.

Diffusion of Building Product Innovations

There is a large body of diffusion literature, (Rogers 1983) which is specifically concerned with the adoption of new ideas and methods. The work of Everett M. Rogers (1983) is held in high regard by fellow diffusion researchers and his work is the most often quoted in other diffusion literature. In simple terms, diffusion studies are concerned with the communication of an innovation, to a social system over time. This process is generally referred to as 'Diffusion', described by Rogers (p.5 1983) as

> *"... the process by which an innovation is communicated through certain channels over time among the members of a social system. It is a special type of communication, in that the messages are concerned with new ideas."*

Although there has been a great deal of diffusion studies published, none of them have been concerned with the diffusion of building product innovations. The majority of published literature that has investigated the way in which architects make decisions has concentrated on the 'design process' with emphasis on the resulting 'design'. (Rowe 1987). Commonly referred to as 'Design Methods' literature (Eg. Broadbent 1973, Heath 1984) it was concerned with creative problem solving and sought to describe the design process as it should be carried out, rather than how it is carried out. The architect's use of specific building products or the process through which the designer has passed to reach this decision is rarely discussed. (Leatherbarrow p. 143 1993). There would appear to be, therefore, a break between the design idea, ie. general material selection, and detail design where individual product selections are made. In diffusion literature, this decision making process is referred to as the 'Innovation-Decision Process' (Rogers p163 1983) during which the communication of knowledge about building product innovations is vital to their adoption.

Communication - the Gatekeeping Construct

Building product manufacturers have two methods of communicating information about their products to architects. The first is via 'paper information', in the form of advertisements in the professional journals, direct mail and technical information, some of which is also supplied in electronic format on computer disk. The second method of communication is by 'interpersonal channels' via the trade representative who has the opportunity of talking with architects when visiting or telephoning the architect's office.

Both forms of communication have to pass through a physical gate to get into the architect's office. The trade representative has the 'foot through the door problem', and in the authors interviews with a number of trade representatives (unpublished) they all complained that architects were very difficult to 'sell to'. Some put this down to arrogance on behalf of the architect, whilst other trade representatives had concluded that architects were not interested in new products and therefore ignored information relating to building product innovations.

Although it has been argued that architects have tended to ignore new information, (Eg. Cole and Cooper 1988), Emmitt (1994) suggested an alternative view, that architects have attempted to manage the information, that is filter out what they do not need, (or what they think they do not need.) This is supported by Rogers (pp.169-172 1986), who suggested that the "information rich" ie. architects, will be forced to filter or control the large amount of information that reaches them in order to manage information overload. This filtering or management of information is known as 'gatekeeping' in mass communication literature (Shoemaker 1991), a field of study closely related to diffusion literature.

The gatekeeping construct was introduced to architectural management literature at a symposium of the CIB Architectural Management W96, Nottingham University where it was proposed (Emmitt 1994) that the architect's receptionist may act as a 'gatekeeper', controlling access to the architects within an office. What emerged in discussion at the conference was that the filtering of information did occur, but much more widely than had been proposed in the discussion paper. Architects at the conference confirmed that technical literature entering their office is filtered by senior staff, then filtered further as it is passed to less senior architects and technicians within the office.

Communication - Active and Passive Models

What also emerged at the Nottingham conference was a suggestion that the process should be looked at from the architect's viewpoint, rather than that of the manufacturers. Diffusion studies have accepted that communication is a two way process (Rogers 1983), with information exchange between the promoter of an innovation and the potential adopter. This is important when looking at the architects office. On the one hand there is a constant and rapidly increasing volume of information, both in paper and electronic format, which is targeted at architects offices. On the other, there is the architect, who will require specific information for specific projects at different times. Bullivant (1959) noted that the architect's need for information is directly related to the stage, or timetable, of the particular project.

If the observations of Bullivant (1959) are correct, it could be argued that the architect will only be responsive to building product innovations if s/he is exposed to them when actively involved in producing working drawings. Thus there will be periods when the architect is actively looking for information to solve a particular problem, a period during which s/he will be receptive to incoming information and during which s/he will actively seek information, illustrated as an 'active model' shown below.

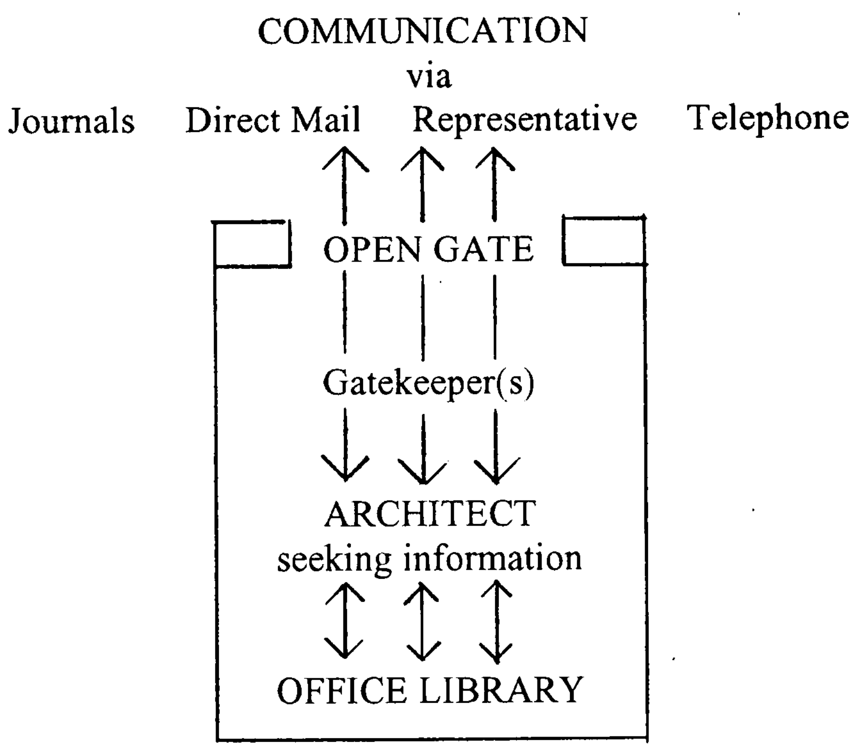

Figure 1: 'Active Model"

Conversely, there will be periods when s/he is engaged in tasks unrelated to product selection, a period during which the information is likely to be ignored, discarded or filed, as the gate will be closed.

The most active period would appear to occur during the detail design stage, when the decision maker is more likely to be actively looking for products which meet his or her requirements and, or, solve a particular problem. Thus the decision maker is likely to be more receptive to information about building product innovations communicated during an 'active stage' than during a 'passive stage'.

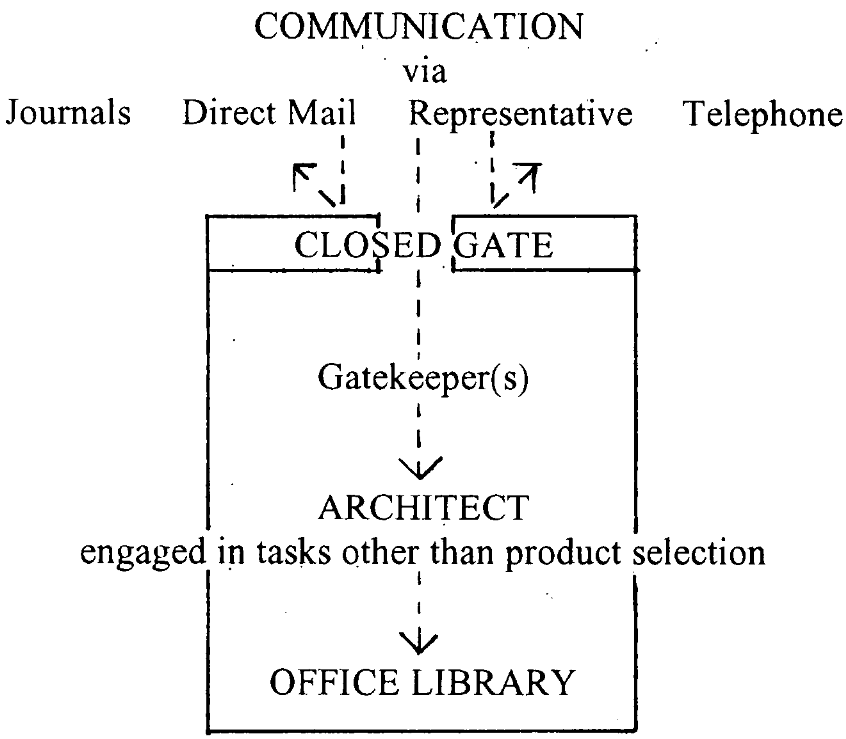

Figure 2: 'Passive Model'

Beyond the palate

Clearly architects do adopt building product innovations, but what makes the architect look outside the "palate of favourite products," and engage in an active search for building product innovations that satisfy particular criteria? In order to explore this process, an architect was observed, candidly, by the author, whilst working within the same architectural practice.

The architect was in the process of producing working drawings for a series of retail units. Whilst three of the units were designed with traditional timber rafters and tiles for the roof covering, the fourth was to be detailed with a structural tray and profiled metal cladding as a roof covering. Whilst the architect had detailed the buildings with the tiled roof from his own palate of favourite products, (a selection of trade literature stored close to his drawing board for "easy reference"), his personal library did not contain any literature which would help with his detailing of the metal roof. Therefore, he was forced to look for products outside his palate of favourite products, i.e. search for building product innovations, figure 3.

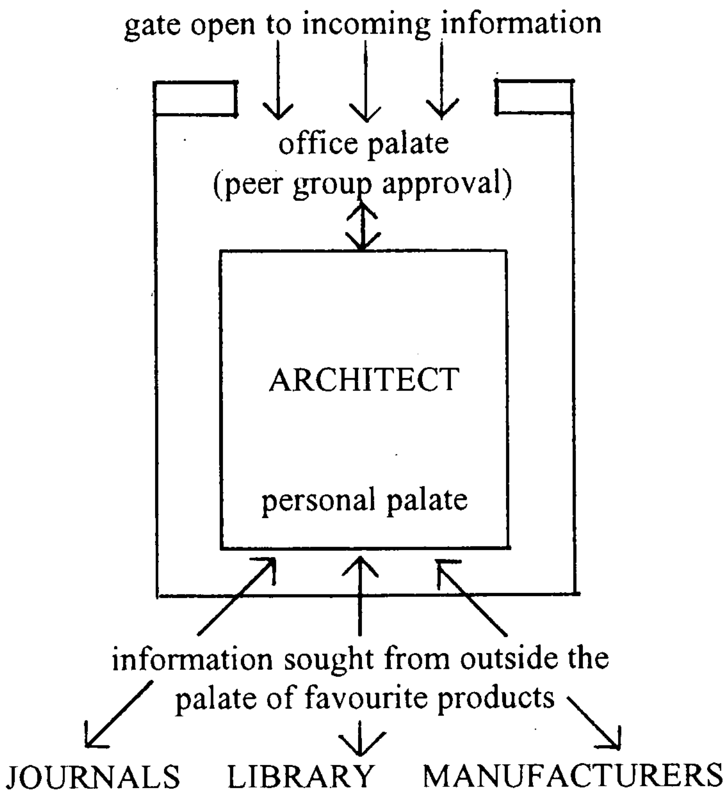

Figure 3

The architect was observed making the following search process. The first step was to ask other architects in the office if they had used a suitable product recently on other similar types of project, i.e. he first sought peer group recommendation based on the office palate of favourite products. This first step was taken to "save time looking in the library". The office palate of favourite products did contain a manufacturers roofing product, which had been successfully used before. The architect then sought further information about this building product innovation from the library before contacting the manufacturer to ask for further technical information and product samples.

Shortly after the detailed drawings had been completed, the architect was interviewed, during which specific questions about the process of specification and his attitude towards building product innovations were addressed. Although the architect described himself as creative and always looking out for new products he was aware that his actual behaviour was contrary to this. He claimed that he was "forced to be conservative" because of his own concerns and the concerns of the architectural practice about the possibility of building product failure. This was described by the architect as a form of risk management, a technique which relied, primarily, on his own palate of favourite products.

His personal palate of favourite products had been assembled over a 25 year period in the building industry from products that were "known to perform", (ie. he believed that they would not fail); building product innovations were only included if a new situation forced their consideration. All direct mail was thrown away, whilst trade representatives were only seen or spoken to by telephone if it related directly to a specific project. In this case study, communication with building product manufacturers was always initiated by the architect, supporting the active and passive models proposed above.

Two reasons for looking outside the palate of favourite products were recorded in the interview, namely technical substitution and a new situation. Technical substitution, would arise if the product in the architect's palate of favourite products was not suitable for the given situation. This would result in a search for information about other products, which may themselves eventually enter the palate of favourite products. A new situation would arise if the architect was engaged on a different building type to that normally commissioned, resulting in the need to search for different types of building products. (As noted in the example above). Both of these situations would result in the architect engaging in an active search for information.

Conclusion

This paper has proposed that the receptiveness of an architect to building product innovations is likely to be influenced by the particular stage of the project that the architect is working on. Rogers (p 164 1983) questioned whether it was the need for an innovation, or the awareness of an innovation, which comes first in the innovation-decision process. The case study has indicated that architects actively search out building product innovations when the need arises, and not before. It is not, therefore, the communication of information about building products to architects that is critical to the diffusion of building product innovations, it is the architect's ability to search out information about them.

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How Buildings can be Tailor-Made

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For starters I want to tell you an old Indian parable. This parable may be known to some of you, but I think it illustrates quite clearly what is happening in the building industry.

Once there was a king who sent for all the blind men in this town. When this had happened the king ordered one of his courtiers to show an elephant to the blind.
The courtiers made one of the blind touch the ear of the elephant and another the trunk. The others successively had to touch a tusk, a leg, and the tail. Each of them was told that what they were touching was an elephant. Afterwards the king interrogated the blind one by one. He asked them:' You studied the elephant, what is your conclusion?'
The man who touched the ear replied: 'An elephant is like a fan'. The blind who touched the trunk said: 'An elephant is like a plough'. Likewise the others came with the following comparisons: the tusk became a ploughshare, the leg a column, and the tail a broom. Each of them was very determined in what a elephant looked like.
Finally they started arguing en shouted at each other: 'an elephant is like this', 'no, an elephant is like that' and they started fighting. The king was very amused and smiled.

We can learn from this tale that people can look at things quite differently. They all pay attention to different aspects when confronted with the same topic. This is not only true for the blind in this tale, but also for scientists and people involved in the building industry.

In the process of building are many people involved, like: architects, product developers, project developers, advisors, contractors, subcontractors, producers, clients. And all these people have their own role in the building process. Sometimes people even combine roles. Because of this possibility, it is a better idea to look at tasks people may have in stead of looking at their professions. That is, if you are interested in the different aspects participants tend to look at when it comes to decide which product is going to be used in a building. An other reason to look at tasks rather then persons involved, is the fact that the traditional professions in the building industry usually consists of a group of people, an organisation, rather then one single man or woman.
A description of the tasks can be helpful to track down the aspects which are important to the different people and organisations involved in the building process. This is useful if you are going to develop a new product, because you have to anticipate the problems that can cause failure.
Considering the task of aesthetic design, for example, material, form and colour are important. But if you are looking from a more technical perspective, behaviour of the

product in fluctuating temperatures and weathering become interesting. Distinguishing different tasks may help to make an inventory of all aspects that should be looked at while developing a new product.

I continue this lecture from the perspective of the architect, but similar reports can be given for other professions or tasks.
To achieve a better grip on every aspect of appearance of your project, it is advisable to understand the processes for new product development. That is if you are interested in making special products, a product that is especially made for *your* building. This in contrast to a standard product. Most architects, however, choose to have a rather passive attitude when it comes to materialise their designs.

But if architects are interested in designing a tailor-made building for their customers, why not make that special product which completes the conceptual image of the project. The techniques of doing so at acceptable costs are there: simultaneous engineering, on-line connection-possibilities with manufacturers, calculation and visualisation techniques on computers. This all helps to shorten the lead-time. These techniques have already evolved in other industries. All these techniques don't come from nowhere. They all have to do with competition.
The phase model of Bolwijn & Kumpe[1] shows a trend in business marketing. They claim that businesses tend to compete on different aspects throughout the years.

from	*demands of the market*	*most important*	*type of company*
1970	price, quality	efficiency + quality	the quality firm
1980	price, quality, choice, time needed for delivery	efficiency + quality + flexibility	the flexible firm
1990	price, quality, choice, time needed for delivery, unicity	efficiency + quality + flexibility + innovation	the innovative firm

In the sixties price was the most important weapon in gaining the attention of the customer. Ten years later people were persuaded to look at quality as well. Later in the eighties more attention was paid to the time needed for delivery. And now, in the nineties you see a tendency towards the supply of unique products.
An example of this is the possibility to order a Levi's jeans tailored to your own measures in Canada. A clerk in the shop takes your measures and sends them on line to the factory together with your wishes about the colour, the fabric, the model etc. Levi's labels your jeans with a bar code. If after some time, you decide that you want an other pair, you phone in, give the number of your bar code and because the information of your measures is stored, Levi's knows how to make your own unique pants. This principle can also be used in the building industry.

If the architect decides to use special products in a building, he or she has to realise that the manufacturer is not just a retailer where the only possibility one has, is to purchase what is in the catalogue. The manufacturer has knowledge about what is possible with his production equipment and what is not. And he is able to give an estimation of the costs, the ways to reduce them and he has insight in the ways better product quality can be achieved. Therefore the manufacturer can be seen as an advisor, like a structural engineer. If we draw this parallel a little further, we realise that in order to be able to communicate on an equal basis, the architect has to have some basic knowledge about the processes of product development. For better results it would be helpful if the architect had knowledge of the following three topics.

Firstly, it is important to know something about the processes involved in the evolution from idea to product and *when* in these processes specific methods and techniques can be useful. Examples of these methods and techniques are: methods of organising product development and techniques for creativity, financial and quality control. Emphasis on knowledge of processes does not mean that obtaining insight in methods and techniques is a waste of energy, because it is not. The point is, that processes and tasks involved do not change over the years, while methods will. And as an architect you may not have time to keep up with all the latest possibilities, since the era of information technology comes with the problem of information overload. It is therefore a necessity to concentrate on generating knowledge of organisation and processes of product development. Knowledge of techniques and materials is where the manufacturer can be of assistance.

Secondly one should be able to distinguish the archetypal forms of an organisation for the processes of product development. Archetypes can help in order to be able to position a specific process. For example the difference between a serial and a parallel[2] development process.
If one looks at trends in business management one can distinguish a growing interest in simultaneous engineering, a combination of a parallel development process and teamwork. A form of this *within* an organisation, where people of different departments are put together in a team in order to develop a new product, is called matrix organisation. The goal of this type of organisation is to make a better product in a shorter time. It is remarkable that we already have a long tradition of teamwork in the building industry, because of the different specialisation's involved. In the building industry there are, however, a lot of problems like collisions of interests and problems of product responsibility. Now other industries become more interested in teamwork as well, we may want to find out if they are developing insights that may help in solving a couple of our problems.

Finally one has to be aware of the different tasks that people can have in this, like I discussed earlier. For example, who is going to design the new product in a certain situation, the architect or the manufacturer? Or is a form of co-operation a better solution?

Still, today, not a lot is known of the specific characteristics of the processes of product development in the building industry. To generate a theoretical knowledge of these processes one does not need to invent theories from scratch. In other industries a lot of research has been done and a lot can be learned from them. This is the reason that I decided to make a comparison of product development in different fields, the backbone of my research.

In concrete terms, this means comparing the processes for generating new components[3] for buildings with those used for developing new components for cars, trains, boats, satellites and televisions. The emphasis will be put on the relations of the processes involved with the design and development of components and the processes of design and development for the complete product.
By distinguishing parallels and differences for the different products, the characteristics of the processes of product development for building components become clearer, and new strategies for the building industry may evolve from this.

Equipped with a basic knowledge of the processes of product development, the architect, or any other person involved in the building industry, will be in a better position to orchestrate the processes of product development.

Notes

1 Translated by the lecturer from Dutch into English from the book *Marktgericht ondernemen; management van continuïteit en vernieuwing* written by P.T. Bolwijn & T. Kumpe.
2. Also known as concurrent engineering.
3. Definition of component as formulated in the article “Tussen produktontwikkelen en de-systematiseren” in *De Bouwadviseur,* May 1994 by Prof dr ir Mick Eekhout.

House of the Mechanical Muses

A museum of the technology and the history of the Polytechnic school in Torino

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Abstract
The research investigates some of the problems connected with the design of a museum that wants to become on one side a representative part of the city as a building but at the same time that could tell the story of the city itself. In its last two hundred years history Torino is impossible to be described and to be seen without the development and the growth of the industries. At the same time only the improvement of the school and the scientific research institutions with the Polytechnic school as one of the most important, could explain the reached results.
In many parts of the world new museums are increasing their importance becoming a sort of social and not only cultural focal point for the city life to refer to. The museum as a "laic cathedral" coming from the Nineteen Century tradition is transforming itself in a place where is possible to meet a new form of art, or if we want, a new form of intellectual activity: " the art of Memory ". We may also consider Memory as an autonomous entity able to create in the so called collective mind a resistance against any change attempt, or in others words able to create a protected area for men and women that want to connect themselves to the inner meaning of the zeitgeist they are living in. A museum dedicated to the history of the technology and the science is a place where you learn to see from another point of view the world surrounding you. Apparently banal things from the credit card to the refrigerator show their importance and influence in everyday life.
The approach used to the problem was in these two years a wide exploration of all the different languages used by man not directly involved with the theory of the architectural design in defining the work of the architects. To investigate this abstract but real existing collective mind is a way of trying to know the deeper desires of people and to give answer to the increasing demand of meaning in the way of living in our world. Comes to the mind the rewritten Cartesio sentence about life , not anymore "Cogito ergo sum" (I think, therefore I am), but "Memini, ergo sum" (I remember, therefore I am).

From the Muse to the Museum

Memory is the place where, in a defined way, is deposited the interrupted meaning of the whole.[1]

To speak about a museum also means to speak about the memory and the importance that memory has in our life. It should be better to say that when we fear to loose or to forget something that was important for our life, we feel the need of saving its recollection in a place where we can find it again and again whenever we decide to go and see it. This need can be described as an ambiguous balance between our deep desire of changing faster and faster and the influence of our memory that works as a source of resistance against all the changes of our life.

The museum as a place of memories can be considered as a "big railway station, like Proust has said, with the idea of the farewell, the idea of dying, but at the same time also the place where is always possible to come back"[2]. The museum is the place where the past is alive or better becomes again alive trough the *inventions* of our memory. I use for the result of the memory the word *invention* because in its Latin origin means something we can find also by chance, something we were not seeking for, something that we knew before but now appears entirely new to our eyes. This is the power of the memory as a mental faculty able to create new meanings using unusual connections between objects, situations, different historical or artistic periods. We can compare this attitude of the memory to the experience of making a piece of art. This *Art of the memory* finds the best place to exercises itself in the museum where we go to see objects that have lost their original meanings. For us "The man with the glove" is not anymore a portrait of an man lived during the Renaissance Time but "only" a painting by Tiziano.[3] Art has lost the social function that it had until the Nineteen Century. Since when the museum became the laic cathedral where is possible to experience the aesthetic pleasure of seeing all together the different periods of human history, the only means available to us for giving back life to this collection of dead objects is to use the memory as an instrument of research and investigation. Memory always deals with the emptiness, with the oblivion of the life, of the history, of the worlds of the objects. What memory does is to outline the border of an empty space, to describe an empty space where things, imagines and recollections are called back to a form, maybe only to the ghost of a new form that becomes alive and survives through us and in this way after us.[4] This situation is also the direct consequence of the fact that perhaps, after Hegel and his "Death of the Art" we have really reached the vanishing point of the Art. Using the words of Jean Baudrillard we can say that "the height of the refinement is to mean anything but however to mean something ...Art is nowadays disguised by the Idea. The Idea is disguised by the Art"[5]. For all these and others reasons in many parts of the world new museums are increasing their importance becoming a sort of social and not only cultural focal point for the city life to refer to. The imagine that architecture gives to the museum is not anymore related to the form and content of the collections. The architecture of the museum becomes more and more a piece of art in itself. The meaning that the building gives to the city goes beyond the function. In a few words the museums of the last generation try to become the flag of the modern cities. The museum as a building with its imagine and form tries to declare in a strong way how much the city identify itself as a place where the Modernity (or better the action of the modernity, that from the word is the action of the continuous forgetting to become new) can be associate with the idea of the memory and with the possibility of keeping a tradition in the way people look to their life. This means that a museum is not anymore a place where you go to visit a collection of objects trying to tell you a story but is a place in which you can look for a story or better where you create your own story being interactive with the space, the colour, the sound and all the elements you meet.

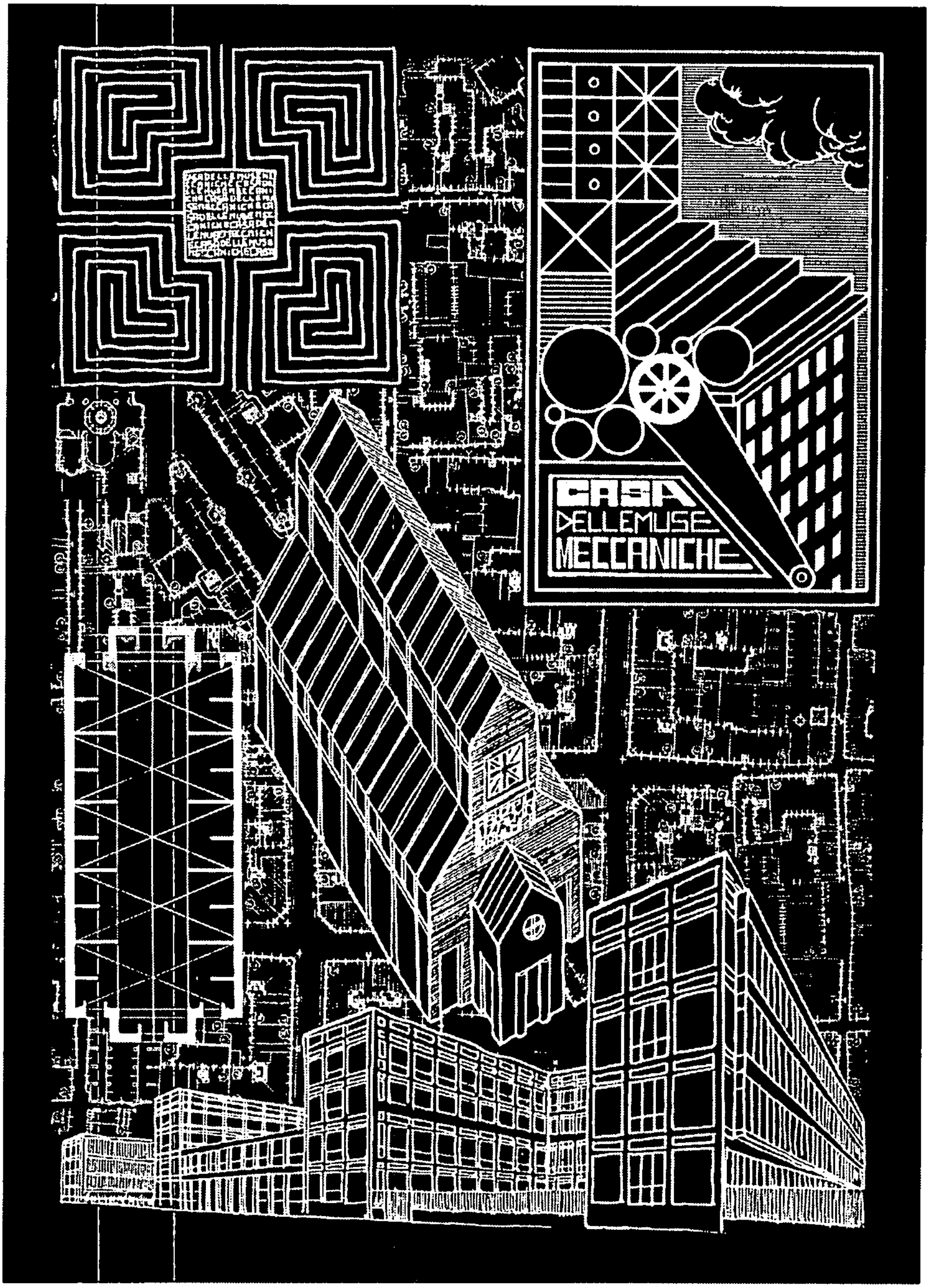

Figure 1: Carlo Ostorero "House of the Mechanical Muses"
Drawing for the catalogue "Actuality of the urban shape- research for the architecture in the Italian universities". Triennale di Milano. Milan 1995

House of the Mechanical Muses

The research carried on during these two years investigates some of the problems connected with the design of a museum that wants to become on one side a representative part of the city as a building but at the same time that could tell the story of the city itself. A so considered industrial town as Torino is living all the contradictions connected with the changes of the fourth industrial revolution. In its last two hundred years history Torino is impossible to be described and to be seen without the development and the growth of the industries. At the same time only the improvement of the school and the scientific research institutions with the Polytechnic school as one of the most important, could explain the reached results.

A museum dedicated to the history of the technology and the science is a place where you learn to see from another point of view the world surrounding you. It must be a place in which you can see, for instance, a refrigerator not only as a mass-produced article, (for this is enough any museum of contemporary art) but also as a re-engaged history of the cold.

The design of a building has to be able to give and not to take away meaning from the endless series of objects apparently banal, but with a deep influence on everyone life and the possibility to find in it the meaning of the too fast to be understood changes that technology makes in our life is the goal of the research.

The approach used to the problem was a wide exploration of all the different languages used by man not directly involved with the theory of the architectural design in defining the work of the architects. The translation of these ideas into forms and volumes understandable for everybody is a matter connected with the already called "art of memory". To investigate this abstract but real existing collective mind is a way of trying to know the deeper desires of people and to give answer to the increasing demand of meaning in the way of living in our world.

To use the language as a start of the research means to give back importance to the vocabulary of thousands lost words. Too many times is possible to understand in our work how much the words have lost their original meaning. Many of them have been falsified by the wrong use of them in the media (newspapers, T.V.). In Italian for instance, is very easy to refer an endless series of negative meanings to the words *concrete* and *cemen*t because they were always used speaking about bad speculations in the construction industry.

From another point of view is clear to everybody how weak and not anymore enough rich is our technical language when we try to speak about the conditions of the buildings. Many times we are obliged to use words taken from medicine to explain problems connected with the restoration or the refurbishment of the building. Also for these reason the problem of the design of a museum of science and technology is a matter of defining the language or the different languages that will be used to give back names ad meanings to the objects. Architecture has to be the means that translates into understandable imagines all the world of objects surroundings us in normal life and loosing their meaning faster and faster. Is easy to understand this only looking a movie ten years old. Everything seems to belong to a past we have forgotten and we can not recognise anymore and we have this perception most of all from the normal things we see in the story told by the movie : a T.V. set, a car, a dress.

This is the challenge for the design: *how to speak to the memory of everybody.*

This is the way we can use hoping to survive.

Comes to the mind the rewritten Cartesio sentence about life , not anymore “Cogito ergo sum“ (I think, therefore I am), but “Memini, ergo sum“ (I remember, therefore I am).

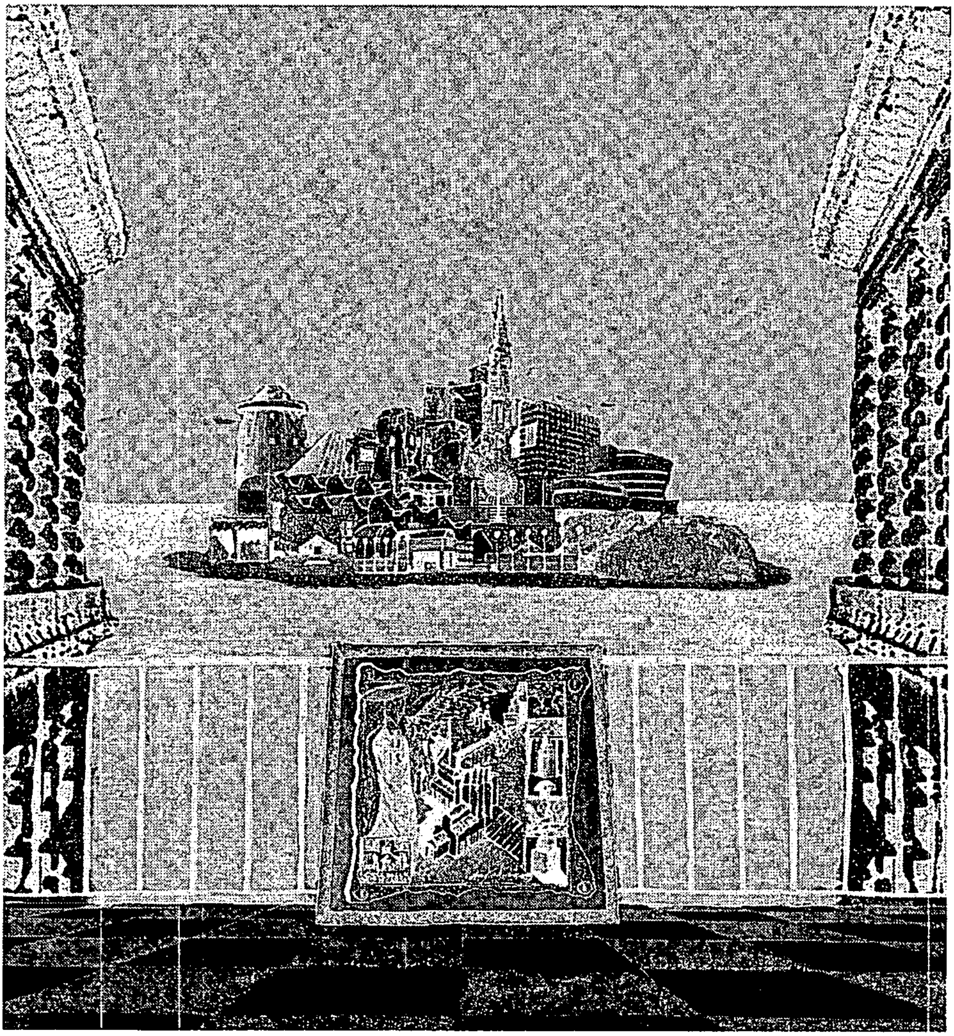

Figure 2: Carlo Ostorero “The island of the Museums”
Drawing for the exhibition “Actuality of the urban shape- research for the architecture in the Italian universities”. Triennale di Milano. Milan November 1995

Notes

1. The sentence is taken from "Modernità e memoria" Modernity and Memory) by Perone Ugo (1987) and from a reference in the same book by H.G.Gadamer. In our time Memory can't be simply considered anymore as one of the mental faculties, but as one of the most important character of our way of living. We remember something and not everything and the use of the Memory is connected to the *action of forgetting*. To forget is not only connected to the loss or to the lack of something, but most of all, as Nietzsche says, it can be considered as a condition for the life of the spirit.
2. See the complete lecture given by Alexander Van Gravenstein, Director of the Bonnefanten Museum in Maastricht, with Aldo Rossi and Umberto Barbieri at the Faculty of Architecture in Venice, 1992-93.
3. This concept is well explained by André Malraux in his book "Le voix du silence".
4. About this matter is interesting to remember what Maurice Blanchot has written about the Poetry in its "Oublieuse Mémoire":
   "The poetry is memory: the sentence is ancient. The Memory is the Muse. Who sings, sings thanking a memory and trough memories gives the possibility to everybody to remember."
5. Jean Baudrillard use the paradox like in his sentence "Just as the world drives towards a delirious state of things, we must drive towards a delirious point of view" to outline the condition we live in our time. He calls the *Xerox point of the culture* the world of the imagines surroundings us, a world of imagines that has nothing to show, in witch three is nothing to see.

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Connections Between Components
A design method

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Exordial
Since January of this year I am working on a PhD study on a design method for connections between components used in prefabricated building. For the congress on "Doctorates in Architecture and Design", with this lecture I would like to inform on the findings in this research on connections between components so far. I will try to make clear why it is I think these connections are interesting and how these connections can be employed usefully, for me assumes the people here are, like I am, interested in the consequences of the use of components for architecture and architect. I figure it wise to go into the phenomenon prefabrication' at the beginning of this speech. After that I will talk about 'component' and finally I will go into the matter of 'connection'.

Prefabrication
It is my solid believe that in the future all products forming a building will be prefabricated. The only thing taking place at the building spot will be the official delivery of the completed building. To accomplish this, all good qualities of prefabrication within the possibilities of our nowadays society have to be employed.
One important factor in the succeeding of the method of prefabrication is the development of connections between the products used, especially the connections fabricated at the building site. Because: how far prefabrication in building may be developed, somewhere in the building process products have to form a whole. Prefabrication implies the fabrication of building products, constructed apart from the material context of the final building. Think about the fabrication of building products in a plant or factory. The production process can be controlled extensively. Fabrication and inspection of the products can take place in an optimized environment.

The most important consequences are first that the building process is less depending on unpredictable weather circumstances: the worker does not have to climb a scaffolding in the pouring rain carrying a huge piece if paper just to see if he can fix some bit of a job. Secondly the available manpower can be used efficiently without them having to travel from project to project. It is like the mountain has come to Mohammed: it is like the building is moving instead of the worker. Thirdly the materials used to make the products can be exploited to the maximum, there is much less left over material and waste. Thus can be expected that with the help of prefabrication technology, building in a manor of higher technical standard is possible, under better circumstances, with care for environment, more beautiful and cheaper. To utilize the potential of this technology it is necessary to thoroughly analyse and understand the concept's range of logic. By looking at the results obtained with prefabrication analysing how to do better is possible. Such an analysis can guide the further working-out of the concept. Only by following this chain and feeding back "input /result/analyses/adjustment" this assumption can be fulfilled. The five characteristics: of higher technical standard, under better circumstances, with care for environment, more beautiful and cheaper, are used as the core of the logic of the prefabrication concept.

Components

The component is a product from a series that can be used in the building process (1: Eekhout, 1994). It is specific to a component, it is an entity: a more or less self supporting piece of the building. Therefore it is very much likely to come from prefabrication. Prefabrication in building is not new, see for example some centuries ago. Window frames were fabricated in winter for a building to be built next summer, which was, so to speak, not even planned. That was a case of prefabrication of elements: from the half product wooden part' window posts were shaped to profile to be composed to the element window frame'. The prefabrication of components is even a step further. Then not only elements are prefabricated, but large pieces of building parts are made from several elements in a factory: the components. When done they will be transported to the building site where they will be assembled into the building parts that will form the final building. Thus, these components have a high level of independence, functionally and constructively.

In short: component' issues a category building products that in the hierarchy are close to the final product, the building. With the nowadays and future application of the logic of the prefab concept, the component forms an evident link. With the introduction of the component yet another part of the building process has been made independent of the hard to control influences from the world outside.

Connections

As I already stated, the connections between components are the main items of this research. The goal is to gain notions about the lay out of connections between the products used to build, by way of analyses of all possible sorts of connections. It has appeared to be important to be aware of the idea that the products in different levels may need different methods of being joined: the picture gets clear that connections between products on different levels may have differing natures. The following three prepositions are meant as an illustration on how utilizing these specific qualities can give extra weight to the use of components.

Preposition one

'Reducing the hard works of the assembly of components down to zero is possible'. One quality that stands out as product level attached, is in how much ease the connection can be taken apart: the extent of destruction the disconnection of the parts inflicts. As the product level, on which connections has to be made, is lower in the hierarchy, which is closer to the raw materials that is, the nature of the connections is more aggressive. Like this, the connection between the materials forming the half products are often glued, like for example plasterboard consists of paper sticking to a core of gypsum. At another level of products the element "window frame" consists of the half product "window posts" screwed together. In the same way components using connections in the nature of their level can be supposed to be joined by hanging them together. Over the sequencing following levels, the connections appear to be less difficult to take apart without damaging the products used. When these two trends are elaborated, constructing building segments without further work should be possible. There are two reasons for wanting to achieve this. Firstly: the quality of the final product. With the high quality of the components the restriction in quality shifts from the product itself to its connections, especially the connections that still have to be made at the building location. These works are the hardest to control. Designing the connections in such way is obvious, no complicated works are necessary when on the building site. Secondly: improvement of the labour circumstances. One consequence of shifting work from the building site to the factory is that the products handled on the building site are so big that the worker can't handle them manually anymore. Therefor instead of manpower machine power must be used. One advantage is thus that the worker cannot strain himself in lifting.

Preposition two

'To exploit the maximal duration of the used products the connections must be worked out on all the different levels of products'. Not only offers the controlled building process at the factory the possibility of using the applied materials and products more efficiently, but by finding the right balance between the products, use of the maximum duration of the several materials can be reached (2: Brouwer, 1995). The potentially available hierarchic structure in building with prefabricated products makes it possible to handle these differences in duration by joining the connection to certain groups of products. A tradition exists in handling building components like they were a random building material, only bigger and more of that: the component is unscrupulous made an inseparable part of the surrounding construction. Because of this, monolith constructions are produced which are unlikely to be changed ever again. Therefor components need to be not only easy to assemble, but easy to be disassembled as well. When a component for whatever reason does not reach the user's demands, because for instance a higher insulation value is needed or the preference of the appearance has changed, it should possible to be removed from the building easily, without having to demolish big parts of the construction. Then the components can be revitalized or replaced. A component is assembled from elements. To be able to recondition the component, elements in the component can be, eventually after repair, used again, possibly in a new configuration. The success of this concept depends on how the elements are made up in itself. When the composing parts of the element can be taken apart without destruction, the component can become a product with a high trade-in value, under the condition that the properties of the connections are developed and fixated by the product level.

Preposition three

'To make architecture with prefabricated products, tuning the products and their connections for product development within the range of the logic of the concept of prefabrication is necessary. Two aspects are expressly active: first the position that the industrially fabricated product may have in architecture and secondly the expression that the connection may claim in architecture. It is useful to note that the use of prefabricated products leads to building methods strongly dominated by building products fabricated in an industrial way. This is one reason building in prefabricated products

may be oriented on mass production. Nowadays and recent past practice shows: repetition of large parts and production in small variety in large amounts. This aspect of prefabrication appears to affect adversely, for the esthetic of the thus created architecture may be rejected. To design architecture accepted on a broad base in society, the image quality may be a precondition. For obtaining this aspect a well-considered scale and measurement of repetition and variation are indispensable (3: de Jong/ Ravesloot, 1995). In accordance with this research, establishing the relation between the industrialized fabrication of products and their connections is important, to give the architect the possibility to control the architectural effects from these products with the design method for connections. This may lead to a pollination between my research and the area for attention of the image quality: what product levels are in this prospect eminent for industrialized fabricated products and what does that mean for the connection and vice versa: what plan of connections makes industrialized production possible on certain levels.
Concerning the connections I would like to say this. Compared with the qualitatively superior prefab components, the connection is retarded: the connection is often not much more than a luted line killing any expression in the architecture. By developing a design method for connections between components, we may give way to fine connections that are significant throughout all levels of the architectonic design. Highly appreciated designs from the past show-off especially because of the sophisticated connections between what may be interpreted as components a priori. Examples to speak for itself are connections created in buildings from the architecture style known as the Amsterdam School': at the spot where different components' meet, an exception is found. This was done then, about eighty years ago, with the craftsmanship of the skilled workmen who adapted with their own knowledge to each others products and production methods (4: van Stigt, 1992). Nowadays craftspeople are hard to come by and workers cannot handle problems on the spot cunningly. Therefor we must either stay ahead of problems or solve them in advance. The design method gives insight on the issue of connections, thus making it possible to control the aspects of connections between components. This creates the freedom to imply architectural expression.

Conclusion
Conclusive I would like to summarize what has passed. With the growing part of prefabrication in building, the component will gain importance. For the component makes extended profiting of the advantages from prefabrication possible. With the introduction of the component it is good to form the characteristics of the connections further to gain even more from the concept of prefabricated building. One of these characteristics is the possibility to detach a connection. By the effect of joining this characteristic to the levels of products, connections can be kept simple to make at the building site. Furthermore the durations of materials can be used to their maximum. Finally the development of a connection design method may give the architect the control over the effects of the use of industrially fabricated products on the one hand and the appearance of the connections on the other hand.

Notes

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Analysis of Oeuvres

Theorie and Practice of Artistic Creation in the Early 17th Century
The Poetic Model of Salomon De Caus

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Abstract
This study examines the status of theory in its relation to artistic practice in the "post-renaissance-pre-scientific" world of the early 17th century, as exemplified in the prolific work of the Architect and Engineer Salomon de Caus (1576-1626). De Caus wrote four theoretical treatises on Perspective, Machines, Music and Sundials. In his practice he designed gardens and grottoes with spectacular machinery for different European courts. His treatises relate to the new type of technical texts that emerged in the late 16th century testifying to the increasing respect for the knowledge of the practicing artisan. From a close study of De Caus' writings on music, where he touches on the theory, practice and actual "production" of the art, as well as from an analysis of the general composition of his texts, it can be shown that the relationship between theoretical discourse and artistic practice was of a dynamic coexistential nature. Theory and practice converged in what was the fundamental justification of human production at the time: the mediation of knowledge of the immaterial and Divine through worldly matter. Neither theory nor practice was independent of the unstable existence of the man-made world, but rather provided vital instruments for the perfection of art.

This interpretation of De Caus' works reveals a poetic model for the making of artifacts in a world where the ultimate meaning resided in the Divine. Today, the disclosure of this model might suggest alternative approaches to reconnect the parted worlds of theory and practice in contemporary architectural production.

This paper is based on research presented in *Automata, Perspective and Music: Poetic Instruments in the Written Garden of Salomon de Caus*, M.Arch. Thesis, McGill University, 1995. Advisor: Prof. Alberto Pérez-Gómez.

Introduction

In this paper selected works of the early 17th century architect Salomon de Caus will be examined with the intention of disclosing the theoretical foundation behind his written and built works. It will be argued that the aim of artistic production at this time essentially was to convey a specific kind of knowledge: the knowledge of the world as a Divine creation. The work of the artist, whether a painting, a sculpture, a building, a garden or even a musical or theatrical performance, was a means to bring down a glimpse of the immaterial Divine to mortal man (Hart 1994).. The "post-renaissance-pre-scientific" world of Northern Europe in the early 17th century was a time of transformation characterized by many different and often conflicting ideas. In studies of contemporary characters such as Bacon, Kepler and Fludd, as well as of De Caus, a difficulty with placing them in any specific strain of thought is encountered. They are all found to, if studied from only one contemporary viewpoint, partially contradict themselves (Rossi 1978, DaCosta Kaufmann 1993). The length of this paper allows no space for outlining in depth the particulars of De Caus influences. However, I will give a brief biography followed by an account of the most important factors behind his ideas.

Salomon de Caus was a French Calvinist who was born in Normandy in 1576 and died in Paris 1626[1]. His family moved to England in the 1590:s and he spent most of his life outside France, working in different European Courts as Architect and Engineer designing and constructing gardens and garden machinery. His designs were influenced by Italian Renaissance gardens, which he is known to have visited. Not much is known of his formal education but in his texts he shows a familiarity with classical authors such as Hero of Alexandria, Vitruvius, Pliny, Euclid and Boethius, as well as contemporary writers on mechanics and music theory; Jacob Besson, Augustin Ramelly, Pontus de Tyard and Gioseffo Zarlino. De Caus wrote four treatises on Perspective (*La Perspective avec la raison des ombres et miroirs*, London 1612), Machines (*Les Raisons des forces mouvantes*, Francfort 1615), Music (*Institution Harmonique*, Francfort 1615) and Sundials (*La Pratique et demonstration des horloges solaires*, Paris 1624). At the time when the first three were written, De Caus was employed by the courts of Queen Anne and Prince Henry (1607-1613) and by the Palatinate court in Heidelberg for Frederick V (1613-1619). In Heidelberg he designed the Palace gardens which became famous and marveled at as the "eighth wonder of the world" (Fehrle-Burger 1962).

Being an artist employed by the Protestant Courts in England and Heidelberg, De Caus was part of the hierarchical and essentially neoplatonic power-structure dominating these Courts at the time (Tillyard). The King was regarded God's representative on earth and the artist was employed as a "magus" who, working according to the principles of natural magic,[2] would ensure good influences from the macrocosm. The work of the artist was thought to momentarily connect the macrocosm of the Divine to the microcosm of man. Gardens played an important role in this context. The garden was a site for theatrical performances, the Royal Masques, where the King often participated embodying the Divine connection; and the place for intricate grottoes with automata (moving statues) and water-works, enacting classical myths (Hart 1994). The garden also expressed the desire to recreate on earth the Garden of Eden, an important dream for the Protestant movement of the 16th and 17th centuries (Yates 1972).

In his treatises De Caus appears as a faithful Christian. Calvinism, along with other Protestant movements, carried the spirit of the Humanist Renaissance in its criticism of authoritative structures and belief in power of the individual man to change his situation (Encyclopaedia Brittannica). In his *Institutes of Christian Religion* (1536) John Calvin particularly emphasized the duty of each individual to seek and spread the knowledge of God through a close study of the three testimonies to his eternal presence; *man*, *nature* and the *Holy Scriptures*. For the Calvinist the seeking of knowledge was no longer a privilege but every man's duty, and the sources were no longer primarily classical texts, but Nature herself and man, the image of God. In many aspects

De Caus' works can be explained from this Calvinist outlook: both in his ambition to make his knowledge accessible outside of the "profession" and in his selection of topics where he disclosed the reasons behind the forces of nature, the principles of perspective, the composition of music and the shadows cast by the sun. De Caus' treatises can also be read as an indirect result of the humanist movement for universal learning - the enlightenment of all men - which culminated in the 17th century[3].

Between Theory and Practice

A particularly interesting feature of De Caus' treatises is that he wrote as a practitioner for the use of other practitioners. On one level they are simple hand-books explaining *how to* draw perspective, construct machines, compose music and make sundials. But the titles and the composition of the works also reveal a different level which aims at something more. De Caus began all his treatises from the perspective of the deeper question *why* which followed his own mastery of the *how* to construct machines. Not only the *how to do* but also the *why does it work* had to be understood in order to become a good practitioner in De Caus fields. For De Caus, the most foundational justification of *all* human practice was nothing less than the desire to reveal and understand this fundamental question.

De Caus' organized his topics around the principle of composition found in Euclid's *Elements of Geometry*. He thus began the treatises with necessary definitions of a priori facts and concepts for the science at hand. From the definitions the theorems unfolded and at last the "demonstrations", or "problems" followed in which De Caus brought in specific examples and explained how to, for example "make an admirable machine which is at the base of a statue, sounding when the sun rises or when the sun sets so that it seems as if the statue made the sound." (Fig. 1, De Caus 1615b, Probl. 35). By employing the structure of geometrical discourse De Caus forced the reader to follow a specific logic, the logic of Euclidean geometry. This logic was, according to Aristotle, derived from human reason; *the reason dwelling in the human soul,* (Euclid 1956, intro.) and the employment of this structure would hence make it natural for the reader to comprehend and to remember what had been explained. With the help of the structure, De Caus moreover appears to put his knowledge (primarily derived from practice) on almost equal footing with Geometry, which was a respected and largely theoretical science. His concern with conveying the knowledge in the most natural and efficient way (i.e. through the geometrical principles guiding human reason) thus went hand in hand with his ambition to put forward, as a science, the fruits of practice.

De Caus was not alone in writing this kind of "quasi-theoretical" hand-books, but it was a relatively recent phenomena beginning in the 16th century. It developed from an increasing respect for the knowledge of the artisan, acknowledging practical experience as an important *source* of true knowledge (Rossi 1970). Theory was thus given a new role as the *fruit* of practice, rather than its opposite. A parallel development took place in Renaissance music where the art of composition and the *musica speculativa* began to inform each other. The marriage of theory and practice was on one hand a consequence of the humanists' desire to regain what they considered a classical virtue (Palisca 1961) and on the other a result of changing musical practice. The complexity of polyphonic music gave rise to a demand from the practitioners (i.e. the composers) of a firmer theoretical foundation (Palisca 1985).

The "Archemaster"

Salomon de Caus' practice appears in the eyes of our time to have been extremely diverse, but in the eyes of his contemporaries his different activities fitted well into their definition of a Vitruvian architect. Extracts from the *Ten Books on Architecture* was first brought into the English language by Dr. John Dee in his preface to the 1570 edition of Euclid's elements. This text had a major impact on the artisan class in England and its influence coloured the atmosphere at the court where De Caus practised when he prepared his treatises (Yates 1969). In the preface Dee classifies nineteen *mathematicall artes;* where architecture is one, perspective and music others. He also defines an art called *thaumaturgy*, which was the art of making "wonders" and includes the construction of remarkable machines such as automata, the moving statues which was De Caus' specialty.

In the Vitruvian tradition architecture was considered a subject containing many different arts and sciences within it. All these sciences were interconnected in the "Encyclopaedia" , the universal frame of knowledge, which assisted the process of acquiring mastery of the profession. (Vitruve 1964, Book I, fol.4) Dee's nineteen *mathematicall artes* can be considered as defining the field of knowledge necessary for an Architect, or in Dee's terminology an *Archemaster* (Wagler 1995) While Vitruvius saw *Architecture* as the chief art comprising all others, Dee formulated a different one, the art of *Archemastrie.* This art was defined as what brought to *actual experience* what all other mathematical arts proposed. Dee's emphasis on experience is very interesting in connection to the above outlined shift of the traditional position of theory in relation to practice. Only through human experience would theoretical knowledge be productive in the sense of becoming materialized and brought into the human soul (Grillner 1995, pp16-20).

Both De Caus and Inigo Jones, his colleague while working for the English Court, emphasized the importance of human experience in their work. While De Caus applied his technical skill to garden machinery, Inigo Jones focused on theatrical illusions. Both used similar mechanical and hydraulic principles. De Caus explains his machines both from the point of view of the constructor and of the experiencing subject. In the introduction to his treatises he also expresses a concern for explaining well his subject and says that he rather "writes too much than too little" (De Caus 1624). De Caus is thus conscious of the importance of both *what* he writes and *how* he writes it, for the mediation of knowledge from one person to another. The works which his treatises taught the reader to realize, *as well as* his own writings, aimed at making the order of Nature and the Divine appear to the human senses and reason through the experience of wonder and beauty. True knowledge of the sciences De Caus taught could only be conveyed through *appearance.* (On architecture as appearance and epistemological structure, see Kagis McEwen 1994). For these purposes De Caus utilized the immutable principles of Nature, the nature of human perception and understanding and the eternal provider of light and motion, God. He was a true *Archemaster.*

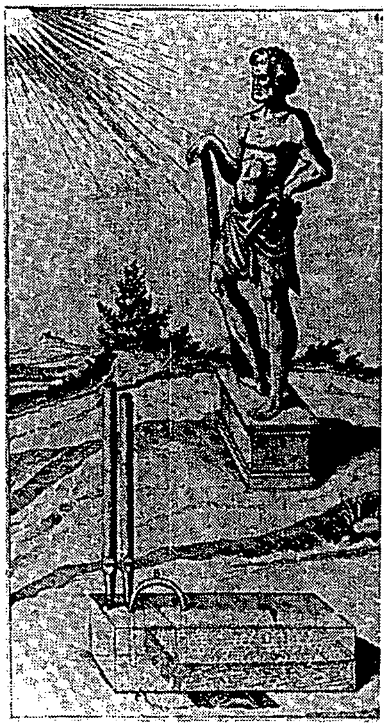

Figure 1a: *"An admirable machine which is at the base of a statue, sounding when the sun rises...so that it seems as if the statue made the sound." Based on the story of the Egyptian statue of Memnon - "dawn" - de Caus in this machine employs ancient myth and the figure of Hercules to call to the reader's attention the virtues of an active life. (De Caus 1615b, Book I, Prob. 35).*

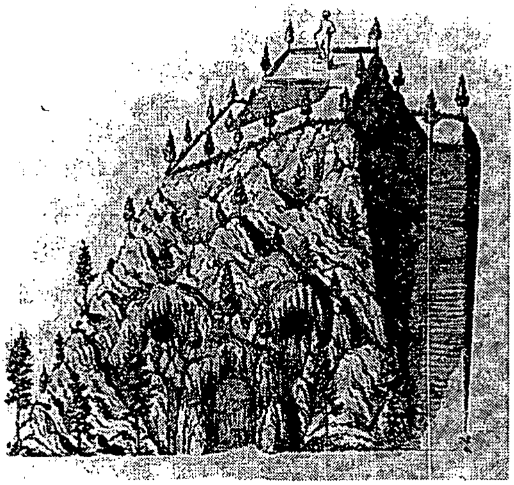

Figure 1b: *Placed at the top of a pyramidal mountain, the statue will be the first to be struck by the rays of the sun and, with music, announce the beginning of a new day. (De Caus 1615b, Book II, Prob. 10).*

Instruments of Knowledge
This emphasis on knowledge gained through experience, particular to the Late-Renaissance world of De Caus, might be illustrated through De Caus' writings on music. His *Institution Harmonique* (1615) is entirely devoted to the Divine Science of Music[4] and is divided into two parts. The first deals with theory and the second with practice, the art of composing. In *Les Raisons des forces mouvantes* (1615) the third part teaches the construction of organs, the musical instrument which De Caus considered the most advanced. His writings thus cover the three essential aspects of the science of music: its universal and divine principles, the rules for the correct application of these principles in *writing* music, and, what was the most important, the means for realizing the composition; the instrument which through music opened the Divine principles to human experience.

In the western tradition, music had a superior position due to its correspondence with the harmony of the heavenly spheres and the spiritual element through which it was mediated to the senses, *air.* In Plato s *Timaeus* both the elemental, visible world and the invisible world were structured according to geometrical proportions which were also the basis for the musical consonances discovered by Pythagoras (Plato 1971). The theory of music therefore constituted a theory of the cosmos, the music of the world. The structural analogy between the human body and soul, the microcosm; and the material world and its soul, the macrocosm; gave music a particular role as the spiritual messenger from the celestial spheres to man (Hart 1994) Following this tradition Boethius, the Roman philosopher, had divided music into three kinds; *musica mundana* (cosmic music, the celestial harmony), *musica humana* (human music, the bodily harmony) and *musica instrumentalis* (instrumental music, that is *audible* music) (Boethius 1989). This three-part division represented the two separate levels of reality; the immutable and the corruptible spheres, as well as the medium which constituted the possibility of their interaction, the *instrument.*

When introducing the art of making organs, De Caus pays particular attention to the meaning of the word *Organo*, in order to define the nature of the organ. He brings up its Greek origin, where it signified instrument: "a general name for all that there is through which another thing is made, as a hammer, a saw, a knife... are organs through which a work is put to perfection, so are all kinds of musical instruments called organs and the work which shall be made through them is music." (De Caus 1615b, Book III, Intro.). De Caus implies an elevated position for the organ. In its etymological origin it is the "tool of tools", it is also the instrument which, according to De Caus, manages the closest representation of the human voice. He moreover develops specific analogies between the parts of the organ and the parts of the human body, based on either functional or visual similarities. Following this praise of the organ, De Caus continues to explain what it takes to become a good organ-maker. It "requires a man who has the knowledge of at least three arts; firstly he needs to be a good musician; as much in theory,.... as in practice,..., secondly he has to know the art of plumbing,..., thirdly it is also necessary that he has a good knowledge of carpentry..." De Caus clearly emphasizes that this art depends on more than the hands of the skillful artisan. He refers to it as a science and establishes its basis in musical theory.

The concept of *instrument* was used in the early 17th century as a wide metaphor, connected to the process of learning with its origin in the Latin verb *instruere*. Through its related nouns *machine* and *engine* it was also etymologically related to thinking (*machiner*) and the spirit (*ingenium*) (Furetiere 1690) The spirit, *l'esprit*, was regarded as the *souffle vital,* the life giving breath and the principle of life, reason and understanding (Larousse 1992). Connections between the literal meaning of a word and its more metaphorical levels, as exemplified here, must be considered in relation to the Late-Renaissance view of the world as organized through a principle of correspondence. As much as the universe consisted of corresponding planes constituting different spheres of reality, interconnected through analogies (Tillyard), so did the words and the things hold different layers of meaning, all equally *real*. For example, Jacob Boehme, a 17th century German mystic and shoe-maker, considered everything that existed in God's creation and all that man had made as *instruments* which could, if played upon by the divine spirit of the human soul, be used to reach knowledge of God (Boehme 1989). In the operation of hydraulic machines the spirit of man and of nature was at work and by inventing a machine, man breathed his spirit, or soul, into it.

Having broadened our understanding of the concept of instrument, the significance of De Caus book on the art of making organs might appear clearer. The organ was not only a technologically advanced hydraulic machine, but it was the instrument which most closely imitated the human voice, which in turn was of God's making. Seeing that music in its widest sense encompassed the whole cosmos, and that the instrumental music, the tones produced by the organ, was considered the most efficient medium through which to reach deeper knowledge of the Divine; we might speculate if the master of organ-making could not have held in his hands the keys to the New Jerusalem - the utopian dream of the reformed church at the time?

The *musica instrumentalis* as the aural product of human artifice was what established the medium for the understanding of God in man. De Caus' book on the art of making organs complements the *musica mundana* and *humana* of his *Institution Harmonique*. Without the organ, supplying the means of perfecting without taking part itself, both the composer and the philosopher would stand helpless and unable to establish the connection between man and God, microcosm and macrocosm. The book appears to have been placed as a link between the treatise on machines, *Les Raisons des forces mouvantes,* and the treatise on music, *Institution Harmonique*, signifying their mutual dependence. It moreover represented the link between theory and practice, in the field of music, as well as in other fields concerning human production. The model applying to music, could to a large extent be generalized, considering its status as a Divine science, encompassing the whole Divine creation. The actual performance of music, might be regarded as only one of many possible manifestations of the *musica instrumentalis*. Only at the moment of experience was the artifact at work . The building performed to its visitors through the architect, as much as the instrument through the musician. Knowledge was conveyed in the play between the artifact and its user .

Conclusion

This interpretation of De Caus' works reveals a poetic model for the making of artifacts in a world where the ultimate meaning resided in the Divine. What has been shown through the reading of De Caus works, in particular these two treatises, is that the instrument, not only in a metaphorical way, but also in a concrete and literal way, was still considered an intrinsic part of the conveyance of knowledge in the period preceding the era of the scientific revolution. All human artifacts thus had a crucial role to play as keys to the understanding of the whole cosmos, which of course only God could fully grasp. Had man not lived under the curse of materiality, he would, as the angels, have had access to immediate comprehension. But since his Fall, man could never recover that angelical state, only through matter could he strive towards his beginning and end in God.

What is then the significance of this study to the present condition of the architectural profession? The relationship between theory and practice today has a very different but also more problematic nature compared to the 17th century environment of De Caus. There is generally a deep gap between these two "sides of the coin" while they remain fundamental concepts for all human action. In architecture this gap is represented on many levels. For example in the split between architectural research and professional practice. Through studies of historical situations where a more dynamic relation between theory and practice appears to have existed, light might be shed on the conditions governing this relation today. The three-part model described above depended on two poles - the time-less and the temporal, or the eternal and the corruptible - which were united through a third agent - the medium making human experience possible. Today, living in a culture which has lost those eternal values this model might be difficult to uphold. Nevertheless, I believe those concepts still to be necessary. Even though the solid will always melt into air , we depend on the thought of its momentary existence if we are to understand the world around us and ourselves. The disclosure of De Caus' poetic model might suggest alternative approaches to reconnect the parted worlds of theory and practice in contemporary architectural production.

Notes

1. The biographical data are gathered from secondary sources treating De Caus: Maks 1934, Yates 1972, Strong 1979 (pp72-112), Conan 1981.
2. Natural magic was believed to operate through the interconnecting paths running between different parts of the cosmos (Mebane 1989). For example; in imitating well the celestial movements in music, benign influences of the stars were believed to be brought down to man (Ficino 1980).
3. Representative works are Francis Bacon *The Advancement of Learning* (1606), Johann Amos Comenius *The Great Didactic* (1627) and *Pampaedia* (1650) and Tommaso Campanella *Civitas Solis* (1623). See also Yates 1972.
4. De Caus made a distinction between Divine sciences (instituted by God), human sciences (founded upon human reason) and those invented by man out of necessity (as for example mechanics). Particular to the Divine sciences, which were music and astronomy, was that the deepest truth about them would only ever be known by God. (De Caus 1615a, 1624; Grillner 1995, pp50-52).

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"Continuita" and Crises: the Theoretical and Design Approach of Ernesto Nathan Rogers in the Architectural Post-War Debate

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Trying to describe the relevant change in modern urban life, Walter Benjamin, in his essay dedicated to "Baudelaire and Paris" (1), demonstrated the importance of the "shock" as the new , existential condition of modern man. The "traditional" cultural and social dimension progressively disintegrated under a series of continual crises which crosses daily people's lives. The existential condition of modernity represented a radical change in the relationship between individual cognitive process and stratified reality. The "loss of aura" (2), which synthesized the new, tragic condition of the modern artist, introduced immediately the core of the problematique evolution of modern culture: the conflictual relationship between the intellectual, his creative process, and reality, without a medium of shared tradition. Modern design suffered, and continues to suffer, in this state that is however one of the "natural" characters of its evolution, having to struggle with a dogmatic anti-historicism, and the want to individuate a tradition of Modernism. At the same time we can't understand the evolution of a modern architectural discipline, and the weakness of its ideological paradygms, without analyzing the radical change of our social and economic background. Continuity and crises are the characters of a natural historical opposition which became stronger in the last century, and, simultaneously the main elements of focus in the evolution of individual ideology (3). What is the real incidence of a collective event in the elaboration of a creative process? We consider creative process and its products as part of an "ideological environment"(4). Individual experience and collective dimension are linked in the study of the evolution of a cognitive process in relation with mentalities and events. At the same time historical research dedicated to the analisys of artist's work should focus on a better definition of elements like "collective mentality" and "historical background".

We need to individuate the main characters of an etherogeneous form of relationship, generational models, and type of education and language that may help us to show a different geography of human relationship, and knowledge exchange. The nature and the character of a "paradygm" (5) have to be analyzed in depth, as it is with the nature of the relationship between a shared paradygm and an individual creative process.

The aim of this research-study is to focus on the process of individual learning values in relation with practice, and the theory of modern design in a post-war Italian context. This study, moving from the analisys of the theoretical and creative experience of the Italian architect Ernesto Nathan Rogers, tries to develop a research method which can analyze the complex framework of the individual reasoning process in relation with collective events, and with a stratified geography of social, political and economical relationships. The "case" of E.N.Rogers is relevant in the analyzis of the rise and evolution of a new paradygm in Italian architecture from the late 20s until the early 60s,

and , it simultaneously evidences an interesting link between his theoretical experience and the evolution of the Italian context.
The relevance of Rogers' role, mostly in the post-war debate, can be determined through the in-depth study of his theoretical elaborations which are closely connected with the architectural activities of the BBPR group, the firm he established with Banfi, Belgioioso and Peressuti in 1932 (6). Rogers was one of the main "actors" in the linguistic and conceptual reform of post-war modern architecture; he was director of "Domus" (1946-1947), and "Casabella- Continuità" (1953 - 1964), became a member of the Council of the CIAM from 1945 to 1958, and taught in Universities both in Italy and abroad. Rogers tried to develop a theoretical and operative method which gave new conceptual values to the relationship between the use of history and modern design; at the same time his theory of "continuity" in moderne architecture represented a fundamental ideological attempt to link the rigid paradygm of Modernism with the etherogeneity of differing cultural contexts. The richness of Rogers' intellectual background, BBPR's activities, and the important historical phase: from late Fascism to the Second World War, and then, from the European reconstruction, to the economic "boom", all give us the possibility to study in depth a relationship between the evolution of individual research and collective events. The cultural experience of Rogers and BBPR symbolize the conditions of the evolution of a new generational paradygm, and,yet contemporarily sinthesizes the last important season of Italian architecture.Elaborating Rogers' experience means analyzing the rise and the expansion of a different way of perception, evaluation and assumption of values in Italian architecture in relation with a radical change in Italian and International economic and social backgrounds. Rogers' "continuity", seen through his dual experience in "Casabella-continuità" and BBPR's activities, can be studied as an ideological elaboration clearly linked with the cultural and political background of the '50s.
We are studying the evolution of BBPR's office in order to analyze , on one side the characters of a different disciplinary approach to design expressed by modern professionism, and on the other, the form of the dialogical interaction between the members of the BBPR office in order to generate design concepts.

Simultaneously I started to develop an epistemological revaluation by the use of sources, focusing on the role of Archives in modern architectural offices.
The growing complexity of the architectural practice has generated in the last century a quantitative evolution of firms' archives: drawings, models, photographs, personal and official letters, technical documentation and magazines that have all become the core of modern archives, and one of the main sources for a non-formalistic approach to the history of contemporary architecture.
At the same time a research study on contemporary architecture must face a larger number of sources. Television and radio programmes, newspapers and magazines, municipalities' and builders' archives represent a fundamental sources which can be compared with interviews with living witnesses.

A research study in the history of architecture has to escape from a formalistic point of view, to return to considering design as a part of a more complex background.
The historical environment finishes to be the vague horizon of architectural manufacts.

An indepth research into BBPR's Archive provides the opportunity to focus on the evolution of Rogers' method in theoretical and design reasoning, and to analyze the progress of his single projects.
I consider design mainly as a product of a conflictual relationship between individual intuition and collective accordance. The study of a large series of the documents (visual and written) permits the precise reconstruction of various cultural, social and economic components which contribute to the realization of buildings.

In this brief report I introduce some of the conclusions regarding the analisys of the correspondances between E.N.Rogers and BBPR office from the 30th of April 1948 until the 16th of April 1949, when he was named professor at the University of Tucuman (Argentina), and advisor of the Town Plan of Buenos Aires.
The historiographic relevance of the material is represented , on one hand, by the particular political phase that conditioned the architectural activities of the firm, and , on the other, as proof of inside relationships in the group.
The distance of Rogers obliged his associates to write and express him every detail of the daily workings of the office, the public and private relations, and all the programmes regarding the new organization of the office and its projects.
Analyzing BBPR's correspondances in this phase it is relevant to firstly describe briefly the Italian situation at this time.

The period between 1944 and 1947 is fundamental in understanding the evolution of the economic and poltical situation in Italy in the 1950s and the 1960s.
In 1944 a "Governo di Unità Nazionale" was organized by all the Italian political parties to confront the dramatic economic and social situation, and to aid Italy towards a new political state (7). The "Governo di Unità Nazionale", lead until 1947 by De Gasperi, wasn't able to open a social, economic and cultural season of reforms. The gravity of the problems brought about by the reconstruction were infact too strong, and resistance to any real reform grew progressively (8). The international situation was rapidly changing. The election of Truman in 1945 as President of the U.S.A. pollitically signified the limitation of Soviet influence in Western Europe. In 1947 the creation of the "Piano ERP"(9) represented a strong, ideological attempt to intervene in Italy, where the largest european Communist Party held 30% of the vote (10).
In May 1947 De Gasperi formed his first governement without the left wing Parties, butwith the support of the right, conservative groups (11). It was the definitive end of the "Governo di Unità Nazionale", and it lead the way to a progressive and stronger ideological contrapposition (12).
In April 1948 Democrazia Cristiana won the political election, and a different, conservative form of government led Italy until 1963.

The intellectualy progressive components, which tried to develop a different model of modernization and cultural reform, were inevitably excluded. The possibility to work outside the two major ideological coalitions was radically reduced.Simoultaneously the difficult economic situation striked architectural activities, and obliged a progressive reform of the profession.
In 1945 the milanese rationalist culture, left fatherless without Pagano (13), identified Rogers as one of the main protagonists of the continuity with a strong cultural experi-

ence. After his exile in Switzerland, Rogers was the most important link with the CIAM and the International context, and BBPR thus became one of the political and cultural centers for modern architectural culture in Milano after the war. Rogers was fired as director of "Domus" at the end of 1947, and the BBPR was affronted with a difficult economic situation. The decision to accept Argentine's proposals was motivated by Rogers' desire to build new links with a "young" country, and to take time to reflect on his last years of research and work.
1948-1949 represented an interesting biennum of transition for Italian architectural culture. The definitive change of the political situation excluded progressive italian architects from the institutional debate on reconstruction, and obliged them to face the arise of different political groups in the city administration. The cultural and progressive groups such as the CIAM, the MSA and the "Casa della cultura" were politically isolated.
The deeping economic crises forced the majority of milanese professionalists to reform their activities which inevitably brought about a situation of strong "introversion"(14), and of disenchantement regarding public activism.
The new wave of the "Italian Style" flourished under this particular ideological condition, and BBPR is an important element of this phenomenon.

The topics of BBPR's correspondances could be divided into three main sub-addings: Office activities and projects, Publications,and Cultural and political Relations (Fig.1). The visualization of the whole activity gave us the opportunity to understand the strong effort of the firm to consolidate a foundation in the Italian and Milanese background. Rogers was perfectly conscious of his cultural role in Italy, and forced Peressuti and Belgioioso to enforce the ideologic role of the BBPR. The cultural supremacy in Milano was evident: Rogers was member of the CIAM council, and BBPR was the main participant in leadership of the Italian group of CIAM, at the same time they contributed to the foundation of the MSA group(15), and directed a series of publications dedicated to the Masters of modern architecture(16). The BBPR office was considered by the foreign architect "the place" of arrival in Italy.
In 1948 Neutra, Maldonado, Kaupfmann Jr.,and other young foreign architects visited the office, consequently Peressuti met Aalto in Zurich to take his exposition to Milan. The dialogue between the BBPR and Giedion,Le Corbusier, Alfred Roth, Max Bill and the Mars Group in London was frequent; in 1948 the CIAM Italian group was asked to organize the CIAM Congress in Bergamo in 1949. The role of BBPR, and above all of Rogers in this situation was fundamental, both politically and ideologically.

BBPR on one side controlled the composition of the Italian group through the election of the new young members alligned with their cultural position; they also tried to discourage the political pressure of the comunist component of the Italian CIAM (Bottoni, Mucchi) supporting the "International" vision of the association.
This kind of political agnosticism was influenced by the difficult political situation in Italy. Rogers was afraid that modern Italian architecture would be identified with the left wing and communist culture,and thus supported the idea of an International meeting on general arguments (17).

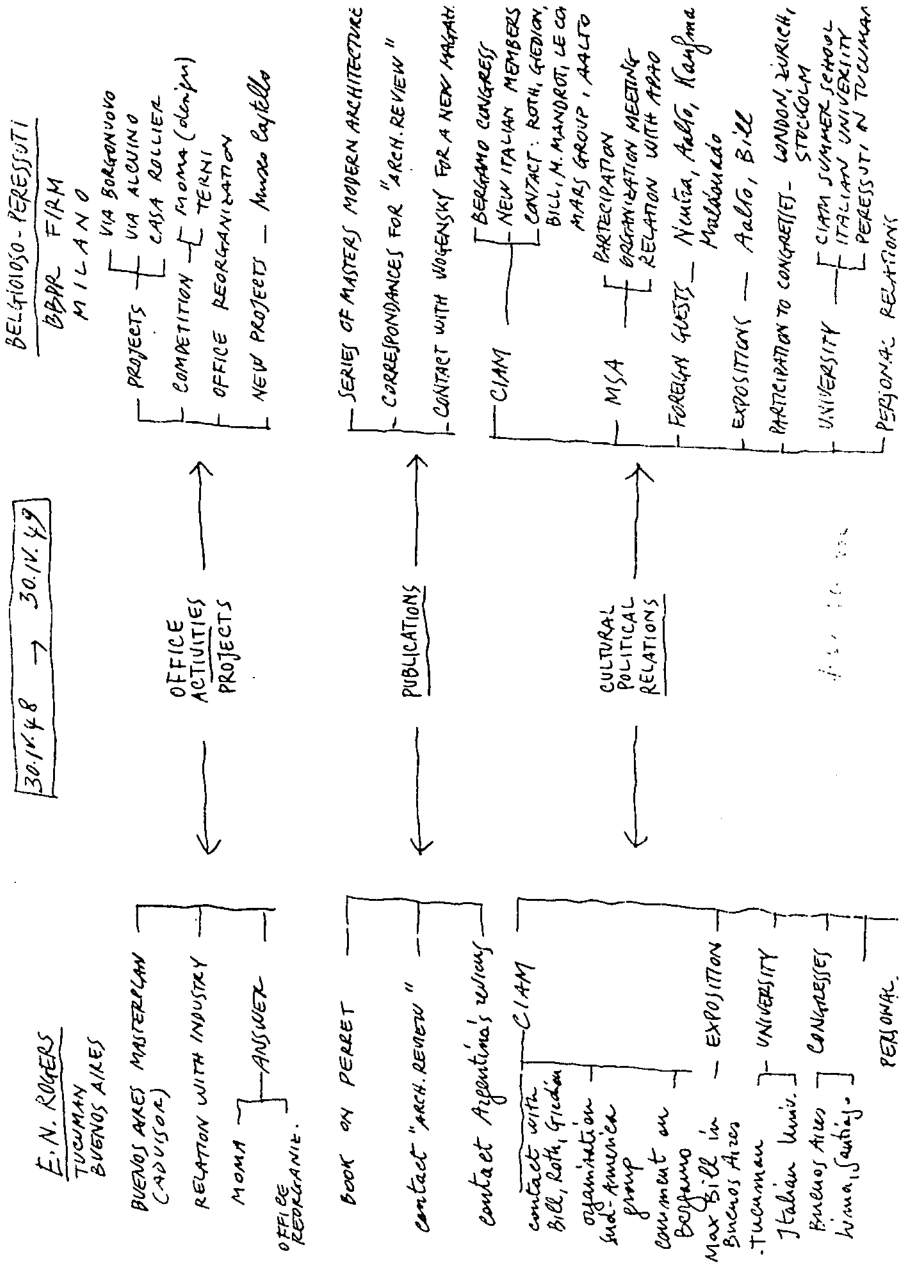
E. N. ROGERS
TUCUMAN
BUENOS AIRES
30.IV.48 → 30.IV.49
BELGIOIOSO - PERESSUTI
BBPR FIRM
MILANO
OFFICE ACTIVITIES PROJECTS
PUBLICATIONS
CULTURAL POLITICAL RELATIONS
BUENOS AIRES MASTERPLAN (ADVISOR)
RELATION WITH INDUSTRY
MOMA
ANSWER
OFFICE REORGANIZ.
BOOK ON PERRET
contact "ARCH. REVIEW"
CIAM
contact with Bill, Roth, Giedion
organization Sud-America group
comment on Bergamo
EXPOSITION
Max Bill in Buenos Aires
UNIVERSITY
Tucuman
Italian Univ.
CONGRESSES
Buenos Aires
Lima, Santiago.
PERSONAL
PROJECTS
VIA BORGONUOVO
VIA ALCUINO
CASA ROLLIER
COMPETITION
MOMA (design)
TERNI
OFFICE REORGANIZATION
NEW PROJECTS — Museo Castello
SERIES OF MASTERS MODERN ARCHITECTURE
CORRESPONDANCES FOR "ARCH. REVIEW"
CONTACT WITH WOGENSKY FOR A NEW MAGAZ.
CIAM
BERGAMO CONGRESS
NEW ITALIAN MEMBERS
CONTACT: ROTH, GIEDION, BILL, M. MANDROT, LE CO
MARS GROUP, AALTO
MSA
PARTECIPATION
ORGANIZATION MEETING
RELATION WITH APAO
FOREIGN GUESTS
Aalto, Kaufman
Maldonado
EXPOSITIONS — Aalto, Bill
PARTICIPATION TO CONGRESSES — LONDON, ZURICH, STOCKOLM
UNIVERSITY
CIAM SUMMER SCHOOL
ITALIAN UNIVERSITY
PERESSUTI IN TUCUMAN
PERSONAL RELATIONS

Figure 1

At the same time Belgioioso and Peressuti started a radical reorganization of the office based on a modern vision of the architectural practice, and on a rationalization of sources. Belgioioso visited several English offices of architecture (18), and Christof Bon, a young architect who was working in the firm, worked towards the organization of the programm. It is interesting that the researches into better office structure were elaborated at the same time as the growing sperimentation on prefabrication and design (19). Rogers was been up to date on the state of every project (20), and followed the evolution of the BBPR's affair with an intense correspondance to Europe and the States. His condition of solitude, and his natural tendency of psychological delicacy in human relations, increased the numbers of the letters he wrote, leaving us an abundant testimony of his psychology, and of his relationship with BBPR and the world.

Notes

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3. Althousser Louis. *Idéologie et appareils idéologiques d'Etat.*, Paris, "La Pensée", 1970. "ideology as an imaginary relationship of an individual with his own condition of existence".
4. Bakhtin M.M., Medvedev P.N.*The formal method in literary scholarship.*Cambridge, 1978, pag.27.
5. See: Kuhn Thomas.*The structure of scientific revolution.*Chicago, 1962.
6. Bonfanti Ezio, Porta Marco. *Città.Museo.Architettura.Il gruppo BBPR nella cultura architettonica italiana 1932-1970.* Firenze: Vallecchi ed., 1973.
7. Ginsborg Paul. *Storia d'Italia dal dopoguerra ad oggi. Società e politica 1943-1988.* Torino: Einaudi ed., pp. 92-157, and, Lanaro Silvio. *Storia dell'Italia Repubblicana.*Venezia: Marsilio ed., pp.5-164.
8. Ginsborg , Op.Cit., pp.116-148.
9. Ibid., pp.101-102.
10. Lanaro, Op.Cit.,pag.143, and , Ginsborg , Op.Cit., pp.101-103.
11 Ginsborg , Op.Cit., pp.145-148.
12 Ibid., pp.148-159.
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16. BBPR organized and directed a series titled " I Maestri dell'Architettura Moderna" and published by " Il Balcone".
17. "..allargamento molto scelto della compagine.Gli ultimi avvenimenti internazionali, ai quali hai partecipato, il concorso che abbiamo fatto come gruppo per il Centro, le relazioni che abbiamo con gli altri CIAM esteri ci danno la possibilità di tenerlo su un piano più alto perchè internazionale." Peressuti to Rogers, 20.V.1948. Folder n. 154.

18. "Ho studiato un poco l'organizzazione degli studi inglesi che hanno un sacco di gente.", Belgioioso to Rogers, 26.XI. 1948, Folder n. 154.
19. In this phase BBPR experimented plastic pre-fabr design closely to Pirelli and Montedison.
20. The discussion focused on the projects: Via Borgonuovo, Via Alcuino, and the new project for Castello Sforzesco.

> PORTRAIT OF ERNESTO NATHAN ROGERS

The Process of Stratification in the Work of Carlo Scarpa

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Theme: Analisis of the stratification principle in the work of Carlo Scarpa.
Examination of the historical roots of this method and research on the spacial and formal effects.

Stratification as a morphological principle in architecture:
Stratification as a principle of material arrangement is part of the nature of construction and is among the normal requirements of a building. In architecture it is necessary to have different layers or strata in the construction as protection against rain, sun and changes in temperature. So stratification can be found in each type of building.
The term "stratification" is normally used in the tecnical description of facades. The two-layered facade or the cavity-wall is an example of the resolution of an element into its various functions. Only the whole complex of a wall-construction can be physically flexible and is able to endure different climatic conditions, to create and limitate space and to satisfy visual requirements (Fig.1).
In addition, the method of stratification is able to integrate different time-levels into one building. This makes the existance of different stiles and periods possible within one complex, without distroying or disturbing the individual elements. (e.g. restauration and modification of old buildings).
"Variability by stratification"[1] can not only be applied to technical areas, but also to the creation of space and the division into different zones.
Apart from all these material aspects of stratification, one can find a level of association in architecture which is reminiscent of historical traditions and creates a certain poetry of symbolic significance which I would call the "association layer".

Carlo Scarpa transformed the existing rules of construction into a principle of architecture. He transformed a primarily technical principle into a instrument of design, that is very flexible and contains many possibilities of formal development of the architectural elements. He started with the decomposition of the whole building and created individual independent elements. These elements later will be recomposed into a new complex (Fig.2). The separation of the elements becomes visible for example at the joints of two panels, which are the most important and most elaborated details in his work (Fig.3). By splitting the building structure into different elements, their coexistence is possible without hierarchical order. In the case of the renovation or modification of an old building, there is also the possible coexistence of different time levels. Already existing substance is completed by new strata (Fig.3).

Theory

Theorists at the end of the 19th. century tried to find a new understanding of architecture in their discussion of the use of polycromy in ancient architecture. The discovery that ancient architecture was not a monolitic structure, but was made of different "layers" such as stone stucco and paint, is the beginning of an new interpretation of architecture.

Gottfried Semper's clothing theory defined the roots of architecture as structure and "carpet". "The carpet is the originary form, the basis of room-separation"[2]. Architectural elements have to be treated like textile objects with elements like seams and special joints. The clothing of the construction changed from textile to other materials such as stone, but the treatment remained the same. "So, according to Semper, the art of construction begins with the method of clothing of a building. Only this brings the real artisitic component namely a symbolic representation of the tecnical constructive and functional basis."[3].

The treatment of wall-panels and floor construction etc. in the work of Carlo Scarpa display elements of Gottfried Semper's theory. Scarpa probably never read the writings of Gottfried Semper, but there is a remarkable affinity between this architecture and Gottfried Semper's thoughts. In Scarpa's projects the envelopment of structures consisting of different layers of different materials is the basis of architectural design.

Tendencies

According to Scarpa's own words he was deeply impressed by different tendencies in architecture. The De Stijl movement, the Vienna Secession and the aesthetic culture of Japan were very important directions which used the principle of additive stratification. Architects such as Le Corbusier and Frank Lloyd Wright influenced Scarpa, especially at the beginning of his architectural carrier.

C. Scarpa

Carlo Scarpa (1906-1978) is an architect whose development drew on deep roots in the Veneto region and on traditional forms and construction methods. The phenomenon that I would like to examine is the transformation of normal stratification into the principle of design as visible in Scarpa's projects. He transformed a primarily technical principle into a instrument of design, which is very flexible and contains many possibilities of formal development of architectural elements.

During his architectural development, the significance of stratification gradually increased and became part of his morphological thinking. He developed his own rules about how to treat the layers of a building (facade, floor and ceiling).

"In choosing Venice as his spiritual home, Scarpa affirmed his identity as *magister ludi* of fragmentary architecture. In this type of architecture the possibilities of innovation and invention reside in the building elements and in the manipulation of the visual and kinesic relationships among the various fragments and artefacts. Hence this architecture is the product of the resolution, substitution and design of elements, whereas technology, with its double faced role as techne and logos and logos of techne, forms the basis for an understanding of the interplay of elements and in the dialogue set up among them by theis replacement in the fabric of the building."[4] (Fig. 4,5)

Analysis

A. Castelvecchio, Verona (1958-1966)

The Castelvecchio in Verona has Roman origins and was built by Verona's noble family of the Scalgary, on the banks of the river Adige.

In the last century, Napoleon transformed the whole complex and positioned his troops there. In 1924 the facade of the caserma were modified, using pieces of the destroyed Palace Camerlenghi at Verone. The whole building became a museum. Because of this development, the Castle is not a grown structure, but a composition of fragments. Scarpa was hired in 1958 to redesign the first section and then the whole. He tried to make the different architectonic phenomenons visible in various layers, and to create unmistakeable surroundings for the exibition. He added a modern layer to a system of already existing elements of different origin and age without disturbing or destroying anything. I will show a few examples.

Court-yard

A carpet of stone leads to the entrance, accompanied by two low water-basins. Here water is used as independend reflecting layer and has own material qualities.This intervention defines a special zone that is separated from the rest of the courtyard (Fig.6).

Ground floor of the "caserma"

Insertion of a new floor layer, that has its own new grill structure. This new structure creates a kind of "room within a room" , because it doesn't follow the old room contour. It changes the geometrically irregular form into a regular square form. This "carpet" of stone is detached from the walls by joints (Fig.7).

Windows

Insertion of a glass layer inside, which doesn't touch the Renaissance pieces.

"Reversal of expectation also motivated his interpretation of the Napoleonic facade. Redone in 1924 with symmetrically inserted windows and frescoes from old palaces, it was not to his liking. He covered the frescoes, leaving traces of the original stonework, and slid a second facade behind the windows and doors without symmetry or regularity of any kind."[5] The design of the facade elements are reminiscent of the paintings of Piet Mondrian for whom Scarpa organized an exhibition in 1956 (Fig.9).

Space between Reggia and Caserma

The insertion of concrete walls, a bridge for the statue of Can Grande and of staircases forms a special space within the old context. "Perched precariously between the two buildings, the marble statue of Can Grande can be seen from above and below, near and far. Scarpa has invested the intersection with extraordinary density. The bridge itself is kept emphatically separate from original architecture, literally and in design. One trail from the bridge leads up a treacherous stair to a galleria with a view of the river."[6].

Exhibition
Wall elements and panels are the background for presentation. Black and white panels set off the sculptures. Pictures are not esposed on the nude walls of the castle, but have their own background and are seen in the right context.
"The cosmetic treatment of the walls and of the plaster panels which act as backgrounds to the sculptures take an active part in the ordered relationship among the various objects in the exibition; the backgrounds are neither too solid nor too transparent, enabling them to assume the "tone value" of the pieces."[7].

B. Galleria Querini Stampalia, Venedig (1961-1963)
This is a restoration of the ground-floor of an old Venetian palace and integration of a short garden. It is used as gallerie and exibition space. It is an example of the resolution of a floor into different layers.

The whole work shows Scarpa's close association with Venice. At the entrance of the palace, Carlo Scarpa constructed a new bridge, turning one of the windows into a doorway. The design of the interior has a very practical role in connection with protection from the acqua alta. Scarpa also inserts a new architectural vocabulary into the existing fabric. The whole floor structure has different levels, different functions and formal expression. The various layers are made of different materials and have different colours. As in Castelvecchio, the new orthogonal surfaces were inserted into the existing structure. The new surfaces are isolated from the walls.

Entrance Room
"In this entrance room we can see the chief elements of Scarpa's renovation: new stucco lucido panels on the ceiling; panels of stucco surrounded by steel mounted on the walls and a floor sitting free, held back from the original walls. The floor is edged with an exaggerated kerb made of concrete but lined on the inside with Istrian stone."[8].
A polycrome mosaic covers the framed floor surface. The wall panels are of irregular width and folded around the corner to show the continuity of the wall surface. (Fig.10)

Exibition room
A very important element is the volume that covers the radiator, between entrance zone and exibition room, that seems to be made out of fragments of stone and glass.
"It is a modern day equivalent of Ruskin's observation of the venetian habit of "encrustation" and no doubt evokes many memories of Vienna, Byzantinum and beyond."[9] "Scarpa's typical method is visible, especially in the travertine walls in the exibition room which ,apart from the traditional reuse of stone, recalls the picture of a ametonymic change between wood and brick wall, for example between the wood of the bridge and the railing."[10]
The washed aggregate precast floor panels turn up at the side of the room to form the base of the walls. The walls are enveloped by unframed polished slabs of travertine that are separated from the ceiling. The exibition room floor of precast concrete and polished Istrian stone flows from the interior into the garden zone. (Fig.9)

Garden
The garden originally was the courtyard of the palace. Scarpa established two different levels, divided by a wall. Into this, he set a long narrow water course with a stylized "source of water". Stratification in this building in made of surfaces of different materials which are used as panels to define the space.

C. Banca Popolare, Verona (1973-1978)
The new building of the banca popolare of Verone, that replaces two palaces, is formed only by two facades, one facing the square and the other the courtyard. This two facades are integrated into an existing structure of housing block. Because of this the main motif of stratification is the facade-layering. It is one of the few completely new buildings constructed Carlo Scarpa.

"The main facade of the Banca Popolare of Verona is modulated according to Semper's four elements so that we see a base of stone, a facing maconry wall of plaster and a loggia with a steel frame construction"[11] (Fig. 11).

Base
The base is formed by layers of Botticino marble plates limited by a sculptured frieze. This stone cornice has a formal surface, which was also employed in the Brion cemetery.

Middle
A kind of membrane covers the middle part of the facade. "The facade, behind the long fence that runs along the building from opposite Piazza Nogara into Via Coventino, looks like another covering, subtle and delicate, a surface carved with a precious series of round cutouts/windows of different sizes, like the silhouettes of balloons hung from the long water- spouts and square bow-window projections supported by sculptured friezes."[12]

Loggia
The glass surface, lying inside is independent and held by a steel frame construction. The cornice of the roof is accentuated and formed like the cornice of the base.
"Scarpa's bank faces its little piazza with a presence and expressive tension almost unknown in modern work. As with his renovations, it grabs modern time and historical context by the teeth and holds them there."[13] (Fig. 12)

Summary
The possible effects of stratification in architecture as a system of different layers can be defined as:
1. The formulation and definition of space, the dynamisation of existing rooms and environments.
2. The integration of a new layer into an existing building and context without destroying the older structures. This is a method of integrating the architect's own formal ideas into the exisiting complex.
3. The solution of technical requirements that can demand the division of facade elements into various layers with different functions.

4. The transport of associations that refer to traditions and symbols, and contain information reminding us of possible historical buildings or situations.
5. The use of layers as a method of enveloping a structure in order to be able to use it as a basis for presenting objects of art.

Apart from the visible spacial effects, the method of stratification has a didactic component. This is the visualization of the process that has created an element or piece of architecture and to explain directly the attitude of the building.
The base of a working process of this kind begins already at the process of designing architecture. Scarpa's plans often contain several levels, sections and details in one. Like a palimpsest he drafts over old sketchs creating a plan of different layers, that shows the different states of an object in one.
Stratification is not a architectural tendency, it is a method of thinking, that touches all parts of the architectural work.

Notes

1. Alfred Breukelmann: Die Wand eine Medium?, in: *Werk, Bauen und Wohnen* 4, 1991, P.26
2. Gottfried Semper: *Die vier Elemente der Baukunst*, P.57-S.69 ("Der Teppich ist die Urform, die Grundform der Raumtrennung. Mauern werden durch GewŠnder bekleidet.")
3. Heinz Quitsch, Gottfied Semper, *Praktische Ästhektik und politischer Kampf*, P.93
4. Marco Frascari: *Carlo Scarpa in Magna Graecia*-The Abatellis Palace in Palermo, in: *AA Files* Nr.9, 1985, P.3
5. The legendary Castle in: *Progressive Architecture*, May 1981 P.122
6. The legendary Castle in: *Progressive Architecture*, May 1981 P.120
7. Marco Frascari: *Carlo Scarpa in Magna Graecia*-The Abatellis Palace in Palermo, in: *AA Files* Nr.9, 1985, S.9
8. A postumous work in: *Progressive Architecture*, May 1981 P.132
9. Richard Murphy: *Querini Stampalia Foundation* Carlo Scarpa, London 1993, S.11.
10. Richard Murphy: *Querini Stampalia Foundation Carlo Scarpa*, London 1993, S.11.
11. Frampton, Kenneth: Carlo Scarpa und die Verherrlichung des Gelenks; in: *Grundlagen der Architektur*, 1993; Seite 368
12. Frampton, Kenneth: Carlo Scarpa und die Verherrlichung des Gelenks; in: *Grundlagen der Architektur*, 1993; Seite 368
13. Pierluigi Nicolin: L'incompiuta, in: *Lotus* Nr.28, 1980, S.45.

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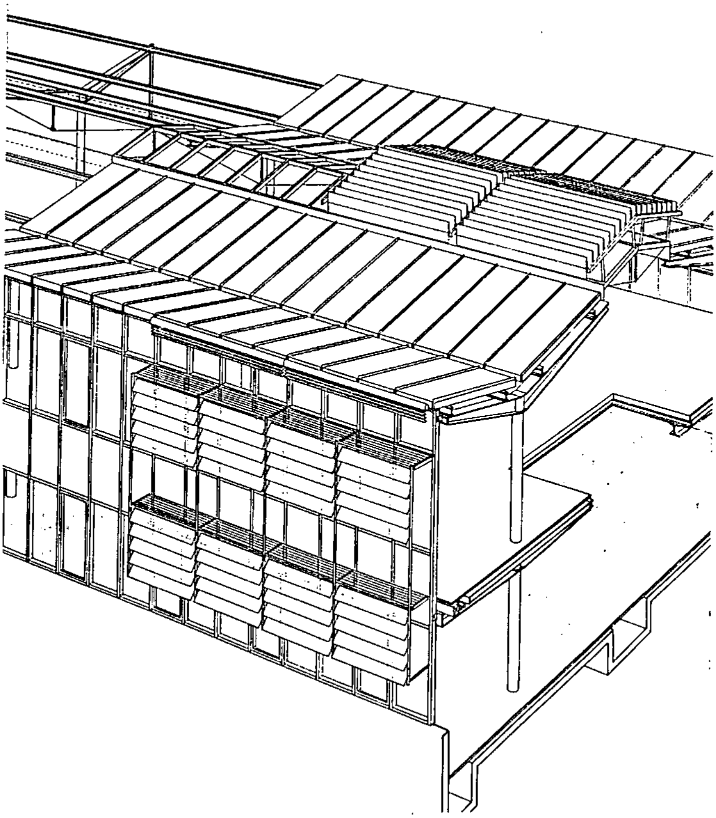


Figure 1: Technical example of stratification: Construction Office Gartner, Gundelfingen

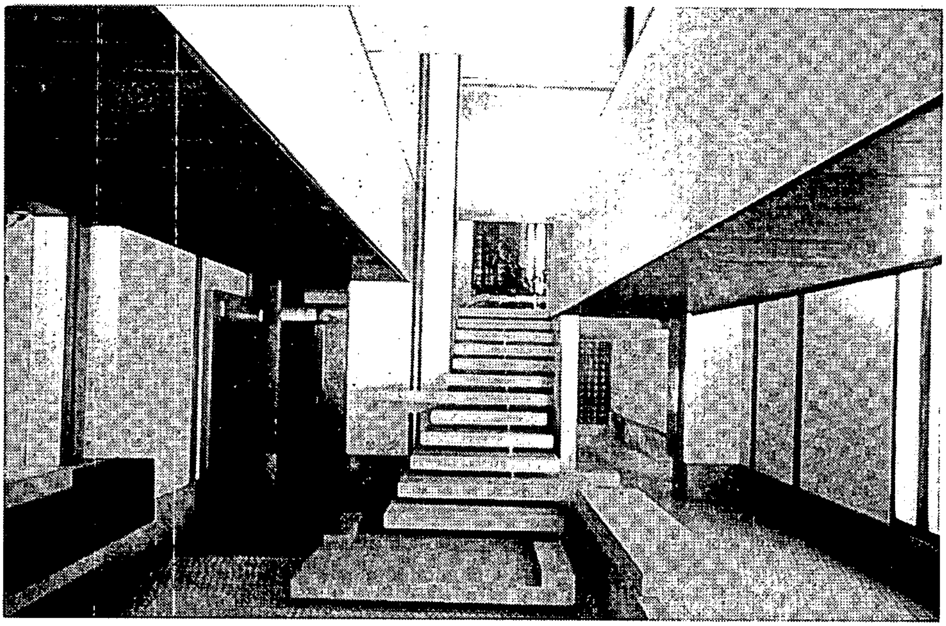


Figure 2: Carlo Sarpa: Olivatti Shop in Venice (1957/1958): entrance room

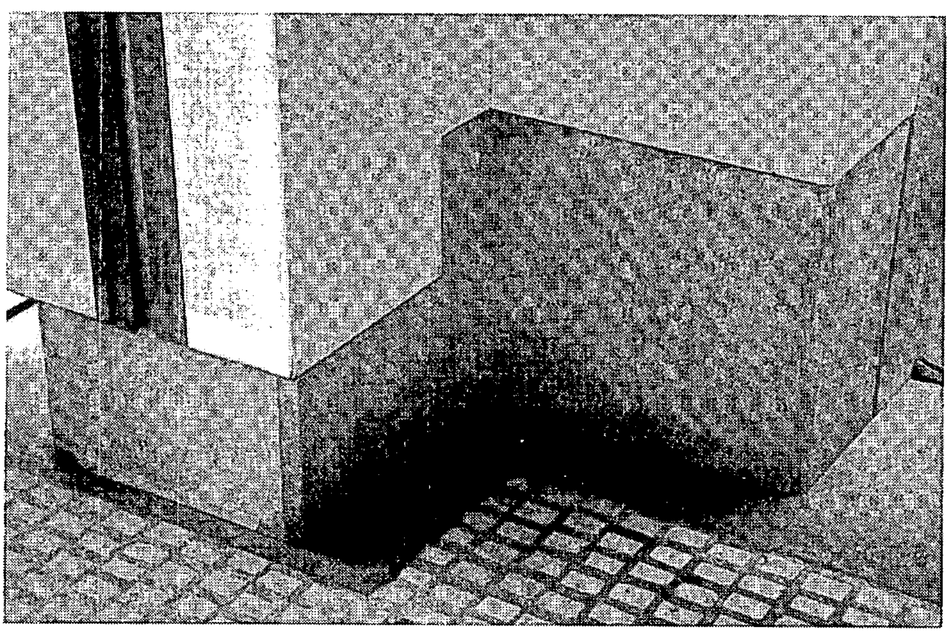
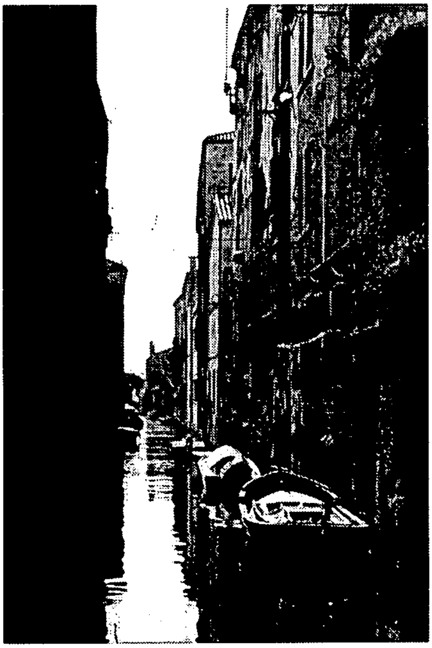


Figure 3: Carlo Scarpa: Olivett Shop in Venice: detail

Figure 4: Venice: Canal



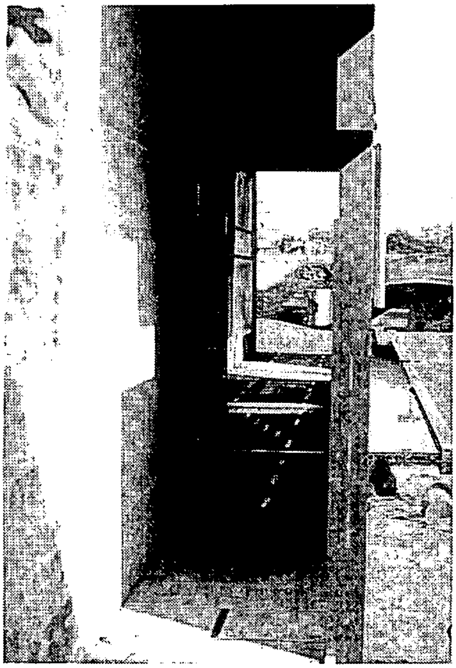


Figure 5: Carlo Scarpa: Brion Cemetery in San Vito di Altivole (1970): canal

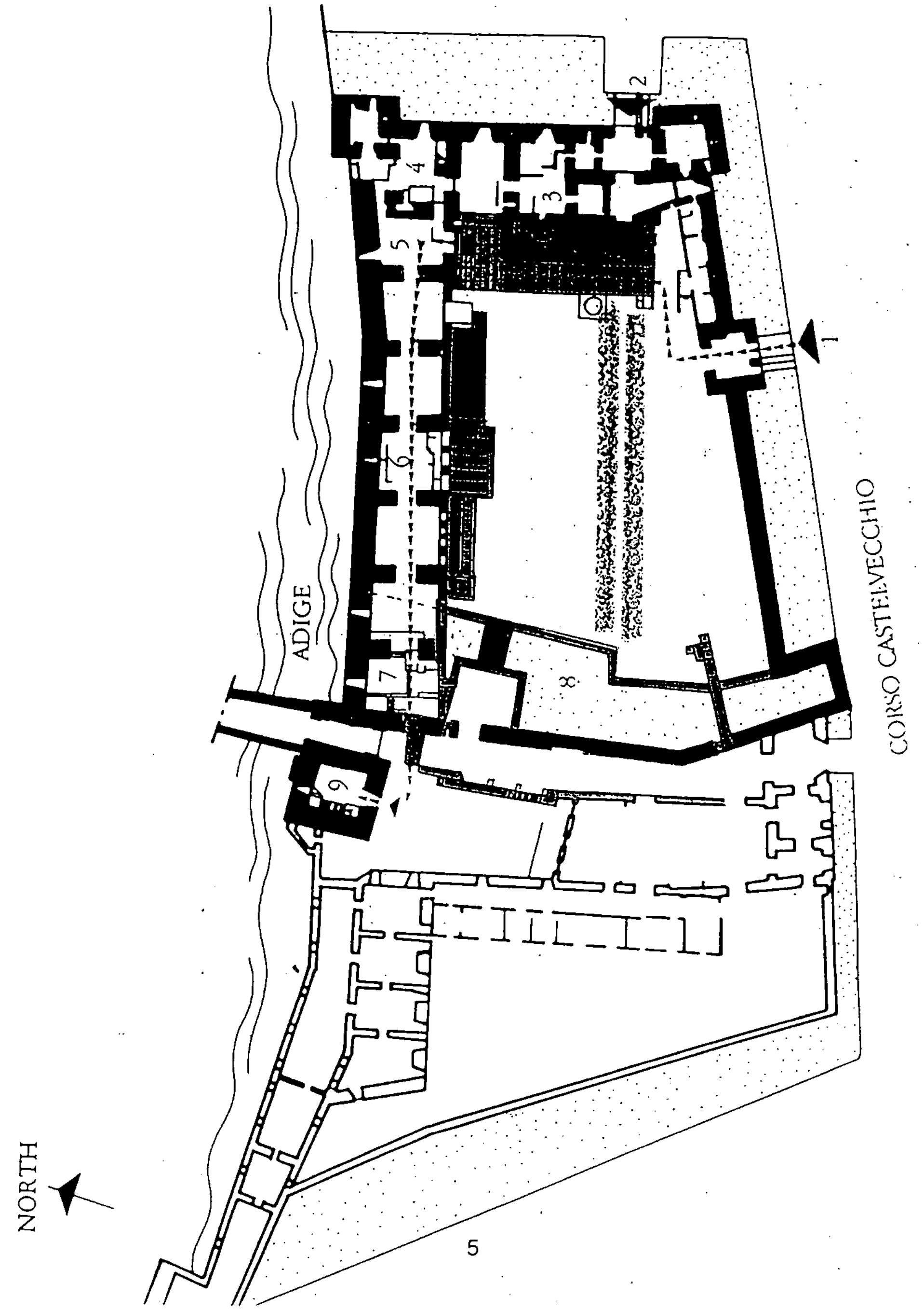


Figure 6: Carlo Scarpa: Castelvecchio in Verona (1958-1966): plan

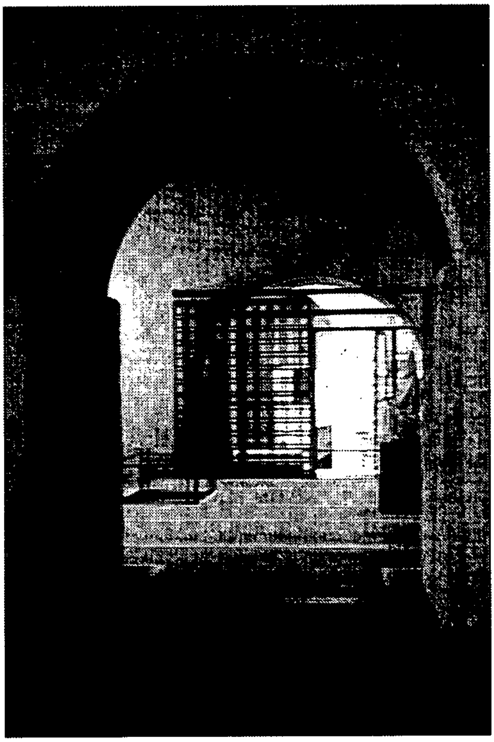


Figure 7: Carlo Scarpa: Castelvecchio in Verona (1958-1966): ground floor

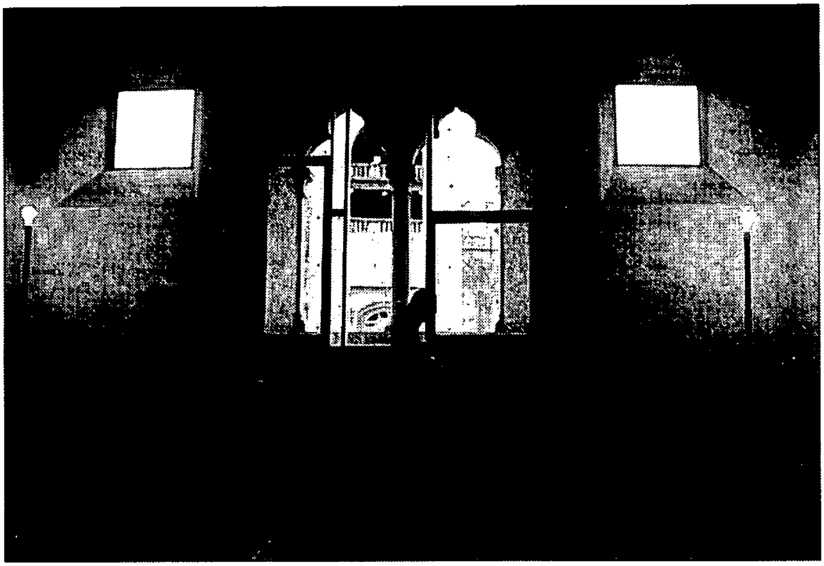


Figure 8: Carlo Scarpa: Castelvecchio in Verona (1958-1966): window detail

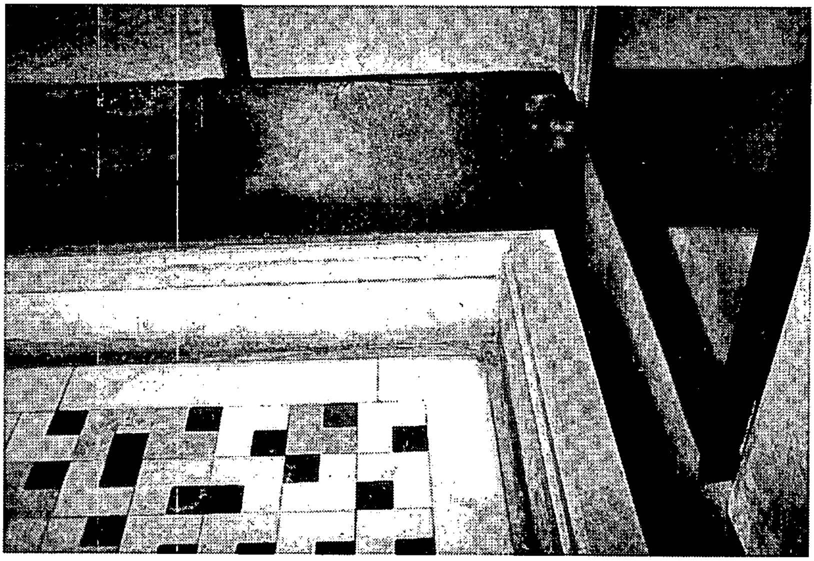


Figure 9: Carlo Scarpa: Foundation Querini Stampalia in Venice (1961-1963): exibition room

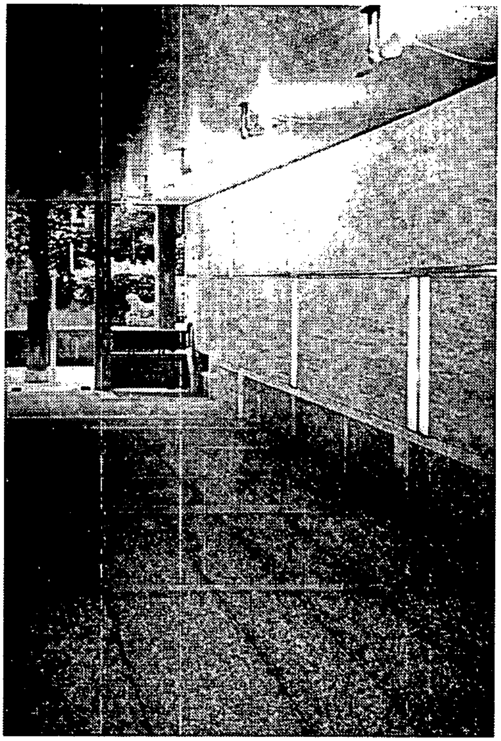
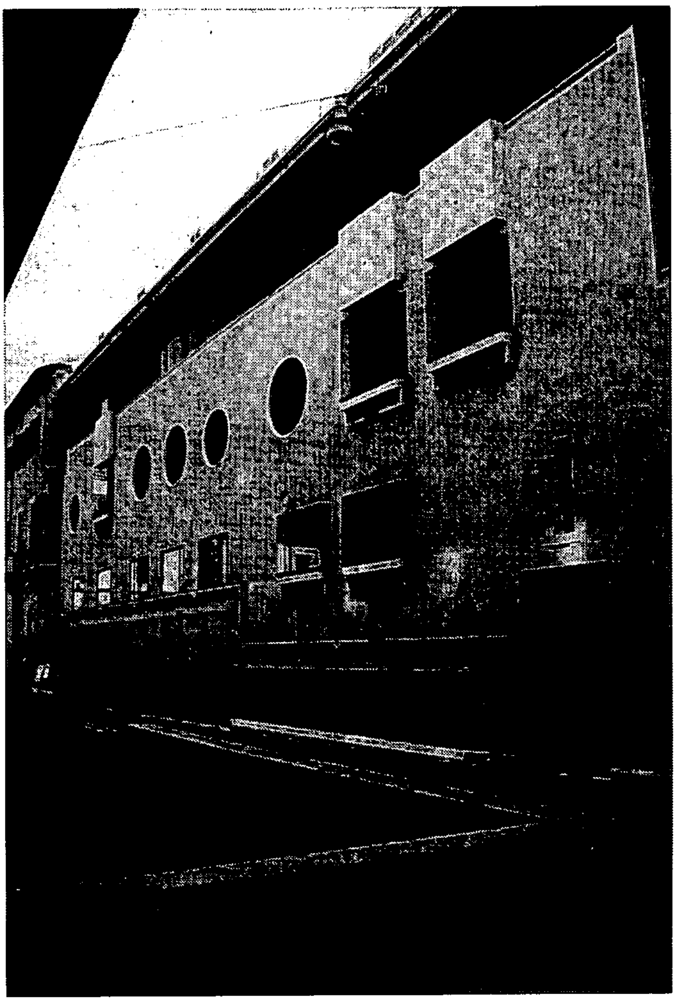
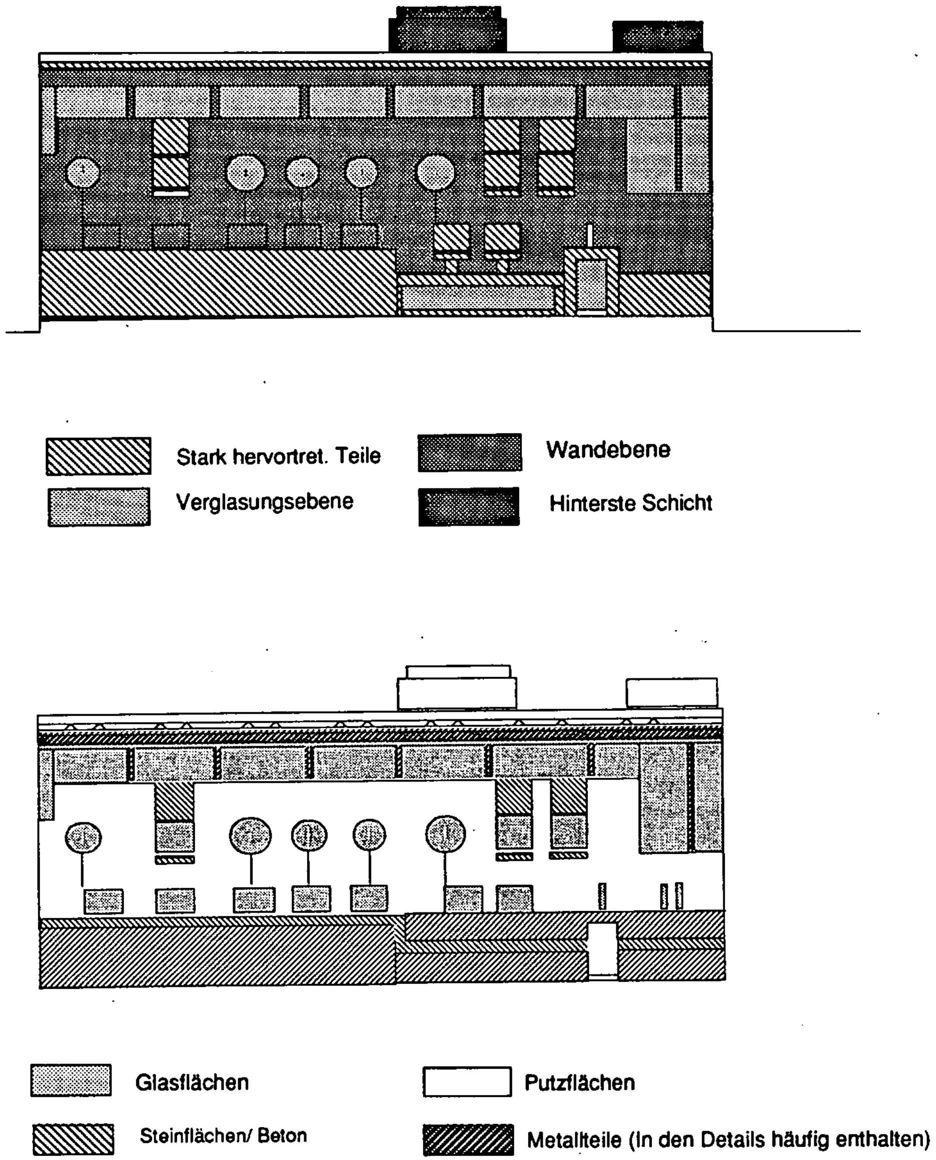


Figure 10: Carlo Scarpa: Foundation Querini Stampalia in Venice (1961-1963): mosaic



11. Carlo Scarpa: Banca Popolaire in Verona (1973-1978): Facade



12. Carlo Scarpa: Banca Popolare in Verona (1973-1978): Facade studies relief/materials

The Country Houses of H.Th. Wijdeveld

Mariëtte van Stralen

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The most noticable feature of the series of country houses built by the Dutch architect Hendricus Theodorus Wijdeveld (1885-1987) in the course of his life, is their immense variety in style, material and construction. Not all that strange, since they were designed over a large time-span, mostly at intervals of several years. The series comprises more than thirty designs, the first dating from 1909 and the last, the alteration of a water tower in Wassenaar into a private house for himself and his second wife Charlotte Köhler, from 1970[1]. Besides, the designs are based on a wide diversity of commissions, ranging from vast country houses like Endymion in Bloemendaal (1909), De Wachter in Amersfoort (1922) and De Bouw in Hilversum (1927) to quite plain and small dwellings, like the H.P. Bendien house in Naarden (1920) and the DIY-dwellings for employees from Thomsens Havenbedrijf/Dockworks in Ridderkerk (1957).
Still, for all their differences the designs clearly bear the trademark of one and the same architect, as can be illustrated by a comparison of the designs of Wijdeveld's first and last realized country houses: the Endymion house in Bloemendaal (1909) and the house with dental practice in Velp (1962).

At first sight they bear little resemblance. The formal vocabulary of Endymion is classical, that of the Velp house modernist: the white box seems to be suspended above the ground. With respect to interior finish and decoration too, there's a world of difference. In the case of Endymion, Wijdeveld's close involvement with the interiors is witnessed by the attention to detail and luxury. Its residents may well imagine themselves to be a wealthy industrialist family in days long past, being served hand and foot, because servants' quarters are included. As are a separate servant's entrance and routing. In contrast, Wijdeveld's involvement with the interior of the Klaassen house in Velp was minimal. Of course, interior decorating generally was much more a part of the architect's job at the beginning of this century than it was in the sixties.
More interestingly, a comparative study of both houses reveals quite a few similarities. For one, both extend over two building levels. In the case of Endymion a mansard roof containing servants' quarters has been added, and in that of the Klaassen house a basement housing dental practice and garage. Both buildings are for the most part coated in white plaster. In both cases the façade is the main side of the house, expressing a desire to reach a harmonious composition of horizontals and verticals.
The position of both main entrances is slightly off-centre. That of Endymion is incorporated in the monumental central ressault which forms a marked vertical accent in the composition. Over the door is a work of art designed by Wijdeveld, a bronze relief featuring the name Endymion and the first line of the poem of the same title by the Romantic poet John Keats: *A thing of beauty is a joy for ever.* A foliate motif en-

wreathes the letters. As at Endymion, the door of the Klaassen house combines with the fan light to form part of a monumental vertical accent in the façade composition, in which we recognize a cruciform. A horizontal accent is provided by a dark beam incorporating several windows and an abstract relief designed by Wijdeveld.
Another similarity is that both buildings rise above the surrounding landscape, making us conscious of actually entering a house. In the case of Endymion the country house sits on a high point of the terrain, and in that of the Klaassen house the building volume is situated on top of the basement. Furthermore, the rooms of both houses are grouped around a central hall with staircase. As we enter the house and the main hall - in Endymion through the vestibule - the lay-out of the houses reveals itself to us. The halls of both houses provide an unexpected change of visual orientation, the houses opening up, as it were, towards the light and the view. This somewhat dramatic orientation towards the landscape is the main function of Wijdeveld's halls.
In other ways too, we see an effort to create a special place in both the Endymion country house and the Klaassen house. Obviously, Endymion being much bigger than the Klaassen house, it has separate, individually designed rooms for all functions of living. But both with respect to their programs and to Wijdeveld's apparent intentions the two houses are largely similar. Take the separate living-dining room of the first, which is reflected in the latter in the form of an open living area with articulated spaces for those same functions. There are corner spaces for a winter seat and a dining area. The Heerenkamer on the first floor of the Endymion country house is reflected in the study nook in the living area of the Klaassen house. In the Klaassen house, the so-called Boudoir on the sleeping level of the Endymion country house has been reduced to a small boudoir in the form of a cupboard, designed by Wijdeveld, in the first floor master bedroom. Significantly, this was added at the express wish of the architect[2].

Character and Composition
In his article *Character and Composition; some Vicissitudes of Architectural Vocabulary in the Nineteenth Century* Colin Rowe describes how in the 19th century the two connotations Composition and Character existed side by side[3]. Composition would refer to the principles underlying the organization of a building. This connotation may be related to the tradition of the aesthetic categories of academism. Character on the other hand refers to the symbolic content of the buildings. This could be related to the picturesque, if we think of the English turn-of-the-century country houses, which were the result of a new, asymmetrical organization. According to this definition of the terms Composition and Character, the Endymion exterior with its decorum of representativeness and monumentality could be interpreted as a desire to express Composition, and the interior with its English-style intimacy as a desire to express Character.

In its execution, the Endymion exterior is reminiscent of certain design tendencies in German and Austrian architecture at the beginning of this century. Among the various schools involved in the architectural debate in those countries was one which tended towards an abstract-classical formal language. The work of Peter Behrens is a case in point. His Cuno country house in Hagen, also from 1909, bears a close resemblance to Endymion, if only in its slightly asymmetrical monumental ressault in the façade and its two extensions on the garden side. At the same time the Cuno design is more abstract and modern, with less detail than Endymion[4].

Wijdeveld's country house is perhaps more closely related to the buildings depicted in Paul Mebes's influential 1908 publication Um 1800[5]. For instance in the execution of detail and the mansard roof with oval skylights. This adoption of the *Um 1800* style may not only be interpreted as a nostalgic desire for a time when architecture symbolized the unity of society, but also when architecture was still essentially a craft. For the subtitle of Mebes's publication reads: *Architektur und Handwerk im letzten Jahrhundert ihrer traditionellen Entwicklung.* Wijdeveld was well-acquainted with German and Austrian architecture, having visited those countries on many occasions. Between 1904 and 1915 his close friend Lauweriks spent a lot of time in Germany[6]. His first wife, Ellen Kohn (1884-1965) was born in Breslau. During a visit to her mother in 1909 - the year Wijdeveld designed Endymion - she sent Wijdeveld a postcard of the Herzogl. Schloss Slaventzitz (1828)[7]. This building, with its distinctive slate tile mansard roof, white plaster coating and classicist detailing may well have inspired Wijdeveld's country house design.
On the other hand, Wijdeveld's use of a central hall betrays the influence of English turn-of-the-century country houses. So does the finish of the interiors, for example the wooden panneled ceilings and the parquet floors. Wijdeveld was equally familiar with this architecture. During his stay in England between 1905 and 1909, he also worked for a brief period with the famous architect Baillie Scott[8].
Endymion is typified, as are many of Wijdeveld's other houses for that matter, by an obvious effort to create a synthesis between the English and the German approach, Character and Composition.

In general one could argue that Wijdeveld, who as the editor of *Wendingen and Architectura* had a wide knowledge of contemporary developments in architecture, never really followed one single school or master, despite the unmistakable traces of his long and intense relationship with Frank Lloyd Wright. However, Wijdeveld's use of any influences he absorbed would always be highly individual.
There's a drawing by Wijdeveld dating from 1930, entitled *Fundamentele Waarden / Fundamental Values*[9]. It is a diagram of terms, in which he brings together a great number of seemingly incompatible things. The heading theory, including hygiene, orderliness and comfort, interconnects with the heading practice, under which he ranges ornament, decoration and imagination. In further subdivisions he combines utility with cosiness, for example, and social with interior.
Nor did Wijdeveld think in terms of just one kind of building. He once made a diagram outlining four types of building: the cube, the crystal, the shell and on tiptoe. On the basis of this division most of Wijdeveld's country house designs would either be cubes, crystals or shells. None of Wijdeveld's country house designs could be classified as on tiptoe. On the contrary, in his designs he emphasizes that his buildings either are set on, or even partly in the earth's surface.

Frank Lloyd Wright
Frank Lloyd Wright's huge influence on Dutch architecture is undisputed. Examples include Berlage, Dudok, Van 't Hoff, Rietveld and the other members of De Stijl. Wijdeveld's name, however, is rarely included. Which is strange, considering Wijde-

veld's early acquintance with Wright's work and the fact that his relationship with the famous American architect was the longest and the most intense.
The historian Auke van der Woud acknowledges Wijdeveld's close affinity with Wright, but save for a few generalities fails to develop this[10)]. According to Leonard K. Eaton, Berlage saw Wright as an architect who was one step ahead of him on the road to a modern architecture[11)]. The younger generation of architects is said to have been particularly fixated on certain passages in Wright's article 'In the cause of architecture', in which he expresses high hopes about the role of the machine in society[12)]. J.J.P. Oud and Jan Wils saw Wright, in Van der Woud's view, as an architect who had redefined architecture by treating spaces no longer as enclosed boxes, but instead combining them into an 'organic' unity. The organization of the plan was visualized and accentuated by the exterior[13]. However, this account merely emphasizes a few aspects of Wright's work, presenting Wright as a (precursor of the) modern functionalist architect. It's a highly tendentious interpretation which does little justice to the wide spectrum offered by Wright's architecture. For one, it ignores Wright's profound concern with spirituality, symbolism and decoration. Wright's views were still deeply rooted in the romantic idealism of the 19th century. He also attached great value to the cultural motives underlying historical styles. But even in his later work he was never fixated on the pursuit of a functionalist architecture in which technology preceded and defined the design. In that sense Wijdeveld is much closer to Wright than his contemporaries. Moreover, he uses the latter's work as a new starting point in an entirely different, more theatrical direction.

As early as in the 1910's some of Wijdeveld's designs seem almost copies of Wright's. These include the Country House along the Vecht river (1914), the undated design for a Country Cottage in Heemstede and the Beach Cottage in Zandvoort (1915). Notable influences in this last design are the emphasis placed on the horizontality of the composition, the course of identical windows, the coloured façade tiles, the glass-stained windows, the flowerpot terraces and the roof structure. Its most immediate counterpart is Wright's Avery Coonley house in Riverside, Illinois (1906-1908). Though much bigger than Wijdeveld's house, it also features first floor living quarters, for instance. During this period Wijdeveld used Wright's architecture as a means to distance himself from the classical formal language of Endymion without having to relinguish an architecture that wants to be meaningful.
But Wright's presence extends beyond the mere exterior into the interiors. As discussed above with regard to the Endymion country house and the Klaassen house, Wijdeveld's interiors contain especially designed spaces that draw our attention. In Endymion each function is allocated a separate, individually designed room, with the drawing room and the living room arranged around central hearths. In the Klaassen house special spaces have been created in the open living area, such as the winter seat and a platform for study purposes. The hall in the De Wachter country house in Amersfoort features a platform with two benches underneath a window.
This attention to special areas can also be found in Frank Lloyd Wright, judging by the June 1919 issue of the magazine *Wendingen*, which contains an article about the architecture of Frank Lloyd Wright by Jan Wils[14)]. The article includes two illustrations: an interior drawing of the Avery Coonley house, 1906-1908, Riverside, Illinois, and a photograph of the Susan Lawrence Dana house, 1902-1904, Springfield, Illinois. On

the drawing we see an open space designed around a central hearth, with several seats arranged in front of the hearth. The ceiling consists of a roof frame. In the background we see a platform. On the photograph of Wright's Dana house we see a sitting area near a window.
Curiously, Wijdeveld, editor-in-chief and designer of Wendingen, has Jan Wils's article preceded by two of his own designs, entitled Study for an actor's house and Study for a musician's house, which are remarkably similar to what follows[15]. Both studies feature large single-space interiors with occasional accents in the form of ceilings and floors of different heights, and separate, partly open corner spaces. There are, for example, sitting areas around hearths and platforms where the actor or the musician are standing with some of their colleagues. The resemblance to Wright's interiors is strengthened through Wijdeveld's use of a drawing style for his *Study for a musician's house* similar to Wright's interior drawing of the Avery Coonley house. Thus we get an explicit insight into what Wijdeveld saw in Wright's interiors, and how these generate what could be called a theatricalization of living. Although Wijdeveld would never again copy Frank Lloyd Wright so literally, the latter's influence extends beyond Wijdeveld's early work. Wijdeveld greatly admired Wright and actually wrote to him in 1923, starting a correspondence between the two architects[16]. In 1925 en 1926 Wijdeveld dedicated no less than seven special issues of his *Wendingen* magazine to Wright's work - the first and most comprehensive European publication about his work since Wasmuth's publications on Wright in 1910 and 1911 - and in 1931 he organized an exhibition in the Stedelijk Museum in Amsterdam. The admiration was mutual, as witnessed by Wright's invitation to Wijdeveld in 1931 to set up the Taliesin Fellowship together. These plans were eventually thwarted by a lack of funds[17].

Many parallels could be drawn between Wright's architecture and Wijdeveld's work. In Wright's country houses, their relationship to nature was central. The transition to the landscape had to be as smooth as possible. Means to this end were, for instance, the flowerpots, the terraces, but also the stained glass windows and other decorations referring to nature. Following in the tradition of Ruskin, Wright had the first floors of his buildings always emphasize the fact that a building had a certain weight and therefore a certain grip on the soil. The next floor up would have openings to let in air and light. 'Ruskin said that there were three great divisions to a wall: the foundation, or base; the body, or "veil", and the coping, or cornice. He said that they ought to grow from each other like the root, the stalk and bell of a flower. Wright enhanced the horizontal sweep of his walls by expressing their foundations and copings as long ledges'[18]. A great many of these features can be traced in Wijdeveld's architecture too. In his country houses, for example, we can always clearly distinguish between the base, the next floor up and the roof, which are nevertheless integrated harmoniously. Similarly, he frequently emphasized the way the building stood on the soil by cladding the first layer in brick tumbling. Even so, there are unmistakable differences too in the way both architects set their buildings in the landscape. Wright usually adapted to the landscape, achieving a synthesis between building and nature. For his part, when given the opportunity by his clients, Wijdeveld would select a site and subsequently work out the relationship between the building and the surrounding garden. This wouldn't be the natural surroundings but a landscape designed by him. The relationship between country house and garden was a staged one, as illustrated by Endymion, De Wachter and

De Bouw. In this sense Wright was more modern than Wijdeveld. After all, up until after the war Wijdeveld would still draw heavily on the English turn-of-the-century country house culture as initiated by architects such as Voysey and Lutyens.
Wright also wanted his country houses to offer protection against nature, an aspect that can also be traced in Wijdeveld's architecture, for example in the first design for the H.P. Bendien house in Naarden (1920), which appears like a protective cocoon for its inhabitants[19].

Wright's plans are never symmetrical, since symmetry goes against the laws of nature. He wanted his plans to be in some way natural. Perhaps it was Wright's work that tipped the balance for Wijdeveld in favour of an architectural approach based on Character. Hoffman said about Wright's plans: 'A natural plan grew in all directions. (It was Goethe's idea that architecture should appeal primarily to our sense of bodily movement, and that thus a man blindfolded and led through a well-planned house should experience a pleasure like that we feel in dancing.)'[20]. In Wijdeveld's country houses there's much less emphasis on the extensiveness of the designs. But they do invite us to experience them as we look at them or walk through them.
The outstanding feature of all Wright's interiors is the central hearth or open fireplace. Wright saw the hearth as a place where the family would be together.(.) Wijdeveld's buildings too are always designed around a central hearth. Or, as in several later designs, an open fireplace. Once, in his houses in Ridderkerk (1957), he even built an external fireplace. A rare sight in the Netherlands, due to the climate. In an interview Wijdeveld explained that he'd adopted the external open fireplace from American architecture[21].

Development
Wijdeveld's roots go back to the 19th century. He was born in 1885 and started working at architectural firms at an early age, including the offices of Cuypers and the Frenchman Le Cordonnier, who worked in the Flemish Renaissance style. In 1911, after finishing the Endymion design, Wijdeveld felt the urge to explore a new architecture. He wrote: 'I hoped a new spiritual world would open itself to me. I felt that the time of imitating Renaissance, Gothic and Classical architecture had gone, but didn't know what we should create instead, which made me restless'[22]. As soon as Wijdeveld realized that the modern age had arrived, he naturally switched to modern materials and techniques.
The Concept-register Bloemendaal, published by the Provincial government of North-Holland, notes the advanced materials used for the Endymion country house[23]. Wijdeveld's Beach Cottage (1915) is an early example of the concrete skeleton construction. Many of his country houses have a reinforced concrete structure.
Remarkable as this use of modern building techniques for relatively minor commissions may have been - consider for example the traditional brick walls of the Rietveld-Schröder House - the use of modern materials was not pivotal to Wijdeveld's architectural philosophy. Unlike the architects of the New Objectivity he wasn't really interested in exposing the structure, let alone in attaching any moral judgement to it. Wijdeveld's concern lay with the image and the atmosphere he could evoke with his architecture. The skin and meat were at least as important as the skeleton. Therefore he attached much greater value to the sensuality and refinement of materials and detail-

ing. If this meant he had to revert to traditional craftsmanship, he did so, and quite often too. In short, far from being a constructive rationalist, Wijdeveld was interested in the tectonics of his buildings. The notion of tectonics stems from the mid-19th century, and brings together the seemingly incompatible spheres of art and technique in architecture. It involves the speculative coherence between how we see things and how we think they are constructed, between the order of the building and the structure of our conditioned perception. Fritz Neumeyer paraphrases Goethe in this context, who once said that art need not be true, but should evoke a semblance of truth: 'Architecture need not be constructively sincere, but should evoke a semblance of constructive sincerity.'[24)]

As mentioned earlier, Endymion has a white plaster coating and its exterior, to the smallest detail, may be interpreted as a decorum of monumentality and representativeness. Up to a point, the same may be said about the interior, be it that there the emphasis is not solely on the representative character but also on a sense of intimacy of family gatherings (with guests). The striking thing about this house are the many works of art, adorning not only the exterior but also the windows that mark the transition between exterior and interior. Delicately designed griffins decorate the first floor balustrade. The attention to detail is equally evident in the handmade, beautifully mortised parquet floors, wainscoting and panelled ceilings.
In contrast, Wijdeveld's Beach Cottage in Zandvoort (1915) is made of brick. It features a quite remarkable roof structure. In this house the attention to detail is reflected in the stylized brick bird's head situated in front of the entrance.
Wijdeveld's first design for the H.P. Bendien house in Naarden (1920) is rural in character. It has a striking oval plan and an almost absurd, low leaning thatched roof, culminating in a pointed tip enclosing the chimney. The work of art with floral motifs adorning the middle of the door, situated in the façade, is a reference to the client's profession, who was a florist and the inventor of Pokon[25)].
The realized version of this design is equally rural in character. The oval plan has become rectangular, and the thatched roof has been replaced by an equally low leaning, rectangular slate tile roof. The red of the tiles contrasts to the yellow and purple zigzag pattern of the beams below it. This design also features a work of art; crowning the front bay is an elegant wooden sculpture with colourfully decorated floral motives cut out at the top.
Both designs for the Bendien house are reminiscent of the Amsterdam School architecture. Not only in the object-like, sculptural character of the buildings, but also in the craftsmanship and decorative use of materials. One could think of the country houses in Park Meerwijk in Bergen (1916-1918), some of which were built by J.F. Staal, a close friend of Wijdeveld's[26]. Yet, in comparison with these houses, Wijdeveld's first design for the Bendien house is much more articulated sculpturally, while his second is much more colour-oriented.

The double-house in Bentveld (1921), with its elongated form tapering sharply towards both ends, looks rather like a ship. Wijdeveld's family and friends used to refer to this house as the Iron-Heater[27)]. It has been designed as a sculptural unity, becoming in fact a sculpture in its own right.

The iron-heater belongs to a new phase Wijdeveld entered during the twenties, in which decorative brickwork bonds seem to replace the external works of art. To bring out the form of the composition even more explicitly, peculiar brickwork bonds (as well as glass bricks) are employed. Examples are the De Wachter country house in Amersfoort (1922), the De Bouw country house in Hilversum (1927) and the Vattier Kraane house in Amsterdam (1928). The initial designs for De Wachter of around 1922, which still feature a work of art in the façade, mark a transition in this development.

Of all these buildings the double-house in Bentveld is the simplest, though arguably also the most refined example. The cladding of this building creates subtle distinctions between the various horizontal courses, for instance through the alternating horizontal and vertical brickwork pattern. This allows us to distinguish a plinth, a window course, a brickwork band, a second window course and the roof. Some courses are slightly receded from the next, notably right under the roof. By giving the windows either a horizontal or vertical form, Wijdeveld lets them join in the play of the surface divisions. Even the way the windows open - sideways or upwards - is employed to accentuate the form of the building, as can be clearly seen on an old photograph of one of the corners.

The cladding of De Wachter further emphasizes the horizontal structure. From bottom to top we see: a course of soldiers, one of horizontal brickwork, one of brick tumbling and finally the roof, covered with gold-like slates that gloriously reflect the sun. Fastening these tiles required no less than fifteen fittings, and must have cost a fortune. Although the specification stipulated that they must be fastened with copper nails, iron nails were used[28)]. In fact there's a wall underneath the slates, so they are purely decorative[29)].

Another milestone in Wijdeveld's oeuvre besides De Wachter is De Bouw. Here too, Wijdeveld experimented with different bricklaying methods in order to let the architecture speak, as it were.

This building consists of two rectangles placed at right angles to each other with numerous projections and recesses. The lower level largely consists of brick tumbling, and may be interpreted as the plinth of the building. A notable feature of this level are the pillars which are half projecting from the building, adding a vertical element to the composition. They are clad in unusual vertical brickwork. The rest of the building is largely erected in horizontally laid bricks. Another striking element is the partly projecting semi-circular stairwell. This forms another vertical element in the composition, further accentuated by the vertically placed oblong glass bricks.

Both country houses, De Wachter and De Bouw suggest an ambiguity between the traditional and the modern. They both lean heavily towards traditional craftsmanship, while at the same time using modern construction techniques. Although both houses tend to be classified as belonging to the Amsterdam School, there are more obvious references to similar buildings by foreign architects. Not surprisingly, in view of Wijdeveld's international orientation.

De Wachter may well be compared to Mendelsohn's double-house in the Karolingerplatz in Berlin (1922). This building also has a slated roof, but the cubist angles of the building volumes and the white plaster coating lend it a more modern look than

Wijdeveld's country house. It's no coincidence that Wijdeveld's and Mendelsohn's architecture may be compared. To some extent they shared the same architectural views. After they met in 1919 they became close friends, and in 1923 they even set out on a journey together. One of the places they visited was Palestina, where they collaborated on a Power Station in Haifa[30]. Wijdeveld also discussed Mendelsohn's work in the Wendingen magazine.

Wijdeveld's country houses De Wachter and De Bouw could also be compared to Robert Mallet-Stevens's Maison de Mr Cavroix in Croix (1932). Still, this building is slightly more abstract in its design, and we look in vain for Wijdeveld's subtlety in the execution of the cladding.

A number of other country houses Wijdeveld built before the war look more modern. A prime example is the Chauffeur's House with garage on the grounds of Endymion in Bloemendaal (1924), which has a white plaster coating. While the first, undated design could still be classified as Amsterdam School, the final design, though unchanged in many basic features, such as the organization of the plan and the living room extension, can no longer. Perhaps Wijdeveld thought an explicitely modernist execution would be more appropriate to the program. He even included a separate asphalt driveway for the car as well as glass garage doors, heightening the visibility of the car as a symbol of modern life. The garage house is not unsimilar to some of Le Corbusier's houses of that period, notably his Ateliers Lipchitz et Miestchaninoff in Boulogne (1923-1925). While in its articulation of the entrance, creating a spatial interplay of surfaces, Wijdeveld's Chauffeur's House is more akin to the work of the De Stijl architects.

The chauffeur's house doesn't have the modern construction of some of Wijdeveld's less modern looking country houses, but is erected in brick. His Were Di country house in Tilburg (1934), also draped around a concrete construction, comes even closer to modern architecture. The lower level of Were Di is clad in brickwork, while the upper level has a white plaster coating. The round portholes in the façade should be seen as a reference to shipbuilding. While working on this project, Wijdeveld also worked on the interior design of the passenger liner Nieuw Amsterdam.

Were Di forms an important link in the chain of Wijdeveld's country house designs. The plans of the houses, initially mostly square or rectangular, become more dynamic in the course of the twenties as the central hall with staircase becomes more articulated. This hall is situated in the 'armpit' of two rectangles which are usually at right angles to each other. Other examples hereof are De Bouw, the Vattier Kraane house (1928) and the design for the Dr. Pelger house in Havelte (1929). In Were Di this theme is developed further. The central hall is endowed with a flowing form which continues into the exterior, for example in the design of the entrance or the bowl-shaped balcony at the rear of the house. Thus the hall forms the unmistakable heart of the building. It contains a heavily baroque-inspired staircase reminiscent of the architecture of S. van Ravensteyn; in particular of his own house in Utrecht (1932), although the baroque element there has been more explicitely executed than in Wijdeveld's country house[31].

This baroque tendency in Wijdeveld's work is further developed in the design for an Official Residence (1953). The overall organic structure still pivots around the central hall. Many of the themes of this house can be traced back to the earlier country house designs we discussed, be it that they are developed more directly than before. There's a noticable simplification of both design and materialization. Still, we see flagstone cladding, often in combination with a white plaster coating. This instead of the earlier, decorative brickwork bonds. Wijdeveld also uses more glass. The interiors often form an open space. The walls of the architecture evaporate, as it were; the skin of the building becomes thinner. This is reflected in the works of art, often reliefs, which are thus fully integrated in the architecture.

The relationship with nature

Wijdeveld had a passion for nature. Being raised in the city - his family lived first in The Hague, later in Amsterdam - he would go on long nature walks as a young boy. Later he would frequently go on walking tours for several weeks, camping along the way. It wasn't the sporting element that drove him - in fact, he was said to loath team-sport - but rather the contact with nature, which had to be experienced in total solitude[32].

Nature deeply informed Wijdeveld's outlook on life. Recalling a moment as far back as 1890, when he was five, he wrote: 'For the first time I enjoyed the gift of being alone with Nature.(...) The warmth, the blue sky, the bramble bushes, the grey-blue thistles, the butterflies, the buzzing of bees and insects, it was all overwhelming. A miracle revealed itself; I had discovered beauty.'[33]

In other articles he expressed his belief that artistic inspiration was triggered by the contemplation of nature[34]. In his opinion natural and artistic forms were of a kind: both are created in unison and arise from the same source of inner harmony[35]. One could say that Wijdeveld ascribed metaphysical values to nature. In this respect his ideas - like those of Frank Lloyd Wright - were strongly rooted in the romanticism of the 19th century.

To emphasize the metaphysical aspect of nature Wijdeveld had intended a large cave in the shrubbery in the back of the garden of De Wachter in Amersfoort. Mr Langelaan, who grew up in that house, remembers: 'There it was on the plan: just the word cave, with a huge exclamation mark. It was a very special cave, a Maria cave but without a Maria or aything. For me as a little boy it was a great pity the cave was never built. I thought it was the best thing about the whole design.'[36] Wijdeveld's metaphysical leanings had religious overtones. Although he came from a strict Roman Catholic background, the issues of *Wendingen* suggest an interest in religions of all kinds of different cultures. Instead of believing in one God, Wijdeveld seems to have tended towards a pantheist philosophy. In Endymion we already noted that the building is raised above the surrounding landscape, both enhancing our awareness of actually entering a house and offering us a wider view of that landscape from the house. We also observed how the interior of this country house is focussed towards a dramatic staging of that view. These elements return in a great many country house designs Wijdeveld made before World War II. De Wachter, on the advice of Wijdeveld, is in fact situated on the highest point of the Amersfoortse Berg / Amersfoort Mountain, offering a panoramic view over the Utrechtse Heuvelrug / Utrecht Ridge. This inspired the actual name of the house[37)]. Those country houses that are situated at landscape level, such as the Beach Cottage in Zandvoort and the Chauffeur's House in Bloemendaal, have their living areas at first floor level to ensure a view. The view was also a major reason for providing several houses with roof terraces, including De Wachter, Were Di and Wijdeveld's own house in Elckerlyc (1934).

Many of his houses feature carefully designed transitional zones between house and garden in the form of balconies and terraces, some adorned with flower boxes. In other houses, such as the Beach Cottage, the Chauffeur's House and the Garage House (1946) we see partly walled terraces. In De Wachter and De Bouw the transition between house and garden is not only accentuated by a canopied terrace, but additionally marked by some steps descending to the side of the garden.

In some cases the designing of the relationship with nature involved the entire grounds. Sometimes merely by staking out the grounds by placing consoles at the entrance in the style of the house. At other times Wijdeveld presented an entire garden design. A good example are the grounds of Endymion (1909). Within these grounds the country house, the Chauffeur's House with garage and a garden house are all harmoniously arranged, linked by means of pergolas and borders. A fence enclosing the entire grounds more or less shuts out the outside world. Three openings in the fence lead to the front entrance, the servants' entrance and the asphalt driveway, which runs underneath a gateway. The various buildings are connected by pergolas with covered paths. The garden is characterized by a number of geometrical surfaces, i.e. lawns, borders and a moss garden, some slightly sunk into the ground. A similar lay-out can be seen in the English gardens designed by architects such as C.F.A. Voysey and E.L. Lutyens around the turn of the century. Like Endymion, these English gardens were created as unified wholes, comprising coach houses, gazebos, gate houses and so on. Hermann Muthesius, the author of the three-volume Das Englische Haus published in 1904 and an influential figure in German and Dutch architecture, wrote about the design of the English garden: 'In England bildet man die Gartenumgebung des Hauses nicht mehr in Nachahmung der Zufälligkeiten und der Wildnes der Natur, sondern man legt sie geordnet und regelmässig an.'[38)]

Another good example is the total ambiance of the immense grounds of De Wachter, to be seen very clearly on an old aerial photograph. Enclosing the entire grounds is a hedge with two entrances at the front, marked by consoles. Simple geometric forms situated on axis with the house, define the garden lay-out. Meandering paths allow pictoresque walks. On the left of the aerial photograph we see a pond, in the back a vast lawn, while on the right, on axis with the terrace, there's a pergola which leads to the tennis courts featuring a strikingly designed little tennis house. This lay-out also harks back to the English country house culture of the turn of the century. Architecturally too, unlike Endymion, De Wachter reveals English influences. Particularly in the rural character of the house and the archway underneath the building. Similar archways appear in the houses of Baillie Scott.

After the war the relationship between Wijdeveld's country houses and nature is expressed more directly; some of his houses are partly sunk into the ground, creating an organic relationship between house and nature. The view of the landscape remains pivotal to his country house designs. A fine example is the undated design for a Dune Cottage. Partly set into the dunes, the house seems to roll with the dunes, as it were. Another example is the design for an Official Residence in Oosterbeek (1953). In a letter to the Renkum City Council dated May 30, 1953, Wijdeveld explained: 'The proposed site being an curved ridge, I let the entire south wing of my design follow the slope of the terrain, resulting in an similarly curved plan.'[39)]
Like his earlier designs, Wijdeveld's later country house designs include terraces, balconies and the like, marking transitional zones between house and landscape, while in some designs the relationship between house and nature is expressed in rather surprising ways. One of these is the pond extending under a wall from the interior to the exterior, as in his designs for a House For Six (plus six guests) and for a double-house in Heelsum (1961). Similar ponds can be found in Wright's work, for example the Herbert Jacobs House, Middleton, Wisconsin, 1943-1948.

The theatricalization of living

In his *Studies for an actor's house and a musician's house*, inspired by Wright's architecture, Wijdeveld aimed for a theatricalization of living. The theatre had always been very important for Wijdeveld.
From an early age he had been closely involved in both music and the theatre. His first wife, Ellen Kohn, was a musician, an excellent cellist and pianist. As a young boy Wijdeveld had taken singing lessons, and both privately and within the context of his working community Elckerlyc in Lage Vuursche he would often sing songs, accompanied by wife. Wijdeveld and his wife called their first son Wolfgang, after Mozart. Wolfgang Wijdeveld (1910-1986) actually became a composer. For H.Th. Wijdeveld, architecture and music were inextricably linked. When invited for a lecture tour of 13 American universities in 1962, he brought his son along, who would introduce his lectures with some piano music[40)].
Wijdeveld's involvement with the theatre was, if possible, even greater. He organized two major exhibitions about the theatre at the Stedelijk Museum in Amsterdam: in 1922 the International Theatre Exhibition and four years later an exhibition about the work of the celebrated Gordon Craig. Wijdeveld also made several theatre designs, for example for the Groote Volkstheater (1918-1919) as incorporated in his proposed reconstruction of the Vondelpark in Amsterdam, as well as a great many theatre set designs. After the death of Ellen in 1965, he remarried in 1970 the actrice Charlotte Kohler.
The influence of the theatre is also evident in the opening of an exhibition of his work in 1979, when Wijdeveld staged a performance with three women who took turns in reciting a text he had written. It could well be argued that towards the end of his life, Wijdeveld tended to see his entire life as a play. Significantly in this respect, in 1979 there was an integral performance of his conversations at home with his wife Charlotte and with guests[41)]. In Hank Onrust's film on the occasion of Wijdeveld's 90th birthday, the theatrical side of Wijdeveld's personality is graphically depicted. At the end of the film we see Wijdeveld, in a jacket with a striking motif, hold forth in front of his

Elckerlyc building, gesticulating wildly, his character taking centre stage as the camera pans back slowly[42].

Having designed theatre stages as well as entire stage sets, it must have seemed only natural for Wijdeveld to introduce elements thereof into the context of an actor's and a musician's habitation. But we also see platforms in some of Wijdeveld's other country houses, in areas especially intended for cultural activities. Take for instance the study platform in the living room of the Klaassen house, which remarkably enough included a TV-cupboard. Now the platform features a grand piano. Or the window platform in the living room of De Wachter, with two benches at right angles to the window, which, judging by an old photograph, were meant as a place for reading[43]. In Wijdeveld's own house in the working community Elckerlyc he placed a grand piano on a platform in the living room. This being a comparatively small house, there was no space for a separate music room, as there was in the house where he had lived for quite a long time previously, at Vossiusstraat 50 in Amsterdam. Other houses Wijdeveld designed for himself also featured platforms specifically intended for cultural activities. One example is a design from 1962, featuring an actual stage for concerts, lectures and - remarkably - film screenings. Another example is Charlotte Kohler, H.Th. Wijdeveld, House in the Gooi, Workshops for studies with youngsters in connection with future culture (1968). On moving in with Kohler in her house at De Lairessestraat 14B in Amsterdam, Wijdeveld immediately placed his drawing table on the existing platform in the living room.
The platforms connect with the sitting areas of the houses. Wijdeveld would imagine a group of people conversing quietly, until one of them would rise and treat the others to a cultural performance of some kind or other. Wijdeveld's son Roland still remembers these frequent musical soirees at home, and the near-ritual introduction of a piano performance: 'My father knew how to dress things up. One couldn't sit down at a grand piano just like that. We had a wonderful, big Bechstein grand piano, which in our house in the Vossiusstraat stood in the piano room. This was a vast room, with cupboards all around, designed by my father. These were lacquered black and the upper parts served as bookcases. The grand piano was pitch black, and there was a beautiful rug on the floor. My father had designed a special chromium-plated metal music stand, exquisite but very unpractical. The whole room was very aesthetic, as it should be'[44].

The significance of Wijdeveld's introduction of the theatricalization of architecture into the context of living can't be overestimated. Wijdeveld's Groote Volkstheater (1918-1919) was situated in the Vondelpark, the very centre of Amsterdam. He wanted everyone to be able to visit it every day, making the building, in Wijdeveld's words, a part of 'the daily life and movements of working humanity'[45]. The ultimate goal would be to create an entirely new society, deeply infused with culture.

There are parallels between these ideas and those of the German Expressionists just after World War I, in particular of one of its main exponent, the architect Bruno Taut. Taut was convinced that through glass architecture, because of the prismatic workings of the material, humanity could come to share in the grandeur of the universe. Ascribing almost religious values to it, he believed glass architecture would establish a Paradise on earth[46]. He would refer to it in terms of the Kathedrale der Zukunft or of

Kathedrale des Sozialismus[47]. But these weren't houses of religious worship. His proposal for Die Stadtkrone (1919), for instance, comprised an unusual grouping of theatres, cinemas, museums and other major buildings where the people, as Taut put it, seine Gemeinschaft erlebt[48].
Both these type of projects by Taut and Wijdeveld's proposed reconstruction of the Vondelpark in Amsterdam, including the Groote Volkstheater, are intended as steps on the road to a new cultural form of society.
In his commentary to the project for the reconstruction of the Vondelpark, Wijdeveld specifically stressed that the main design priority was that of people's immediate surroundings, in the first place of the house. As he put it: 'It is merely an abstract conception, to see an ideal realized in temple buildings, outside the community, where the ancient Religions are gathered and the 'Great' will be among us, as priests, the only ones to enter the sacred sites, with humanity watching in devout attention. We are the champions of the 'common struggle.' Each of us gives and receives according to his personal strength and deeds, and is therefore entitled to partake in the immediate life and fruits of the culture of his time. He wants to work for, yet also in the results of his efforts. And where these yield a noble beauty he will enjoy these results through daily contact. In the difficult process of founding a new spiritual groundwork for humanity, attention to the design of its immediate surroundings is of the highest essence. The house (...) For their inner value, the outer appearance of things once again receives special attention.'[49]
Both Wijdeveld and Taut stressed that these special buildings must be situated in natural surroundings. However, the German Expressionists projected these principles only in theatres and other special buildings and, unlike Wijdeveld, failed to apply them within the context of living. It is this very aspect of Wijdeveld's country house designs that gives them their unique place within the architectural debate: the place where the people, as Taut put it, seine Gemeinschaft erlebt, is designed on a small, domestic scale: in an informal way, in relation to the sitting areas of the houses.

In search of the perfectly harmonious interior

The platforms in Wijdeveld's houses form an important element in the entire artistic ambiance that informs living in Wijdeveld's country houses. In this respect all of his country house designs can be considered to be the expression of the desire to create a Gesamtkunstwerk. We've discussed the special significance of the music room in Wijdeveld's house at Vossiustraat 50. The importance of the music room in general in upper middle class houses at the turn of the century, as the one place where all the arts come together, has been observed by Nancy J. Troy[50].
The architects of the Dutch De Stijl group were equally focussed on the Gesamtkunstwerk, the difference between them and Wijdeveld being that their point of departure was painting, while Wijdeveld's was the theatre.(.) The De Stijl architects viewed architecture as a spatial composition arising from the arrangement of coloured surfaces.

In her publication *'The perfectly harmonious interior: paradise or prison?'*, Nancy J. Troy wrote about the irresistible belief of the moderns in the ability of architecture and design to change society: 'Good design, it has been argued, possesses a moral dimension because it improves the lives of people who come into contact with it.'[51]

Troy continues to argue that this desire for the perfectly harmonious interior - which in the case of Henri van de Velde's Bloemenwerf house extended to his wife's robes, which he himself designed to be in harmony with the interior decoration -, intended to create a paradise on earth, may also be interpreted as a restraining dungeon where everything, including the way life should be lived, is predetermined[52]. This equally applies to Wijdeveld. Life in his own houses was bound by strict rules, for example with respect to personal appearance. One had to look immaculate, well and stylishly dressed, hair in a straight parting, with an upright posture. Women were prohibited both from wearing make-up and being fat. Sick and pregnant women were hidden from visitors[53].
H.Th. Wijdeveld often read from his own works, demanding total silence from his audience, as he did during musical performances. In short, everything had to be culturally correct. Romance novels were stricty forbidden, as was the performance of any other than serious music. Friends without any cultural background were not welcome. So strong was his belief in the positive effects of his work, that he didn't hesitate to involve his family in his ideals. Administrative work like the typing and sending of his correspondence was in the hands of his wife, and his children too were set to work. His daughter Ruscha, for instance, designed a work of art for the hall of Were Di. Her father also used to give her drawing lessons. These weren't just ordinary lessons, but near-ritual events. The night before, the aquarelle paper would be moisted and mounted, so as to be tightly stretched the next day. Eventually, hands washed and pencils sharpened, the drawing could commence[54].

Not only life in Wijdeveld's own houses, but in any of the total artistic ambiances he designed, was bound to strict rules. In the event of a resident breaking any of these rules, as one client did by putting plastic flowers in his interior - on the grand piano, of all places - Wijdeveld immediately broke off all contact[55].

A good example of this expression of the desire to create a Gesamtkunstwerk is offered by Endymion. Its façade features a work of art. In the vestibule we are surrounded by gorgeous marble, covering both the walls and the floor. Continuing, in the consultation room we see another mural designed by Wijdeveld, a symbolic representation of an opening flower. Arriving in the hall, we are surrounded by an ambiance comprising wainscoting, a panneled ceiling with floral motive and an strikingly colourful parquet floor with inlaid motifs. A similar design also defines the drawing room and living room. In De Wachter Wijdeveld not only designed the interior finish but also a large part of the furniture; to ensure an all-round aesthetically sound interior the rest of the furniture was purchased, at his advice, at the renowned firm of Metz & Co in Amsterdam[56].
Thanks to clients who gave him carte blanche and who had the financial means to afford this luxury, Wijdeveld's architecture could flourish. Still, Wijdeveld's pursuit of a totally harmonious interior design is no less visible in his smaller country houses. The Chauffeur's House, remarkably enough still largely in its original state, is a case in point. The living room offers a composition with a marble hearth, an upholdstered wooden bench underneath the bay window. and an extraordinary book case, also designed by Wijdeveld, with cut out motifs in a meander-like design.

Aesthetics, clearly, were the primary point of departure for Wijdeveld's designs, to which he always remained faithful. When he and his first wife were engaged they exchanged lengthy letters about how they would furnish their future home. Even then his letters bespeak the aversion he had developed to ugly furniture and objects, however small[57)]. Referring to Mrs. C. Stoop's present of a silver spoon to him and Ellen Kohn, Wijdeveld wrote in a letter to Ellen dated May 1: 'It is very nice of her (Mrs. Stoop, MVS) to think so of You...very, very nice...only one thing is a pity and this is...'the spoon'...I can't see I like it. It is a big spoon and full of ornament.'[58)] When in 1981 the aged Wijdeveld moved into an old folks' home, the Burgerengasthuis in Nijmegen, he had the standard room revamped into a total artistic ambiance. The room had harshly blue carpeting, red curtains and a gold-coloured ceiling. Over his writing desk to one side were a black lacquered bookcase and a mirror. Adorning the walls were some of his own works of art, representing globes in outer space. Every week fresh flowers would be placed in the room. They were the silent witnesses to the wonders of nature. Wijdeveld called this room, significantly, Mijn Schrijn / My Shrine. In an article he had kept, the word 'schrijn' is said to be derived from the English word shrine, meaning: realiquary, altar, sanctum[59)].
This room may be considered to be the last Gesamtkunstwerk of the architect H.TH. Wijdeveld. He died on February 20, 1987, at the age of 101.

Notes

1. The list of designs has been compiled by studying source material in the H.Th. Wijdeveld archives at the NAI, in the municipal archives, and by talking to relatives, friends and former students of Wijdeveld. In this essay only the earliest dates are mentioned.
2 Information derived from my interview with Mr and Mrs Klaassen in Velp on October 20, 1993.
3 See: Colin Rowe, 'Character and Composition; or Some Vicissitudes of Architectural Vocabulary in the Nineteenth Century', *The Mathematics of the Ideal Villa and Other Essays,* Cambridge, Massachusetts and London, 1982 (first published in 1976), pp. 59-88.
4 Compare: the article about 'Endymion', as published in: *Concept-register Bloemendaal, deel 1, Bloemendaal/ Duinlustpark,* Provinciaal Bestuur van Noord-Holland, Haarlem, 1990, pp. 72-78.
5 Paul Mebes, *Um 1800: Architektur and Handwerk im letzten Jahrhundert ihrer traditioneller Entwicklung*, München, 1908.
6 Wijdeveld had met Lauweriks through his work in the office of P.J.H. Cuypers. For information about Lauweriks, see: Giovanni Fanelli, *Moderne architectuur in Nederland, 1900-1940*, 's-Gravenhage.
7 This picture postcard can be found in the H.Th. Wijdeveld archives at the NAI, file B.37.4.
8 See: Hilde de Haan, Ids Haagsma, 'H.Th. Wijdeveld, 'Het is tijd om in eeuwen te denken'', *Wie is er bang voor nieuwbouw, confrontatie met Nederlandse architecten*, Amsterdam, pp. 237-244: on page 238 it says that, when he was with Ballie Scott, Wijdeveld worked on a country house for a short period.

9 This drawing can be found in the H.Th. Wijdeveld archives at the NAI, file A 102.
10 Auke van der Woud, 'De nieuwe wereld', included in: *Americana, Nederlandse architectuur 1880-1930*, exhibition catalogue, see p. 23.
11 Leonard K. Eaton, 'Woord vooraf', included in: *Americana*, op. cit.,see p. 5.
12 Auke van der Woud, op cit., see p. 21.
13 Auke van der Woud, op cit., see p. 23.
14 Jan Wils, 'De nieuwe tijd, eenige gedachten bij het werk van Frank Lloyd Wright', *Wendingen*, June 1919, pp. 14-17.
15 Wijdeveld's studies were published on pages 12 and 13 of the June issue of *Wendingen*.
16 For information about this correspondence, see also: Paul Hefting, 'Correspondentie met Amerika', in *Americana*, op. cit., pp. 91-112.
17 Ibid., also see the correspondence in the H.TH. Wijdeveld archives at the NAI.
18 Donald Hoffmann, *Frank Lloyd Wright, Architecture and Nature*, New York, 1986, p. 17.
19 Hoffmann, op. cit., p. 15: a building as a shelter.
20 Hoffmann, op. cit., p. 41.
21 'Come and have a look...I built it myself', pp. 64-70, see p. 67, author and origin unknown, article can be found in the H.TH. Wijdeveld archives, file B.133.
22 H.Th. Wijdeveld, 'Lambersart, 1911', in: *Mijn eerste eeuw*, Oosterbeek 1985, pp. 19-24, see p. 19.
23 See note 4, p. 78.
24 Fritz Neumeyer, 'Tektonik: Das Schauspiel der Objektivität und die Wahrheit des Architekturschauspiels', in: *Über Tektonik in der Baukunst*, Herausgeber Hans Kollhoff, Braunschweig, 1993, pp. 55-77, see page 63.
25 Information derived from my interview with Mr and Mrs Dikken in Naarden on September 15, 1993.
26 For more information, see: the double issue of *Forum*, dedicated entirely to J.F. Staal, volume 36/3-4 1993.
27 Information derived from my interview with Mr A. Langelaan (in Diepenheim), and Mrs Van Haeften-Langelaan in Geldermalsen, October 22, 1993.
28 Idem.
29 Idem.
30 Information derived from a letter from Wijdeveld to Ellen Wijdeveld-Kohn, dated March 13, 1923, H.Th. Wijdeveld archives, NAI, file B 38.3.
31 See: Erik de Jong, Hoos Blotkamp, et al, *S. van Ravesteyn*, catalogue exhibition Amsterdam, 1977-1978, p. 28.
32 Wijdeveld's intense dislike of sports becomes apparent in an interview that I had with a former student of Elckerlyc, Mr H. Panhuyzen, at Schaarsbergen on November 11, 1993. Wijdeveld has written about his special relationship to nature in a large number of articles, such as 'De gedachten en de natuur' (1912), in: *Concerto Grosso, 1905-1944*, pp. 15-17, Lage Vuursche, 1944.
33 See: 'Een onverwachte ontdekking', in: *Mijn eerste honderd jaar*, Oosterbeek, 1985, pp. 6-8, see p. 7.
34 In the article 'De gedachten en de natuur', op. cit., see note 32, Wijdeveld discusses, among other things, the connection between nature and the arts.

35 See, among others: H.Th. Wijdeveld, 'Natuur, Bouwkunst en Techniek', in number 8/9 of *Wendingen*, volume 1923: 'Churned up from the deepest waters, found on the remotest beaches, the miracle of these molluscs intimates a harmony between the forms of nature and the forms of art. Both grow in accordance with deep internal laws, both originate in unity, from an inner harmony.'

36 See note 27.

37 Ibid.

38 Hermann Muthesius, *Das Englische Haus, Band II: Anlage und Aufbau*, Berlin, 1904, p. 83.

39 This letter can be found in de Internal Affairs file, municipality of Oosterbeek, file: K.207.354.2 Box 1235, file 4.

40 Wijdeveld wrote a report about this series of lectures: *Creativity, America invites father and son, February, March 1962*, which can also be found in the H. Th. Wijdeveld archives at the NAI.

41 The production was called 'Het Gesprek', and was performed by the Instituut Houtappel (G. Voskamp and L. Lambergts). Several performances, for instance at the Mickery Theater on May 9, 1979.

42 On the occasion of his 90th birthday, Hank Onrust made a film about him.

43 This photograph is included in a photo album which is in the collection of Mrs Van Haeften-Langelaan in Geldermalsen.

44 Information derived from my interview with Wijdeveld's son, Mr R. Wijdeveld, in Bilthoven on May 3, 1993.

45 The Groote Volkstheater, a project by H. Th. Wijdeveld, *Wendingen*, pp.7-9, see p. 8.

46 See: Mariëtte van Stralen, Bart Lootsma, 'Het caleidoscopische en het transparante, Gedachten naar aanleiding van expressionistische glasarchitectuur', *Forum*, volume 31-3-1987, pp. 36-46, see p. 38.

47 Ibid.

48 See: Kurt Junghanns, *Bruno Taut, 1880-1938*, Berlin, 1970.

49 H.Th. Wijdeveld, op. cit., see note 45, pp. 7-8.

50 'The presence of a piano allied the interior to a tradition of music room design reaching back at least to the turn of the century, when the music room, physically embodying the union of the arts, became the focal point of the aesthetically conceived house', in Nancy J. Troy, *The De Stijl Environment*, Massachusetts, 1983, p. 46.

51 Nancy J. Troy, 'The *Totally Harmonious* Interior: Paradise or Prison' (Mondriaan Lecture 85), Amsterdam, 1985, p. 3.

52 Nancy J. Troy, op. cit., see note 51.

53 Information derived from my interviews with Mrs G. Marx-Bijhouwer in Wageningen on August 20, 1993, and Wijdeveld's daughter, Mrs Kloosterman-Wijdeveld in Amsterdam on May 26, 1993.

54 Information derived from my interviews with Wijdeveld's daughter, Mrs Kloosterman-Wijdeveld, in Amsterdam on May 26, 1993, and his son, Mr R. Wijdeveld, in Bilthoven on May 4 and August 26, 1993.

55 Information derived from my interviews with Wijdeveld's son, Mr R. Wijdeveld, in Bilthoven, Mr A. Langelaan (in Diepenheim), and Mrs Van Haeften-Langelaan in Geldermalsen, on October 22, 1993.

56 See note 27.
57 In a letter to Ellen Kohn from March 22, 1908, Wijdeveld refers to the poor taste of people, H.Th. Wijdeveld archives, NAI, file 37.3.
58 This letter can be found in the H.Th. Wijdeveld archives at the NAI, file B.37.4.
59 This article from an unknown publication, written by B.C. Damsteegt and entitled 'Het woord 'schrijn'', can be found in the collection of Mr and Mrs Kloosterman in Amsterdam.

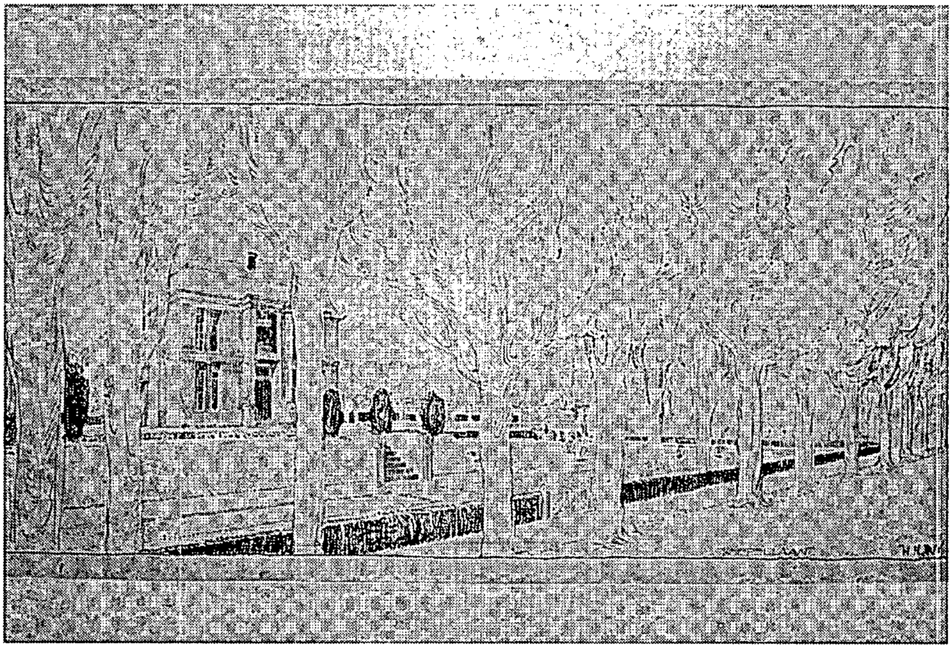

Figure 1: Country house Endymion, Bloemendaal, 1909-1911, Forefront

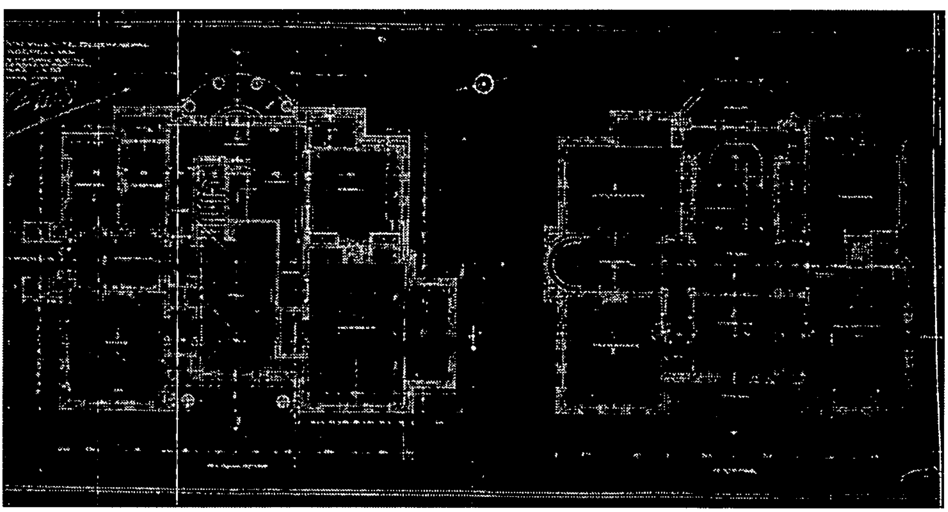

Figure 2: Country house Endymion, Bloemendaal, 1909-1911, Ground plan and first floor

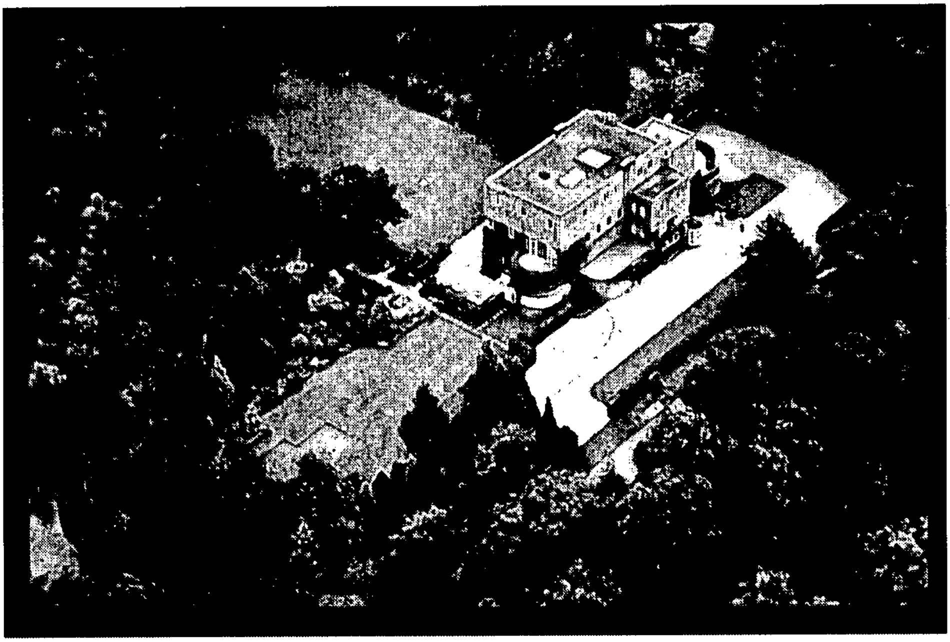

Figure 3: Country house De Wachter, for the Langelaan-Stoop family, Amersfoort, 1922-1928, aerial photograph

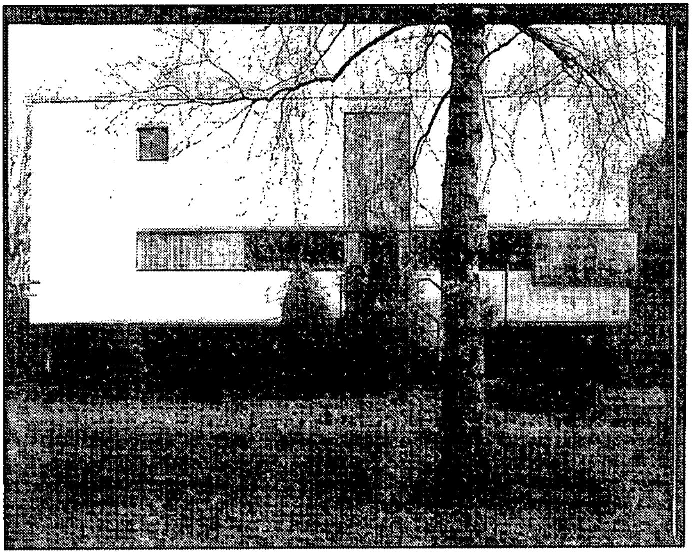

Figure 4: Private house and practice for dentist N.H.R. Klaassen, Velp, 1962-1963, Forefront (photo Bart Lootsma)

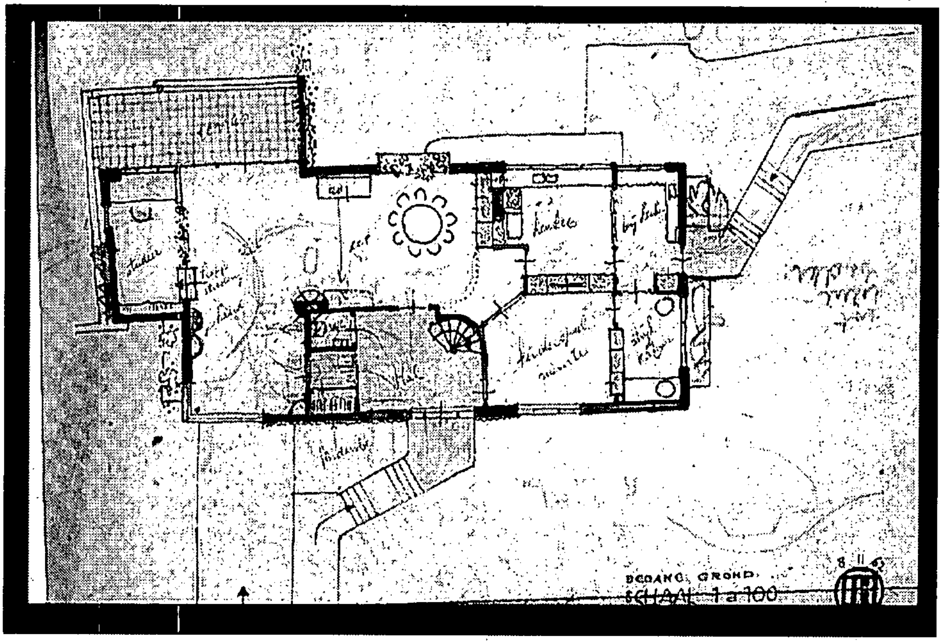

Figure 5: Private house and practice for dentist N.H.R. Klaassen, Velp, 1962-1963, Ground plan

Speculations on the Morphology of the Plans of Seven Ando Houses

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Introduction

Generally, the work of well-known architects attracts attention and is worth investigating for two reasons. First, it may be employed as a prototype or as a point of departure for deriving an analogous solution to a new problem. Second, the form-making ideas that are contained in the work may be of historical interest. With its advent, the computer is enhancing the opportunity to investigate the form-making process employed by an architect systematically, efficiently, and, more importantly, innovatively.

ANADER, a computer-based framework for analyzing and deriving the morphological structure of two-dimensional designs, was proposed by Liou, Vakaló, and Lee (1992). It was suggested that the morphological structure of orthogonal building plans be analyzed and derived at two levels (i.e., the geometric structure and the spatial structure). At the level of the geometric structure, the focus is to establish the relations between lines, between shapes, and between lines and shapes. A Universal Shape Grammar was defined to provide a common ground on which the geometric structure of two-dimensional orthogonal compositions can be analyzed, compared, and derived (Figure 1). At the level of the spatial structure, the focus is to establish the relations between walls, between columns, and between walls and columns. A Universal Architectural Grammar which consists of 1243 architectural rules was defined.

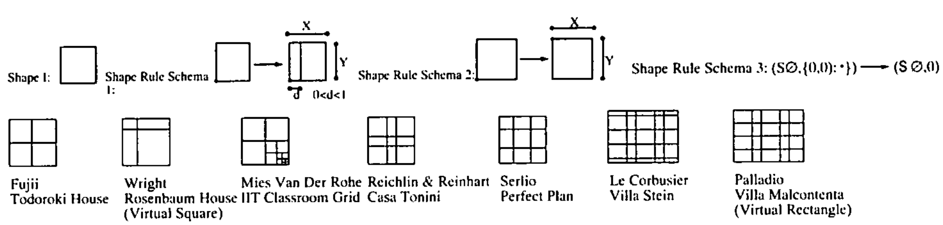

Figure 1: A Universal Shape Grammar and Several Derived Geometric Structures

A review of literature suggests that Ando's architecture is based on a thorough understanding of the architectural heritage he admires[1]. He takes into account the traditional Japanese space, the modern life of the individual, and employs ideas of form and composition from Western architecture to deal with the relations between the parts and the whole. Ando also urges one to rethink the significance of the wall and the column and to discover the rhetorical relations between these elements[2]. In Ando's writings, however, the description and explanation of his architectural form- and space-making is often vague. Using ANADER, it is hoped that the analysis of his seven houses can yield a more explicit account of these activities.

The seven houses selected for analysis are the Azuma House (1975-1976), the Horiuchi House (1977-1979), the Izutsu House (1981-1982), the Kaneko House (1982-1983), the Hata House (1983-1984), the Nakayama House (1983-1985), and the House in Nagoya (1989).

The Geometric Structure

To derive the geometric structures of the plans of Ando's seven houses, the three shape rule schemata of the Universal Shape Grammar have to be used. Each of the seven houses consists of two or three floor plans. Thus, the *primary* geometric structure for each house is established. This structure is the base on which the geometric structures of the two or three floor plans of each house are derived. In the interest of brevity, only the derivation of the geometric structure of the House in Nagoya is illustrated (Figure 2). In addition to the three universal shape rule schemata, Ando's, shape grammar includes four more rule schemata (Figure 2). They are employed to add a rectangle which represents a stairway, steps, or an outdoor access to the corner and the two sides of the overall structure.

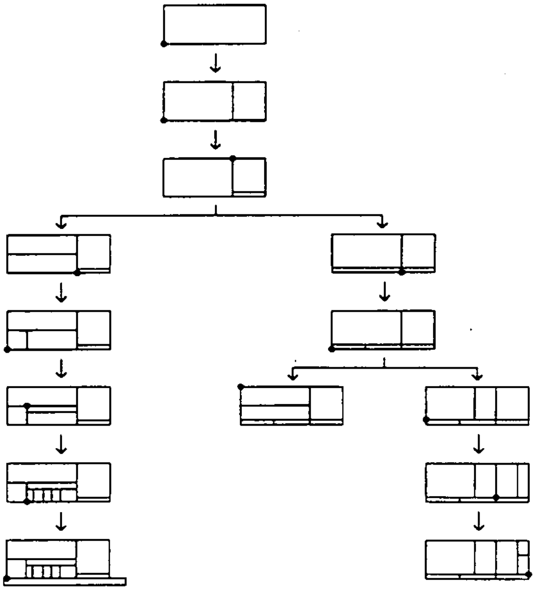

Figure 2: Derivation Process of the Geometric Structure of the House in Nagoya and Four Shape Rule Schemata Used Commonly by Ando

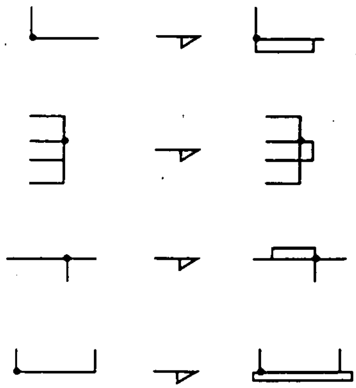

Figure 2: (continued) Derivation Process of the Geometric Structure of the House in Nagoya and Four Shape Rule Schemata Used Commonly by Ando

Rather than in terms of lines and shapes, the derivation processes can be represented also in terms of the three factors pertaining to the application condition of the shape rule schemata 1 and 2 (i.e., R1 and R2). These factors are X_i/Y_i, d_i/x_i, and x_i/y_i. In the derivation process, these three factors, applied step-by-step, yield precise information about (1) what shape (i.e., a square or some rectangle) is to be divided, (2) what ratio is to be used to divide this shape, and (3) where the label is to move to. In other words, this alternative representation of the derivation process records systematically and explicitly information concerning how Ando may have dealt with lines and shapes and their relations at the level of the geometric structure. More importantly, given a uniform format and represented by numbers, the lines, shapes, and relations thereof involved in a geometric structure can be compared with those of other geometric structures. The alternative representation of the aforementioned derivation process is illustrated in Figure 3.

As illustrated in figure 3, the form-making "record" of Ando's seven house plans can be kept by the three shape rule factors. To facilitate the investigation of the geometric structure of each house in relation to those of others, a table which lists the nine shape rule factors of the seven houses can be developed. As shown in Table 1, a comparison of the numbers $N_{d/x}$, N_D, $N_{x/y}$, and N_L between these houses indicates their relative geometric complexity.

Among the seven houses, the Kaneko House uses more kinds of R1 rule schemata (N_D = 17). In contrast, the Horiuchi House uses more kinds of R2 rule schemata (N_L = 22). Moreover, these two houses use more rule schemata of both the R1 and R2 kind than the other houses ($D_{d/x}$ = 37, 22 and $N_{x/y}$ = 46, 34). Thus, the geometric structures of these two houses may be viewed as "more complex" than those of the other houses. On the contrary, the Hata House uses the fewest kinds of R1 and R2 rule schemata, and the fewest rule schemata of both the R1 and R2 kind. Thus, its geometric structure is arguably the "simplest" one.

$X_0/Y_0 = 2.63/1$

↓

$d_0/x_0 = 1/1.5$ ($X_0/Y_0 = 2.63/1$)

↓

$x_1/y_1 = 2.63/1,\ 1/1.75$ $d_1/x_1 = 1/1.17$ ($X_1/Y_1 = 1.17/1$)

↓ (left)	↓ (right)
$x_2/y_2 = 1.75/1$ $d_2/x_2 = 1/2$ ($X_2/Y_2 = 1/1.75$)	$x_2/y_2 = 1.75/1$ $d_2/x_2 = 1/6.75$ ($X_2/Y_2 = 1/1.75$)
↓	↓
$x_3/y_3 = 1/1.75$ $d_3/x_3 = 1/3.5$ ($X_3/Y_3 = 3.5/1$)	$x_3/y_3 = 1/1.75$ $d_3/x_3 = 1/2.1$ ($X_3/Y_3 = 12/1$)
↓	↓ (two branches)
$x_4/y_4 = 1/1,\ 1/1$ $d_4/x_4 = 1/3$ ($X_4/Y_4 = 1/2.5$)	$x_4/y_4 = 1.75/1$ $d_4/x_4 = 1/2$ ($X_4/Y_4 = 1/1.75$) ; $x_4/y_4 = 12/1$ $d_4/x_4 = 1/1.42$ ($X_4/Y_4 = 2/1$)
↓	↓
$x_5/y_5 = 1/1$ $d_5/x_5 = 1/7.5,\ 1/3,\ 1/2,\ 1/1.5$ ($X_5/Y_5 = 3.5/1$)	$x_5/y_5 = 1/12$ $d_5/x_5 = 1/1.5$ ($X_5/Y_5 = 1/1$)
↓	↓
$x_6/y_6 = 1/1$ $d/X_0 = 1/35.5$ ($X_6/Y_6 = 18.5/1$)*	$x_6/y_6 = 1/6$ $d_6/x_6 = 1/1.7$ ($X_6/Y_6 = 3.2/1$)

Figure 3: Alternative Representation of the Derivation Process of the House in Nagoya

The relation between the values of $N_{d/x}$ and N_D and between the values of $N_{x/y}$ and N_L reveals the frequency of application of the shape rule schemata. For example, the ratio of $N_{d/x}$ and N_D in the Azuma House is 15 to 13. It reflects the fact that many shape rule schemata of the R1 kind are used only once in the Azuma House. In contrast, the ratio of $N_{x/y}$ and N_L in the Nakayama House is 20 to 5. It reflects the fact that most of the shape rule schemata of R2 kind are used four or more times.

An examination of d_i/x_i ratio also yields interesting information. The ratio 1/3 occurs in all the houses. The ratios 1/1.5 an d 1/2 occur in six houses. Moreover, the ratios of 1/3 and 1/1.5 are often used together. Note that the application of both ratios divides any orthogonal shape into three equal parts. This type of division constitutes a significant component in Ando's form-making at the level of the geometric structure. It is particularly evident in the Azuma House, the Horiuchi House, and the Izutsu House. The ratio 1/2 refers to the division of an orthogonal shape into two equal parts. This division is used extensively in the geometric structure of the Nakayama House. Its application starts from the division of the overall shape and proceeds to the divisions of the resulting subshapes. Consequently, all the rectangles involved in the process of division exhibit a proportional relation. As reflected in the values of X_i/Y_i, there are three kinds of rectangles whose ratios of the longer side to the shorter side are 1.4, 2.75, and 5.5. They establish a relation of approximately 1 : 2 : 4.

The rectangle of $\sqrt{2}$ (1.4) appears to be an important element in the geometric structures of the plans of Ando's houses. In a√ddition to the Nakayama House discussed above, the Azuma House has a rectangle with a X/Y ratio of 4.3 as its overall shape. Using the ratios of 1/3 and 1/1.5, this rectangle is divided into three equal rectangles of $\sqrt{2}$ within which several sub-divisions are made. The overall shape of the Izutsu House is a $\sqrt{2}$ rectangle. The primary subshapes of it are two rectangles with a X/Y ratio of 2.81 ($\sqrt{2}$ multiplied by 2).

In summary, Table 1 constitutes a mechanism which allows systematic investigation of the geometric structure of each house in relation to that of others. The investigations may include the relative complexity, the frequency of application of the shape rule schemata, the ratio of division, and the shapes and subshapes involved in the derivation of a geometric structure. On the basis of the table of the shape rule factors, a table of Ando's shape grammar can be developed. This table categorizes all the shape rules used in the derivation of the geometric structures of Ando's seven houses. These rules are associated with the universal shape rule schemata (R1 and R2) and Ando's special shape rule schemata (Ando.S). As shown in Table 2, Ando's shape grammar consists of 7 kinds of shape I (i.e., the initial shape), 91 kinds of R1, 68 kinds of R2, and 4 kinds of Ando.S. All the shapes I are rectangles. Although R3 is not included in this table, it is nevertheless always needed to terminate the derivation process.

R1 rules are represented by the shape rule factors of X/Y and d/x. Factor X/Y specifies a particular orthogonal shape to be divided. There are 41 kinds of shapes that are divided to derive the geometric structures of Ando's plans. Among them, the rectangle with a X/Y ratio of 2.35/1 is divided most often (seventeen times, $N_{d/x} = 17$). The factor d/x specifies the location of the dividing line. There may exist a number of rules which can be used to divide a given shape. For example, 7 shape rules can be employed to divide a rectangle with a X/Y ratio of 1/1.41. It should be noted however, that some of the shape rules are employed more frequently than others. For example, given the same rectangle (X/Y=1/1.41), the rule with a d/x ratio of 1/2 has a higher frequency of occurrence than the other four rules. The factors $N_{d/x}$ and N_D in the last two columns under R1 show that 143 R1 rules are used. These rules belong to 91 kinds of R1.

	Shape Rule Schemata													
	R1									R2				
	Xi/Yi 1st fl.	Xi/Yi 2nd fl.	Xi/Yi 3rd fl.	Nx/y	Ns	Xi/Yi	di/Xi	Nd/x	ND	xi/yi 1st fl.	xi/yi 2nd fl.	xi/yi 3rd fl.	Nx/y	NL
Azuma	(4.3/1)*4 1/1.41 (3.3/1)*2	(4.3/1)*3 (1/1.41)*2 4/1 (6/1)*2		15	5	4.3/1 1/1.41 3.3/1 6/1 4/1	(1/3)*2, (1/1.5)*2, 1/8.7, 1/1.08, 1/1.05 1/4.22, 1/2.75, 1/1.55 1/3.14, 1/1.43 1/3, 1/1.5 1/6	15	13	4.3/1 1/1.41 1/1.1	4.3/1 1/1.41 1/4 1/1.23		7	5
Horiuchi	(2.35/1)*5 (1.3/1)*2 1.79/1 1/1.48 2.93/1 1.2/1 2/1	(2.35/1)*5 (1.3/1)*2 (1.79/1)*2 1/1.48 2.93/1	(2.35/1)*7 (1.3/1)*3 (1.79/1)*2 1/1.48 2.93/1	37	7	2.35/1 1.3/1 2.93/1 1.79/1 1/1.48 2/1 1.2/1	(1/3)*3, (1/2.64)*3, (1/1.58)*3, (1/1.5)*3, (1/1.23)*3, 1/3.75, 1/1.35 (1/1.77)*3, (1/8.29)*3, 1/6.1 (1/1.78)*2, 1/2 (1/1.15)*5 (1/2.34)*3 1/3.14 1/1.72	37	16	2.93*(2+1) 2.35*(1+1) 1.9*(1+1) 1.47*(1+1) 1.37*(1+1) 1.3*(2+1) 1/2 1/1.53 1/1.11 1.2/1 1.79/1	1.9*(1+1) 1.53*(2+1) 1.37*(1+1) 1.3*(1+1) 1/1.11 2.35/1 1.79/1	1.9*(1+1) 1.79*(0+2) 1.37*(1+1) 1.3*(1+1) 1.11*(2+1) 1/3.25 1/1.11 1.08/1 3.04/1	46	22
Izutsu	(4.5/1)*3 (2.81/1)*2 (1/1.41)*2 1/2.5 1.8/1 1/1	(4.5/1)*2 (2.81/1)*2 (1/1.41)*2 1/2.5 5/1	(2.81/1)*3 (1/1.16)*2 1.45/1 1/1.41	25	9	4.5/1 2.81/1 1/1.41 1/2.5 1.16/1 1/1 5/1 1.8/1 1.45/1	(1/3)*2, (1/2.25)*2, 1/1.5 (1/3)*3, (1/1.5)*3, 1/2.36 (1/2)*3, (1/1.22)*2 (1/2)*2 1/3.67, 1/1.41 1/3 1/1.67 1/2.36 1/2.29	25	15	1.41*(3+3) 1.8*(1+1) 1.1*(1+1) 1/2.5 1/2 4.5/1 2.81/1	1.41*(3+3) 1/2.5 1/2 5/1 4.5/1 2.81/1	1.41*(1+1) 1/1.19 2.81/1 1.59/1 1.45/1	31	14
Kaneko	(3/1)*2 1/3.8 1/2 1/1.8 1/1.33 1/1 8.13/1 2.55/1 2/1	(6.25/1)*2 (2/1)*2 1/3.13 1/2 1/1.33 1/1 8.13/1 4/1 2.72/1 2.55/1		22	13	2/1 8.13/1 6.25/1 3/1 2.55/1 1/2 1/1.33 1/1 1/3.8 1/3.13 1/1.8 4/1 2.72/1	(1/1.1)*2, 1/1.5 (1/2.3)*2 1/3.85, 1/3 1/4.5, 1/1.42 (1/1.91)*2 (1/1.3)*2 (1/2)*2 1/2, 1/1.19 1/1.5 1/2 1/2 1/5.3 1/1.25	22	17	2*(3+3) 1/1.8 1/1.22 1/1.33 8.13/1 3/1 2.55/1 1.5/1 1.1/1	2*(2+2) 6.25*(0+3) 3.5*(1+2) 1.33*(1+1) 1.16*(1+1) 1/3.13 1/2.24 8.13/1 4/1 2.72/1 2.55/1		34	20
Hata	(3/1)*3 (3.5/1)*2 1/2.5 1/2	(3.5/1)*2		9	4	3.5/1 3/1 1/2.5 1/2	(1/2.33)*2, (1/1.4)*2 1/3, 1/2.7, 1/1.5 1/2 1/1.5	9	7	1.5*(3+2) 1/2 3.5/1	1/1.5 3.5/1		9	4
Nakayama	(1.4/1)*4 (2.75/1)*2 1/2.75 1/1.4 5.5/1	(5.5/1)*2 1/2.75 1/1.4 2.75/1		14	5	1.4/1 5.5/1 2.75/1 1/2.75 1/1.4	1/3.6, 1/3, 1/2, 1/1.6 (1/2)*2, 1/1.25 (1/2)*3 (1/2)*2 (1/1.35)*2	14	9	1.4*(4+4) 2.75*(2+2) 1/4.2	1.4*(1+2) 2.75*(2+2)		20	5
Nagoya	(3.5/1)*5 1/2.5 1/1.75 2.63/1 1.17/1	(1/1.75)*2 12/1 2.63/1 1.17/1	1/1.75 1/1 12/1 3.2/1 2.63/1 2/1 1.17/1	21	9	3.5/1 1/1.75 2.63/1 1.17/1 12/1 1/2.5 1/1 3.2/1 2/1	1/7.5, 1/3.5, 1/3, 1/2, 1/1.5 (1/2)*2, (1/6.75)*2 (1/1.5)*3 (1/1.17)*3 (1/2.1)*2 1/3 1/1.5 1/1.7 1/1.42	21	14	1.75*(2+1) 1*(4) 2.63/1	1.75*(2+2) 2.63/1	1.75*(2+1) 12*(1+1) 1/6 2.63/1	20	5

Table 1: Table of the Shape Rule Factors for Ando's Seven Houses

R2 rules are represented by the shape rule factor x/y. This factor specifies the orthogonal shapes that the label can traverse in the derivation process. As shown in Table 2, 68 kinds of shapes are traversed, and some of these shapes are traversed more frequently than others. For example, rectangles with an x/y ratio of 1/2 are traversed nine times ($N_{x/y} = 9$) while rectangles with a x/y ratio of 1/12 are traversed only once ($N_{x/y} = 1$). The factors x/y and their corresponding frequency of application ($N_{x/y}$) provide important information about the subshapes that are created by R1 rules. From the above example, it may be inferred that more rectangles with a x/y ratio of 1/2 are produced than rectangles with a x/y ratio of 1/12. The factors $N_{x/y}$ and N_L in the last two columns are under R2 show that 167 rules are applied, and these rules belong to 68 kinds of R2. Finally, taken together, X/Y and x/y specify the set of shapes and subshapes involved in Ando's geometric structures. The total number of the shapes and subshapes is 75.

In summary, Table 2 provides a basis on which Ando's seven house plans can be investigated systematically as a class. It informs the analyst/designer of the numbers and kinds of R1, R2, and Ando.S used to define and derive this class of plans. Specifically, the factors of R1 rules (i.e., X/Y and d/x) yield information concerning the kinds of shapes to be divided, and the possible ways to divide them. The factors of R2 rules (i.e., x/y) yield information about the kinds of subshapes that result from the application of R1 rules. In addition, the shape grammar of the class of Ando's seven house plans is ready to be compared with other morphological classes.

The last point deserving discussion here is the frequency of application of the shape rules. The frequency is of particular importance in two respects. First, it provides information concerning an architect's form-making proclivities at the level of the geometric structure. In the study of Ando's seven houses, a record of the frequency may indicate the probability of Ando employing a particular form-making approach consciously or unconsciously. Second, the frequency constitutes a point of departure for guiding the derivation of new members of the class of plans of Ando's seven houses. At each stage of the derivation, reference to the frequency of use of a specific shape rule may indicate "how likely" the current shape is to be divided according to R1, and "how likely" the label is to move within subshapes according to R2. As such, a deeper, quantitative understanding of the geometric structure of an architect's work may be acquired.

Shape Rule Schemata

Shape I X_0/Y_0	R1 X/Y	R1 d/x	$N_{d/x}$	N_D
4.3/1 2.35/1 1.41/1 2/1 3.5/1 2.75/1 2.63/1	2.35/1	(1/3)*3, (1/2.64)*3, (1/1.58)*3, (1/1.5)*3 (1/1.23)*3, 1/3.75, 1/1.35	17	7
	3.5/1	(1/2.33)*2, (1/1.4)*2, 1/7.5, 1/3.5, 1/3, 1/2, 1/1.5,	9	7
	1/1.41	(1/2)*3, (1/1.22)*2, 1/4.22, 1/2.75, 1/1.55,	8	5
	4.3/1	(1/3)*2, (1/1.5)*2, 1/8.7, 1/1.08, 1/1.05	7	5
	2.81/1	(1/3)*3, (1/1.5)*3, 1/2.36	7	3
	1.3/1	(1/1.77)*3, (1/8.29)*3, 1/6.1	7	3
	4.5/1	(1/3)*2, (1/2.25)*2, 1/1.5,	5	3
	3/1	1/4.5, 1/3, 1/2.7, 1/1.5, 1/1.42	5	5
	2/1	(1/1.1)*2, 1/3.14, 1/1.5, 1/1.42,	5	4
	1.79/1	(1/1.15)*5	5	1
	1/2.5	(1/2)*2, 1/3, 1/2	4	3
	1/1.75	(1/2)*2, (1/6.75)*2	4	2
	1.4/1	1/3.6, 1/3, 1/2, 1/1.6	4	4
	1/1	1/3, 1/2, 1/1.9, 1/1.5	4	4
	5.5/1	(1/2)*2, 1/1.25	3	2
	2.93/1	(1/1.78)*2, 1/2,	3	2
	2.75/1	(1/2)*3	3	1
	2.63/1	(1/1.5)*3	3	1
	1/2	(1/1.3)*2, 1/1.5	3	2
	1/1.48	(1/2.34)*3	3	1
	1.17/1	(1/1.17)*3	3	1
	12/1	(1/2.1)*2	2	1
	8.13/1	(1/2.3)*2	2	1
	6.25/1	1/3.85, 1/3	2	2
	6/1	1/3, 1/1.5	2	2
	4/1	1/6, 1/5.3	2	2
	3.3/1	1/3.14, 1/1.43	2	2
	2.55/1	(1/1.91)*2	2	1
	1.16/1	1/3.67, 1/1.41	2	2
	1/2.75	(1/2)*2	2	1
	1/1.4	(1/1.35)*2	2	1
	1/1.33	(1/2)*2	2	1
	5/1	1/1.67	1	1
	3.2/1	1/1.7	1	1
	2.72/1	1/1.25	1	1
	1.8/1	1/2.36	1	1
	1.45/1	1/2.29	1	1
	1.2/1	1/1.72	1	1
	1/3.8	1/1.5	1	1
	1/3.13	1/2	1	1
	1/1.8	1/2	1	1

R2 x/y	$N_{x/y}$
1/12	1
12/1	1
1/4	1
4/1	1
1/3.5	1
3.5/1	4
1/2.93	2
2.93/1	1
1/2.75	4
2.75/1	4
1/2.35	1
2.35/1	2
1/2	9
2/1	5
1/1.9	3
1.9/1	3
1/1.8	2
1.8/1	1
1/1.75	6
1.75/1	4
1/1.53	3
1.53/1	1
1/1.5	4
1.5/1	3
1/1.47	1
1.47/1	1
1/1.41	9
1.41/1	7
1/1.4	5
1.4/1	6
1/1.37	3
1.37/1	3
1/1.33	2
1.33/1	1
1/1.3	4
1.3/1	3
1/1.16	1
1.16/1	1
1/1.11	5
1.11/1	1
1/1.1	2
1.1/1	2
8.13/1	2
6.25/1	3
1/6	1
5/1	1
4.5/1	2
4.3/1	2
1/4.2	1
1/3.25	1
1/3.13	1
3.04/1	1
3/1	1
2.81/1	3
2.72/1	1
2.63/1	3
2.55/1	2
1/2.5	2
1/2.24	1
1.79/1	4
1.59/1	1
1.45/1	1
1/1.23	1
1/1.22	1
1.2/1	1
1/1.19	1
1.08/1	1
1/1	4

R1 $N_{d/x}$	R1 N_D	R2 $N_{x/y}$	R2 N_L	Ando.S 1	Ando.S 2	Ando.S 3	Ando.S 4
143	91	167	68	d/X= 1/7 X/Y= 1/5.94	X/Y= 1.89/1	d/X= 1/6.6 X/Y= 5.4/1	d/X= 1/12.73 X/Y= 14.75/1

Table 2: Table of Ando's Shape Grammer

The Spatial Structure

At the level of the spatial structure, the plans of the seven houses are analyzed using the Universal Architectural Grammar. Some universal architectural rule schemata employed by Ando are illustrated in Figure 4. In this study, the procedure used to number the cells in the structure is to assign a number to the cell at the upper left corner and, then, number the adjacent cells which are most relevant to this cell.[3] In addition to the universal architectural rule schemata, three additional architectural rule schemata are used by Ando. These schemata are denoted as Ando.A1, Ando.A2, and Ando.A3 (Figure 5). Ando. A1 is used in the Izutsu House, Ando. A2 is used in the Izutsu House and the Hata House, and Ando. A3 in the Horiuchi House and the House in Nagoya. The derivation process of the spatial structure of the first floor plan of the House in Nagoya is illustrated in Figure 6.

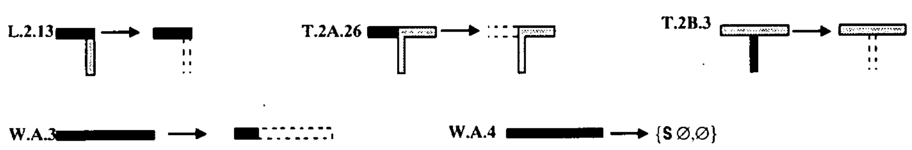

Figure 4: Some Universal Architectural Rule Schemata Employed by Ando

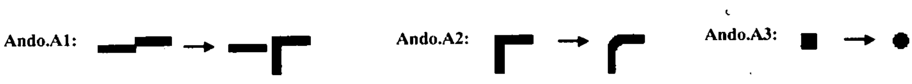

Figure 5: Three Architectural Rule Schemata Employed Commonly by Ando

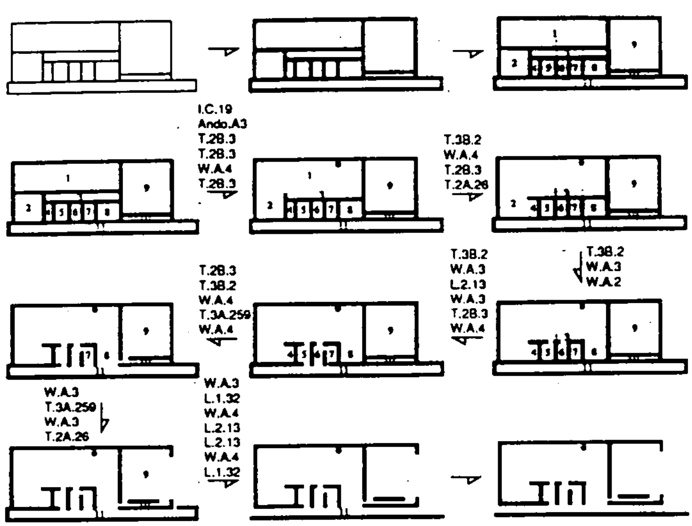

Figure 6: Derivation Process of the Spatial Structure of the First Floor Plan of the House in Nagoya

A total of 51 architectural rule schemata are used in the Azuma House, 146 in the Horiuchi House, 97 in the Izutsu House, 95 in the Kaneko House, 47 in the Hata House, 52 in the Nakayama House, and 83 in the House in Nagoya. To facilitate the investigation of the spatial structure of each house in relation to that of others, Table 3 is established. The first part of this Table lists the kinds of rule schemata applied, the schemata specific to, and the schemata shared by the seven houses. On the basis of the first part of the table, Ando's architectural grammar is formulated. It makes up the second part of Table 3.

As shown in the first column ("Rules Grouped"), each of the seven sets of architectural rule schemata defines the spatial structure of a particular house. For example, 6 and 22 kinds of architectural rule schemata are used to define the spatial structures of the Azuma House and the Horiuchi House, respectively. Note that some of the schemata are used more often than others. In the Azuma House, schema T.2B.3 exhibits the highest frequency of application (17 times). The 5 rule schemata listed in the column "Rules Shared" refer to the schemata which are employed in all seven houses. To derive a member of the class of Ando's seven houses, at least these five rule schemata have to be used. The rule schemata in the column labeled "Rule Specific" are the schemata which belong to a particular house. For each house, they can be derived by removing the schemata in the column labeled "Rules Shared" from those in the column labeled "Rules Grouped." The last column lists the members of the set of architectural rule schemata which constitute Ando's architectural grammar. It is the set of rule schemata which appear in Ando's seven houses. Based on the seven houses, this set is used to define the spatial structure of the class of plans of Ando's houses. Ando's architectural grammar consists of 34 architectural rule schemata. The number in parenthesis to the right of each rule schema is the frequency of the schema's occurrence.

Comparing the rule schemata of the seven houses yields valuable information. Based on this analysis, the Azuma House may be seen as a prototype of Ando's seven houses. It uses 6kinds of architectural rule schemata. Five of these 6 kinds are used by the other six houses. As a matter of fact, four houses (i.e., Kaneko, Hata, Nakayama, Nagoya) use all of Azuma's six rule schemata. In other words, the set of rule schemata defining the spatial structure of the Azuma House appears to constitute a subset of the rule schemata used in the other houses. As well, it may be argued that the Nakayama House and the Hata House exhibit a closer spatial kinship with the Kaneko House than with the other houses because the Kaneko house uses most of their rule schemata (11 out of 13 and 13 out of 16, respectively).

Similar to the shape grammar, the frequency of application of the architectural rule schemata deserves closer examination. T.2B.3, W.A.3, and W.A.4 are the three rule schemata used most frequently in Ando's seven houses. Particularly, in the Azuma House, these rule schemata account for 82 percent of all the rule schemata occurrences. Hence, it may be argued that Ando dealt more with T- and W-type components than with other components. Also, within these two types of components, Ando tended to use T.2B.3 which removes the shorter element of the T component and W.A.3 which cuts off a large segment of a wall, or W.A.4 which removes the whole wall.

<table>
<tr><th rowspan="2"></th><th colspan="6">Architectural Rule Schemata</th><th colspan="2">The Architecture Grammar</th></tr>
<tr><th>Rules Grouped</th><th>Total</th><th>Rules Specific</th><th>Total</th><th>Rules Shared</th><th>Total</th><th></th><th>Total</th></tr>
<tr><td>Azuma</td><td>L.2.13(4) T.2A.26(4)
T.2B.3(17) W.A.2(1)
W.A.3(15) W.A.4(10)</td><td>6</td><td>W.A.2</td><td>1</td><td rowspan="7">L.2.13
T.2A.26
T.2B.3
W.A.3
W.A.4</td><td rowspan="7">5</td><td rowspan="7">I.C.4 (63%)
I.C.19 (25%)
I.1.1 (12%)
L.1.32 (17%)
L.2.4 (4%)
L.2.9 (5%)
L.2.13 (74%)
T.2A.26 (13%)
T.2A.4 (14%)
T.2A.27 (0.5%)
T.3A.259 (7.5%)
T.2B.1 (3%)
T.2B.2 (1%)
T.2B.3 (50%)
T.2B.4 (1%)
T.2B.26 (0.5%)
T.3B.2 (5%)
T.C.1 (0.5%)
T.1.28 (4%)
X.3A.751 (15%)
X.3B.19 (31%)
X.1.13 (4%)
X.1.16 (15%)
X.2.12 (4%)
X.2.10 (12%)
X.4.2 (19%)
W.A.1 (7%)
W.A.2 (3%)
W.A.3 (38%)
W.A.4 (52%)
C.1.4
Ando.A1
Ando.A2
Ando.A3</td><td rowspan="7">34</td></tr>
<tr><td>Horiuchi</td><td>L.1.32(1) L.2.9(2)
L.2.13(9) T.1.28(6)
T.2A.26(6) T.3A.259(1)
T.2B.1(2) T.2B.2(3)
T.2B.3(34) T.2B.4(1)
T.2B.26(1) T.C.1(1)
X.1.16(1) X.4.2(2)
X.3A.751(1) X.3B.19(2)
W.A.1(6) W.A.3(20)
W.A.4(36) C.1.4(2)
I.C.4(3) Ando.A3(4)</td><td>22</td><td>L.1.32 L.2.9
T.1.28 T.3A.259
T.2B.1 T.2B.2
T.2B.4 T.2B.26
T.C.1 X.1.16
X.4.2 X.3A.751
X.3B.19 W.A.1
Ando.A3 C.1.4
I.C.4</td><td>17</td></tr>
<tr><td>Izutsu</td><td>L.2.13(4) T.2A.26(8)
T.3A.259(5) T.2B.1(1)
T.2B.3(18) T.2B.4(1)
T.3B.2(4) T.1.28(1)
W.A.1(5) W.A.3(13)
W.A.4(27) X.3B.19(3)
X.1.13(1) X.2.12(1)
X.4.2(2) I.1.1(1)
Ando.A1(1) Ando.A2(1)</td><td>18</td><td>T.3A.259 T.2B.1
T.2B.4 T.3B.2
T.1.28 W.A.1
X.3B 19 X.1.13
X.2.1 X.4.2
I.1.1 Ando.A1
Ando.A2</td><td>13</td></tr>
<tr><td>Kaneko</td><td>L.1.32(2) L.2.4(1)
L.2.13(5) T.2A.4(3)
T.2A.26(6) T.2B.1(2)
T.2B.3(16) T.3B.2(3)
T.1.28(1) W.A.1(4)
W.A.2(3) W.A.3(14)
W.A.4(25) X.3A.751(2)
X.3B.19(2) X.1.16(1)
X.2.10(2) X.4.2(3)</td><td>18</td><td>L.1.32 L.2.4
T.2A.4 T.2B.1
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X.4.2</td><td>13</td></tr>
<tr><td>Hata</td><td>L.1.32(1) L.2.13(9)
T.2A.26(1) T.3A.259(2)
T.2B.3(5) T.3B.2(1)
T.1.28(1) W.A.1(1)
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Ando.A2</td><td>11</td></tr>
<tr><td>Nakayama</td><td>L.1.32(3) L.2.4(1)
L.2.9(1) L.2.13(3)
T.2A.4(2) T.2A.26(4)
T.3A.259(5) T.2B.1(1)
T.2B.3(10) W.A.1(2)
W.A.2(1) W.A.3(12)
W.A.4(7)</td><td>13</td><td>L.1.32 L.2.4
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T.3A.259 T.2B.1
W.A.1 W.A.2</td><td>8</td></tr>
<tr><td>Nagoya</td><td>L.1.32(2) L.2.13(6)
T.2A.26(2) T.2A.27(1)
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W.A.4(18) X.1.16(2)
I.C.19(2) Ando.A3(2)</td><td>14</td><td>L.1.32 T.2A.27
T.3A.259 T.3B.2
T.1.28 W.A.2
X.1.16 I.C.19
Ando.A3</td><td>9</td></tr>
</table>

Table 3: Table of Ando's Architectural Grammar

In the architectural grammar, the rule schemata are associated with the six types of components (i.e., I, L, T, X, W, and C). Given a component type, there may exist a number of rule schemata to be used. For example, four rule schemata (L.1.32, L.2.4, L.2.9, and L.2.13) can be employed when an L-type component is encountered. However, their frequency of use can vary significantly. Again, take the L-type component as an example. In Ando's seven houses, the frequency of using L.2.13 is .74 while the frequency of using L.2.4 is only .04. For Ando's seven houses, the frequency of use of each architectural rule schema is calculated and listed next to each rule schema. Each architectural rule schema represents a particular spatial condition. Thus, the rule schemata together with their frequency of use may contribute further insights into Ando's space-making approach and may provide a useful reference in the derivation of new members of this class of plans.

Discussion

The morphological structure of Ando's seven houses is explored using ANADER. At the level of the geometric structure, a shape grammar consisting of 91 R1, 68 R2, and 4 Ando.S. is formulated to explore Ando's form-making. Examination of the shape rule factors pertaining to R1 and R2 results in several valuable findings. Notable among them is Ando's preference for the division of 1/3, 1/2, and 1/1.5, and the $\sqrt{2}$ rectangle. At the level of the spatial structure, an architectural grammar consisting of 31 universal architectural rule schemata and 3 Ando.A rule schemata is formulated to explore Ando's space-making. The comparison of the architectural rule schemata used in the seven houses suggests that the morphological structure of the Azuma House may constitute a prototype for those of the other six houses. As well, it is suggested that the strength of the spatial kinship between the plans of the seven houses can be established through the set and subset relations of the architectural rule schemata that define these plans.

In short, this morphological exploration offers insights into Ando's use of geometry and generation of space. It reveals some strategies that Ando may have employed consciously or unconsciously to arrange lines and shapes, and walls and columns. Moreover, with the frequency of applying each rule schema, this exploration provided a quantitative reference to the decision-making activities that may be involved in deriving new members of the class of plans of Ando's seven houses.

Last, but by no means least, it is demonstrated that ANADER facilitates morphological comparisons. Unlike most traditional, shape-grammar-based approaches, ANADER allows the conduct of systematic and explicit comparisons between two-dimensional, orthogonal compositions. As exemplified in the analysis of Ando's houses, graphic and spatial information can be represented not only by shape rule schemata, but also by numbers and symbols which can be shown in tabular form. The tables that list the shape and architectural rule schemata offer abundant opportunities for exploring a wide range of form-making issues. Actually, this study does not exhaust all possible investigations. The tables illustrate only a few applications. For example, a comparison can be made not only between the members of a class but also between the members of different classes. Furthermore, the tables can be extended and updated when new members of a class of two-dimensional, orthogonal compositions are analyzed. It is reasonable to argue that, gradually, a database of morphological classes will result. Such a database may be used to conduct interesting and, one hopes, fruitful morphological investigations.

Notes

1. See Okumura (1984: 131 and 133).
2. See Ando (1984: 128)
3. Note that, actually, the differences resulting from different ways of numbering are not significant because the basic components (i.e., the I-, L-, T-, and X-shaped components of a cell structure) remain the same.

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Urban Design and Architecture

Studies in Morphology of Place

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Abstract

The wider domain of this paper is the study of architectural morphology, but its foremost concern is the study in morphology of place.

According to Goethe's notion morphology is "science of possible form". The ideal of architecture, both in history as well as today, has been that of building places. Place is at the very heart of existential space. However, today there are a lot of misunderstandings in the analysis of architectural form. Besides this there is a long tradition in morphological studies where no common doctrine or methodology exists.

Among the many different approaches for the analysis of architectural space, a minimum of two are clearly defined: phenomenological and quantitative. Representatives of the first group plead for an analysis of formal aspects, genesis and meaning, while the second speak in favour of a quantitative analysis, geometry and structural problems. These two groups each developed separate fields, and their advocates do not recognise works of each other as a matter of architectonic science (Steadman, 1983). With such a division between theoreticians, we cannot expect a positive impact of morphological studies in practice. As a consequence, the discovery of the full sense of place is still missing.

Architecture is by definition a synthesis of tangible and intangible elements. In this paper I propose to posit a morphological understanding of place, from a stand point between these two approaches. It will present a wide ranging approach to studies in architectural morphology that may assist students to superimpose reality and imaginative thoughts during the creative process.

The contemporary morphological methods of analysis are generally focused on research of artefacts, their form and genesis. On the other side, the morphology based on space-time relation may present reality in a more precise manner. When the interrelated categories of space and time unite and complement each other they may present such intangible aspects as: social grouping, spots and paths contractions of space in daily use, and so on. In other words, by this approach we may discover a reality of place which is slightly different than an architect's theoretical interpretation of spatial form.

The contemporary definition for the morphological method is that it is a design-directed instrument. It is a knowledge which disciplines our thought through gaining complete experience about reality. The way Vance sees (1990, p.4), it is not a practice, nor as an existing canon of morphological process.

The common characteristics of all morphological considerations are that: form and structure are observed in totality, and that the common morphological characteristics of a particular structure are expressed. The specificity of the morphology of architectural space is its orientation towards researching the spatial forms and its elements: constructed and open spaces, entireties, blocks, buildings, streets, squares, and the like. The object of work is observed at a given period of time and in a diachronic process, using a comparative method (v.d. Hoeven and Loewe, 1985). The comparison implies an analysis of the development phases and origin of a certain structure, as well as their comparison within a broader regional or global process and corresponding causes.

Morphological studies make possible, and have as their purpose the classification of elements according to their function by formative characteristics - style, applied materials, i.e. toward topography, location in the whole or by other characteristics of the structure (Aymonino, 1985). Building form is regarded as an artefact, which is aggregated into the form determined by the function and structural factors, in particular: geometry, colour, rhythm, composition, proportion, construction, flows of heat, sound and light, material and technology in the overall context (Steadman, 1983; Clark and Pause, 1985). Accordingly, and paradoxically, the orientation of research is empirical.

This orientation seems focused more on fragmented spatial particularities of creation, than on a synthetic study of relations between form and context. According to this principle we may analyse a single place in many different ways. By all this, we say nothing of other scales, for example, relation to the patterns of living, about the effect of existing regulations, economy, traditions and transposition of cultures. In between, there are grey areas that meet some but not all of the tests. Does any of this analysis present a coherent idea about the codified norms, the origin of form and its relationship with context?

Form and context

Cities are the main system, as Martin writes (Martin, March, 1972, p.112), within which all sub-systems exist and operate. Place should be seen as a bipolar system arranged between a particular domain (apartment, building, block) and the carrier, spatially expressed through architectural form. But, architectural form is both: expression and signifier of the culture (Broadbent et al., 1980). The signifier presents itself in an ambiguous way: it is at the same time meaning and form (Barthes, 1957). When we talk about the morphology of buildings themselves, about architecture in a narrow sense, it is not possible to separate them from their entire context - geographic, social and cultural. Separately and commonly, they are an uninterrupted generative interaction.

For that reason, when considering morphological studies of architectural space, two points should be included:

Typological - which includes comparative research of the general characteristics, or one component of an artefact.

Contextual - which concentrates on research into relations between the particular and the general (Shane, 1976).

This framework of morphological studies, as presented at the beginning of the 1960s (Lynch, 1960; Cullen; 1961, Alexander, 1964), in part represents the basis for all place oriented research of today. Modern theories and principles regarding the sequences of *the city image, city landscape, city architecture, the spirit of a place and the morphic language* are an attempt to return to the totality of place through the association of people, society, activities, built structures and nature (Habraken, 1983; Hillier and Hanson, 1984). The aim of these analyses and classifications is the creation of a library of data, in the process of reviewing or designing (Ward, 1969). This data bank can help to discover, preserve or continue the genetic code - a complex system of rules, spatio-temporal reality, architectural syntax and symbols, which principally define the character of each creation (Agnew et al. 1984).

However, the main differences between morphological oriented studies are contained in the superstructure of the basic principle, and in the method of analysis and interpretation of information from the library of data. In one case classification of forms dominates, in a second historical principle, the relation between built and unbuilt in a third, and so on. In general, one theoretical approach is based on quantitative studies as shape grammar, architectural geometry and fractals (March, 1976; Steadman, 1983), while another is paradigmatic, consider genesis of form in relation to the history of art and phenomenology (Pevsner, 1979; Norberg-Schulz, 1980; Rykwert, 1988; Vidler, 1994). In a particular condition the richness of place as context is reduced to a more limited sense of place as location, or in another to generalise the specificity of place into a set of generic categories. Both principles present separate parts of reality and correspond with the warning given by the geographer Entrikin's (1991, p.54) that "a theoretical view of the scientist is more objective, but at the cost of losing many of those meta-codes". The coexistence of these two approaches seems a necessary prerequisite for mutual improvement and presentation of a spatial reality. There are two reasons incorporated in architectural discipline itself.

At first, architecture derived from the inter-play between individual and collective. There is the social logic of space and the spatial logic of society (Hillier, Hanson, 1984, p.28). But, a collective is a conglomeration of many particularities and many social and ethnic groups integrated into urban culture. Their formal rules my be religious or sacred rather than geometrical (Rykwert, 1988). Besides being a synthesis of many individual ideas and acts, forms are also mapping individually (Gould and White, 1986). The development of the notion of cultural values and forms is interdependent and reciprocal. In time, the purpose of the forms as well as their application and interpretation changes. This means that there is not one single reality, but many.

As second, architecture is not a strict scientific discipline but more an experimental laboratory (Scolari, 1979). It requires that we have to apply methods and knowledge from bordering sciences with less paradigmatic tradition. This requires that studies in morphology should virtually imply the synthesis of many disciplines, without the usually clear common borders, including analogies.

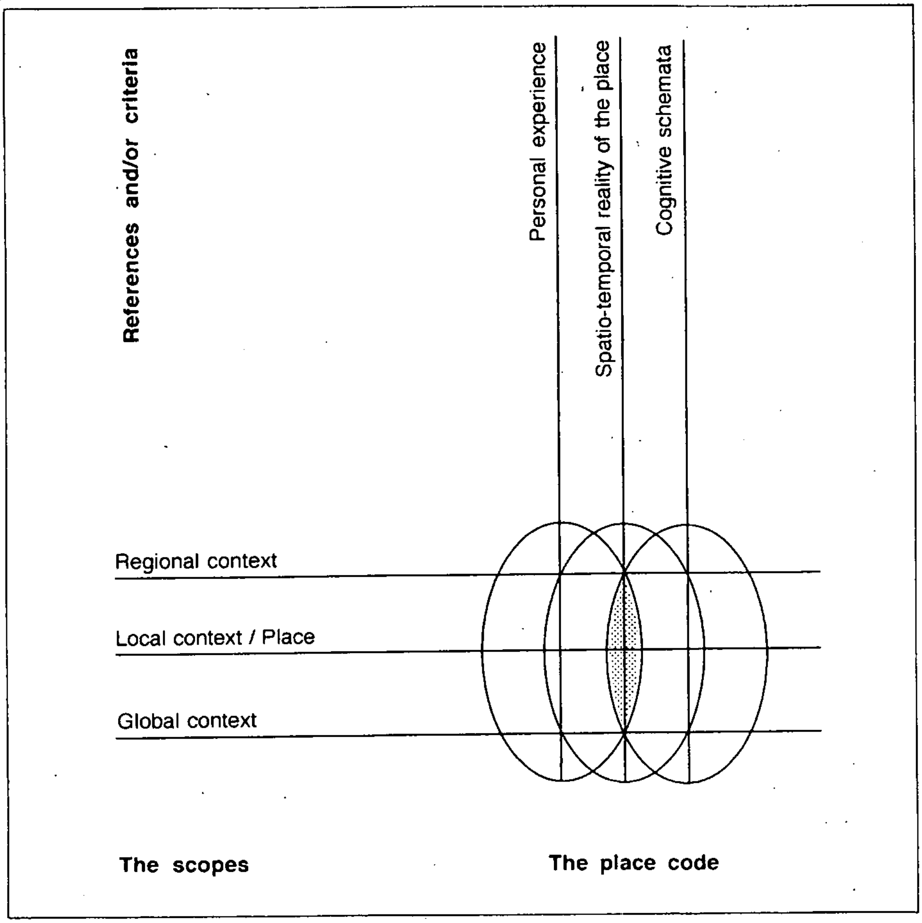

Figure 1: ***Basic diagram of the time-space concept for morphological analysis in the design process (Based on Ward,1969).***

The three association fields: time-space reality, knowledge and personal experience, form the library of references and data in the three different scopes. Intersection of the associations and scopes mark the very core of the place genetic code record.

The connection of different ideas and parameters into a logical whole may create the skeleton for a morphological analysis of built place. A general knowledge of history and wider context, other situations in the same time-cut, or analogical global examples, dimension-less and regardless of the time of creation, in short: cognitive schemata, personal experience and spatio-temporal reality of a place, all in three different scopes: global, regional and local, form the library of data or references about reality (see Fig.1). Such an approach creates a framework which generates a more applicable result. In any case, within this framework, every entity with its own characteristics, history and degree of development requires a corresponding project of research.

The Georges Pompidou Cultural Centre in Paris, by Piano and Rogers, from the 1970s to this day causes contradictory remarks. Opponents most frequently incite the insufficient relation of the building with its context. As we deliberate on the iconic presentation of Paris as the cultural capital of France and Europe, its notion as an environment with experimentation and spectacle as its driving force, the parallel duration of two cultural traditions: representative and subcultural, with its roots in the French Revolution, the spatial matrix of the city, both in terms of geometry as well as dimensions, the tradition of Parisian architecture: vernacular wooden skeleton; Gothic, characterised by flying buttresses; and the poetics of iron from Hector Guimard and Georges Chedanne; refer to the principle of inverse structure in the historical sections of Paris; or to the technological rhetoric of Archigram as global tradition, we are close to the interpretation of the stratified meaning of the Centre which indisputably opposes such evaluations. It is obvious the inert use of a classical value system for a specific and complex artefact is inappropriate. It is necessary to create a broader source of information in order to discover the facts and make objective conclusions about the character of influences on the space shape. By studying it, we can observe the rules, types of shapes, causes in physical forces or establish criteria to estimate the values and selection procedure in a certain environment.

Methodologically there is a problem with morphology - what is constructed - and a problem with morphogenesis - how is it and why is it constructed. Knowledge of the first is proportional to the number of depicted records, and usually large, but a knowledge of the second is not only the matter of architecture. This makes the problem more complex, of particular concern is the superimposition of form and process of genesis. Connecting up many different facts, harnessing - morphology, and processes in space and time - morphogenesis - represent a complex process even for computer methods (Steadman, 1983, p.248). An especially difficult task is the discovery of a spatio-temporal reality of place. In order to superimpose patterns of form and patterns of activities we have to depict the amount and type of information, what often makes its adequate use impossible. In order to adequately use informations in each particular situation, it is necessary to find a suitable common language for the presentation of intangible aspects of form. Moreover, an abundance of information from diverse fields should be translated into an operational and comprehensible language of architecture.

Morphology of space and time

Either as an inevitable component of the process, as an element of periodicity and a benchmark in the historical location of phenomenon, in respect of communications, expressing individual behaviors and time-tables, or as a representative of the cultural character of a society, time is integrated in the forms of space (Parkes and Thrift, 1980).Time function equivalent to the category of space is a possible common medium for expression of the intangible or the *uncanny in architecture* (Vidler, 1884). However, complex study on time has been applied and developed in the field of human geography more than in architecture. In some urban theories time seems to be of a greater importance than the spatial arrangement. Melvin Webber (1963) for example denies that there is a clearly defined universal physical aesthetic of urban forms. He sees that quality is in the dynamic of communication and accessibility, and a main characteristic of space is its transformability. In other approaches time is seen as a remarkable expression of accumulated culture. In the book *What Time is This Place?* Lynch (1972) presents an interpretation of the time records in the life of Boston's communities. His sentiment is to present these records as foundation for all our knowledge of the spatio-temporal world.

In the book *The Role of Time Function in City Spatial Structures* (Bobic, 1990) a framework of space-time relationship to the city is introduced, which is elaborated in *The Studies of Space Time Morphology* at Belgrade University. Among many, three models of time manifested in space were focused upon as a source for studies in morphology of place:

a. *Quantitative* or *diachronic*, irreversible flow determined by physical laws which are used to objectively measure distance, duration, dynamic and the flow of history, which corresponds to Euclidean space (Anderson, 1971; Gatrell, 1983).
b. *Qualitative*, social time manifested by specific cycles that can be measured and classified only within limited framework as it represents the nature of daily activities, social interactions and contractions of activities in the spatial context (Fleisher, 1964; Hillier and Hanson, 1984).
c. *Subjective*, biological time or lifetime expressed by cycles of activity and rhythms of the individual in his limited span between birth and death (time budget), conditioned in existential space (Forer, 1978; Hägerstrand, 1978).

This is a comprehensive framework for investigation into the possibilities of analysing the composition of activities contained in space, as seen through architectural theory and compared to the real nature of process. It may be seen as corrective for existing methods which are focused on physical artefact and based on archetypes. Through these models we are able to investigate the diachronic genesis of an artefact, daily contraction in space, or to scan particular domains. By all this, we may reach a sharper view upon spatial reality for any particular context. In the study of Haarlemmerbuurt in Amsterdam (Bobic,1989), an analysis of space-time geometry revealed a contraction and deformation in space (see Fig.2). When comparing this analysis with spatial form, conclusions are reached about conflict points between dwelling, occupational and public claims, that made a great impact on the process of locating and selecting the type of intervention for the process of renewal.

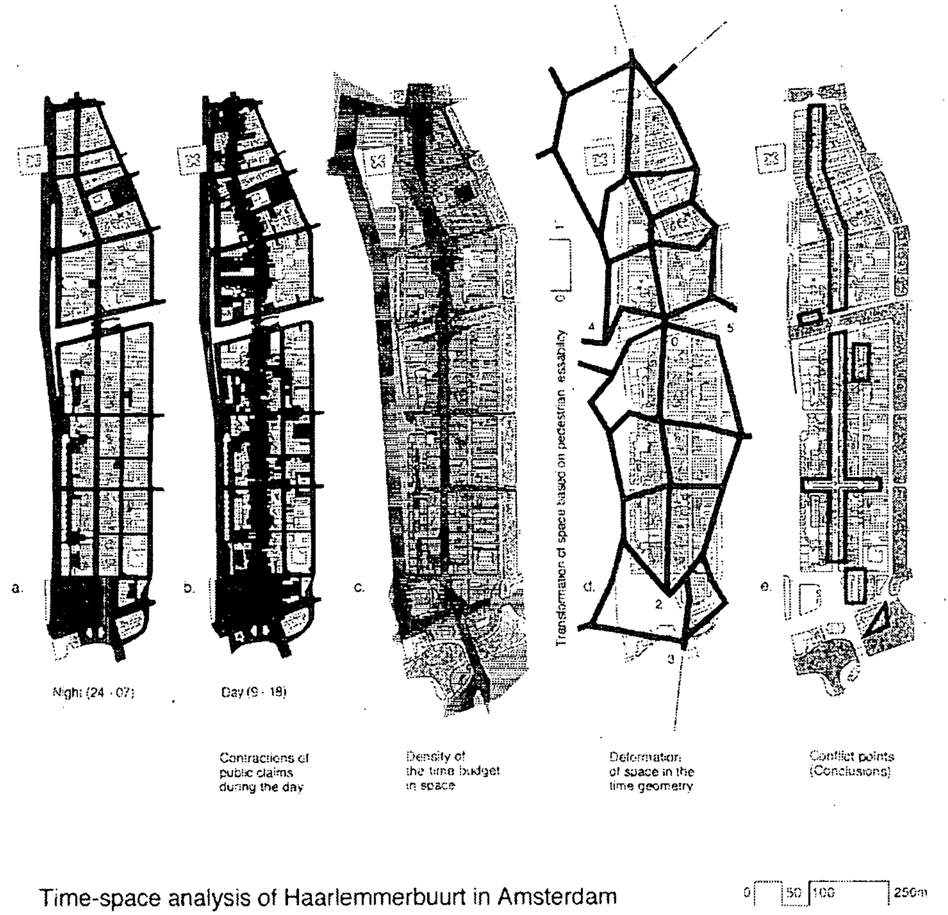

Figure 2: The part of time-space analysis of Haarlemmerbuurt in Amsterdam.
The contractions of public claims during the day (a+b), density of the time budget in space (c), deformation of space in the time geometry (d), and conflict points (e) (after Bobic, 1989). These analyses together with an analysis of the time budget contractions and spatial domains of three main groups of users: dwellers, occupants and visitors, when compared with elements of the spatial morphology as open space, buildings and equipment synoptically present a full significance of spatial structure and lead to the precise location and conclusions about problems and qualities.

Conclusions

Architecture results from the thinking process, which is first of all a mental construction. For that reason, its interpretation is always a repeated attempt to discover the process of creation - morphogenesis, by analysis of that spatializing social and mental construction. Morphology is a medium which allows us to decode and to read the complexities of place. For that reason we have to broaden its scope. In turn this may induce lateral thinking as prerequisite for the reconsideration of the existing schemata and archetypes.

The shift directed towards morphology of place will appear from synthetic and/or comparative analysis of tangible and intangible aspects of architecture i.e. an analysis of the spatial form and the patterns of living. In that respect, a comparative analysis of time and space and space-time offers a more appropriate picture of reality. We would have the very difficult task of understanding how to interrelate the aspects of this study, and to operate within a clear scientific framework. That task could be a stimulus for those theoretical scientists who decide to investigate a relationship between context and architecture.

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Territory-City: Congestion and Dilution of the 'Full Country'
Architectural and historical survey of urban and landscape structures of the Dutch delta

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Abstract[1]

This study raises the matter of the urbanization of the Dutch territory in order to question the possibility of durable and specific urban and landscape forms under conditions of a general and dynamic 'urban' attachment of the territory. Urban space now encompasses dwelling, working, recreation and infrastructure, as well as nature. The traditional oppositions of town versus country and centre versus periphery dissolve in a collage of different shades of urbanization. This dispersion of urban forms exceeds 'urban sprawl'. It entails an urban way of life that affects the whole territory, and is related to the contradictory tendencies of congestion (the 'compact city') and dilution (suburbanization, leisure). Although these issues enter contemporary conceptions, most of these lack a historical perspective. In this respect the concept of the 'ville-territoire' (Corboz 1992) seems more promising. The aim of this study is to elaborate this concept and to investigate its relevancy in the future urbanization of the Netherlands. The paper will mainly introduce the thematic substance of the research.

Introduction

At the EAAE-conference of 1992 in Eindhoven, Rem Koolhaas gave a lecture on his contemporary urban projects[2]. He started the lecture by showing two slides. One image showed Piranesi's reconstruction of ancient Rome: *Il Campo Marzio dell'Antica Roma*, of 1762 (illustration 2 & 3, at the end of the paper). The other showed an aerial view of a contemporary city. The question he raised after showing these slides is precisely one of the reasons for starting this research.

Koolhaas analysed Piranesi's drawing as a map of colliding fragments, "*floating within an ocean of programmatic 'plankton' or debris.*" The major geometrical forms or institutions together with many smaller elements suggest an enormous richness, not only formal, but mostly a programmatic richness. In general the image showed an exhilarating landscape, with an almost metropolitan character. Looking at the other image, of the contemporary town, Koolhaas argued there were many of the same ingredients or characteristics as in the Campo Marzio; or that here also were major volumes with a strong geometrical order, colliding in a configuration with an apparent lack of an overall order. The image of the contemporary town also showed, in the interstices between the volumes, the same kind of debris that was visible in Piranesi's drawing.

Then, the question he stated was: *"Why is the present world, the typical contemporary condition of the city, which is although in formal terms extremely close to Piranesi, even has the same textural richness, ultimately so totally disappointing?"* The main reason for this disappointment is, according to Koolhaas, the fact that urban designers show an inability to work within the forces that operate at this moment, and their mostly nostalgic manner in trying to resurrect former compositional orders or trying to resurrect former systems of control. This paper will focus on these topical issues from a historical point of view, and in particular consider their implications for the Netherlands.

Theoretical Context

Project of the Ground: congestion and dilution

The central issue of this research is to investigate the *territorial foundations* of architecture, urbanism and landscape architecture under conditions of an all-encompassing urbanization. The current dispersion of urban forms exceeds 'urban sprawl'. It entails an urban way of life that affects the whole territory, and it involves both congestion (of existing historical centres, and new centres or 'edge-cities'[3]) and dilution (suburbanization, leisure and nature-development). Related to these contradictory tendencies is a process of 'de-territorialization' (caused by mobility, media-technology, and telematics) and, simultaneously, 're-territorialization' (motivated by a desire for cultural identity)[4]. The main questions involved are: (1) how these processes will affect specific urban-, and landscape-designs, and (2) how to formalize a durable format for the future urbanization of the (Dutch) territory.

The thesis is that instead of a positivistic, i.e., model-based approach of current urbanization phenomena, a historical perception is needed, both to understand the contemporary cityscape, and to redefine its possible 'beauty'. To give concrete form to the range of such an alternative view, calls for a conception of the urban territory as the potential site for a multiplicity of urban forms, without the Modernistic fear of complexity. Also, it calls for a conception of 'planning' as the *art* of the plane, a '*progetto di suolo*', denoting a sensitive exploration of the ground[5].

Historical outline

To underpin the thesis that there is need of a different perception of urbanization phenomena, it is necessary to give a rough outline of the history of urban design. Therefore, the ideas of the Swiss historian Corboz will be shortly discussed. Corboz formulated a new concept of understanding current urbanization patterns through a historical analysis, based on the notion of planning and control of the territory in successive periods (Corboz 1992, pp. 49-52). This analysis is limited to treatises on urban design since the 1850s. Ildefonso Cerdá's *Teoriá general de la urbanización* of 1867 -introducing the term- is regarded as the origin of modern urban design. Subsequently, Corboz divided the history of the discipline in four typical periods: (1) the period of the *Garden City*[6] to be typified as an urbanization *outside* the existing city, and based on a strong exaltation of the medieval town, representing a harmonic, civic society; (2) the period of the *Rational City*[7], based on urbanization *against* the historical city and typified by a strict, utilitarian separation of the different functions in the city (dwelling, working, recreation and infrastructure); (3) the period of the *Historical City*[8], to be typified as an urbanization *inside* the city, based on the notion that the historical town centres are of great importance for our cultural heritage and cannot be put aside to make a fresh start from a 'tabula rasa'; and (4) the period of the *Ville-Territoire*[9], based on the all-encompassing urbanization of the territory, already to be perceived in highly urbanized European areas (Ibid., pp. 49-51). The issue of this research is to clarify the concept of 'territory-city' from a cultural and historical point of view, and to explore its relevancy in architectural, urban and landscape designs, formalizing the all-encompassing urbanization.

Territory-city

Corboz's thesis is that our notion of the city has become problematic. When we think of 'city' we think of the historical centre; the concentric, homogeneous space; based on the notion of a clear distinction between town and country. Everything that does not fit in this in fact nostalgic image is called 'periphery', and is considered to be of much less value, as being *"scandalously disorganized"* (Ibid.). After the Industrial Revolution however, and especially after World War II, the parts of our urban environment that we call 'centre' have become relatively smaller and smaller, and contain by now hardly 10 percent of all inhabitants. Reinforced by faster traffic connections, and -paradoxically[10]- by new media-technology, cities still tend to concentrate into large urban areas, growing towards one enormous European Megalopolis; an urban 'nebulae', stretching from Glasgow to Milan (figure 1). In terms of finance, economy and lifestyle the differences between European regions have definitely vanished a great deal. When we, in addition, consider recreation and tourism as a typical part of an urban lifestyle, practically any part of Europe can be typified as 'urban', including forests, lakes, mountains and seashores, which are being exploited by city-dwellers in their weekends and holidays.

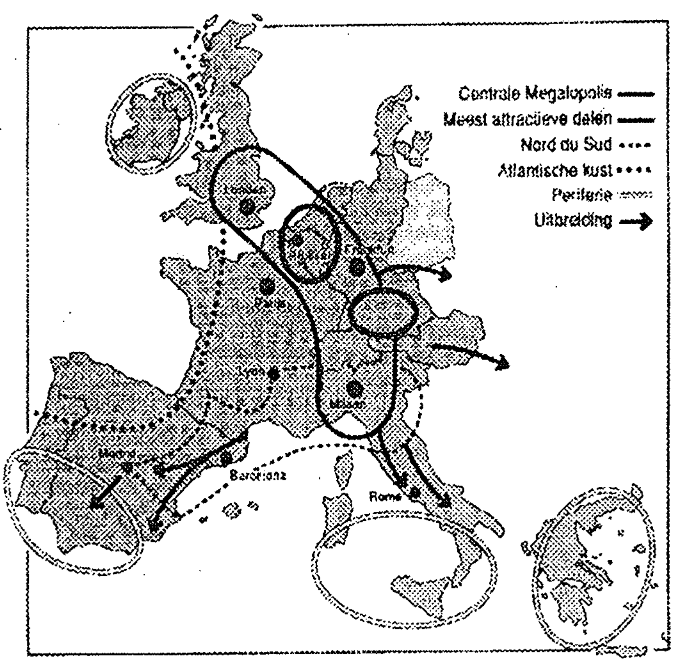

Figure 1: European Megalopolis
(source: RECLUS, Les villes "européennes", 1989)

Especially in relatively small European countries like Belgium, Switzerland and the Netherlands we perceive a level of urbanization, attaching the whole territory. Within these notions all thinking in terms of the above-mentioned oppositions has become anachronistic. Also the idea that urban design is still mainly concerned with planning cannot be maintained in this view. At this point Koolhaas and Corboz meet, in recording that any urban designer should be aware of these global, and elusive forces which can hardly be influenced locally. These observations call for a strategy, completely different from the positivistic notion of a total and absolute order, implicit in many planning instruments. Without proclaiming anarchy or superficiality there is a need to conceive a consistent logic of 'fragments' and 'chaos': a 'pensée complexe'[11)], based on the paradox of defining processes that simultaneously, '*tolerate, generate and oppose*' chaos and disorder (Ibid., p. 52.). To establish these notions in the discipline of urban design there is need of a Copernican Revolution, a dramatic change of attitude in the minds of urban designers and planners (Ibid.).

Territory-City Holland

The 'full' country

The Netherlands is one of Europe's most urbanized countries, and has, in addition, the highest density of population (average of over 450 inhabitants per sq. km). Phenomena of an all-encompassing urbanization are, in consequence, already to be perceived. Moreover, until the year 2015 there will be an additional need of about one million houses in the most urbanized area of the Netherlands: Randstad Holland. Therefore, the future urbanization of the Netherlands could be an exciting, examplifying case for the concept of territory-city[12)]. A fundamental treatise, regarding a design-theory for this concept is, however, not available.

To elaborate the concept of territory-city, design strategies will have to be formulated, based on the above-mentioned notion of a new perception. Thesis is, that -from a historical point of view- such alternative perceptions are already available. To understand and appreciate current urbanization phenomena, it might be clarifying to recall the definition of 'beauty' of surrealist artists, characterised by Lautréamonts description: *"Beau comme la rencontre fortuite sur une table de dissection, d'une machine à coudre et d'un parapluie"* of 1869 (Corboz 1993, p.8). Modern art, literature and modern music did prepare us for a perception of the world in terms of discontinuity, assemblage and fragmentation. These terms perfectly typify our modern urban environment. Consequently, the *beauty* of the 'ville territoire' should also be understood in its dissonant, surrealistic dimension.

To incorporate these notions in a theory of design two issues are at stake: (1) a historical bypass will be made, leading to the hypothesis: *'Territory-city Holland as Campo Marzio'*, and (2) an alternative typology of 'prototypical' fragments will be formalized to constitute this Territory-city Holland by means of architectural and urban designs

Campo Marzio revisited

The thesis here is that Piranesi's Campo Marzio (figures 2 & 3) can be considered and analysed as an early treatise on (modern) urban design, more than just an archeological reconstruction of ancient Rome (for further arguments: Wallis de Vries 1990). Beyond a mere functional zoning the Campo Marzio explores an urban landscape as a 'patchwork' where a close arrangement of compact fragments and open 'in between' spaces creates an almost "*surrealistic intensity*" (Wilton-Ely 1985, pp. 320). Without -in this context- giving an extensive discussion of the Campo Marzio, the statement is that a positive reception of this 'cityscape' could lead to the formulation of design strategies to constitute a 'magnificent city'[13)] beyond the 'ecology of fear'[14)], which typifies post-industrial urban planning.

A theory of design based on these notions, should consider Piranesi's plea for *'l'utilità, la permanenza, e lo stupore'* (utility, durability and perplexity), in one word: *'magnificenza'*, exploring a magnificent city (Wallis de Vries 1990, pp. 181-184). It implies, moreover, the formalization of units of varied scale and programme, arranged in an open parataxis of unique places. The material thus formalized, is to be manipulated through 'strategies' of (Bloomer 1993, pp. 14-15):

Deformation (Splitting, Multiplication)
Repetition
Collision
Ambiguity (Sliding signifiers)
Superimposition
Fragmentation
Thematic weaving and layering
Absence of hierarchies
Plays of resemblances
Excess
Reflexivity

These strategies are derived from Bloomer's analysis of manipulation-techniques used by James Joyce in '*Finnegans Wake*' (1939). In her dissertation she investigated a supposed analogy between the literature of James Joyce and the drawings and etchings of Piranesi. Her thesis is, that the literary techniques of Joyce to manipulate words and sentences into dazzling textual configurations, can be compared to formal techniques, creating the equally dazzling textural worlds of Piranesi. As such, the above-mentioned 'strategies' can also be regarded as spatial metaphores, defining a design-methodology. They will be understood as such, to investigate an alternative typology of prototypical fragments which constitute the concept of 'territory-city'.

Prototypes

The next phase of the research will focus on the formalization of these 'prototypes'. They will be selected from a range of dwelling-forms in the Netherlands (such as country-estates, super-blocks, high-rise tower blocks, high-density-urban-family-housing etc.) but also contain infrastructural fragments (such as transferia, multi-storey car-parks, TGV-stations etc.), commercial fragments (such as shopping malls, highway-hotels, office-buildings etc.), and cultural institutions (such as theatres, mega-cinema's, libraries etc.). These typologies will not be understood in a monofunctional way, but always as a multiplicity of functions that favours a sustainable dwelling culture. Forms are not seen as self-contained models, belonging to a typological system (such as Koolhaas' *S-M-L-XL*)[15)], but as fragments, constituting Territory-city Holland by means of their repetition and differentiation[16)].

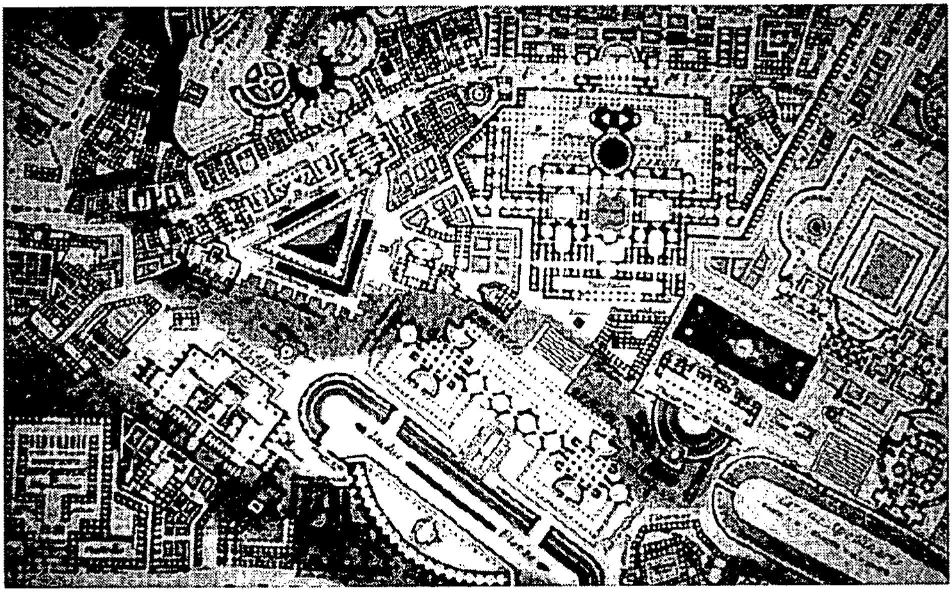

Figure 2: detail of G.B. Piranesi, Il Campo Marzio dell 'Antica Roma (1762)

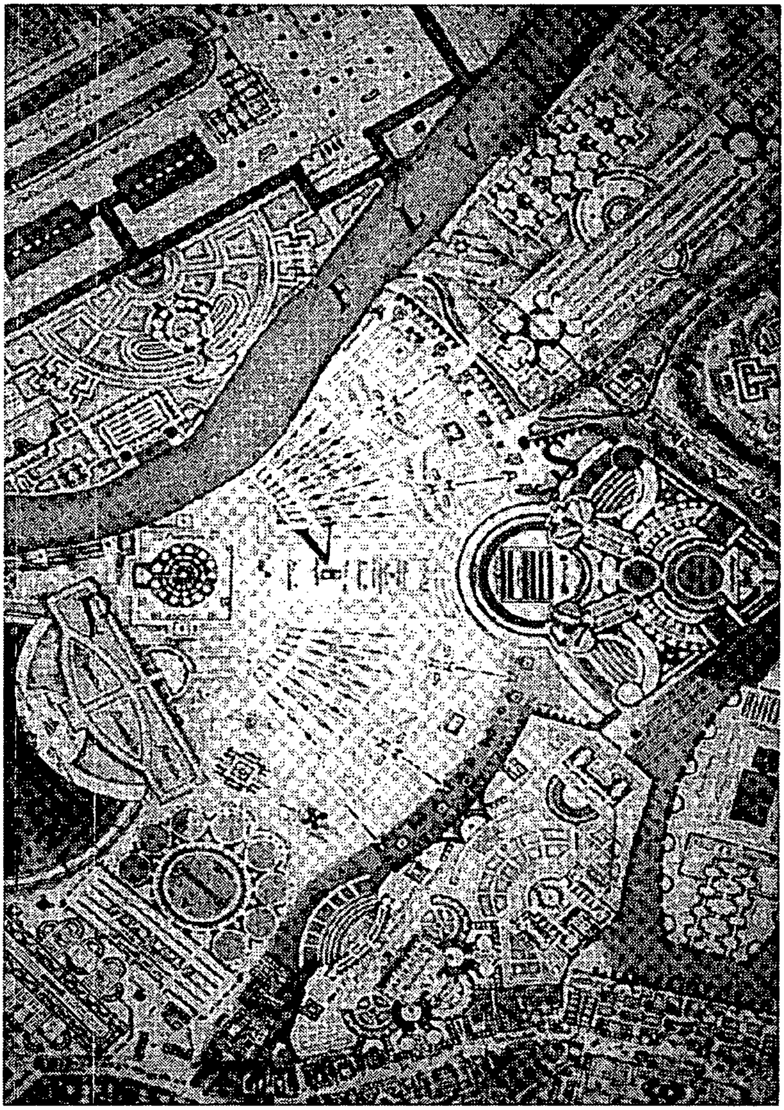

Figure 3: detail of G.B. Piranesi. Il Campo Marzio dell 'Antica Roma (1762)

Notes

1 The notion 'full country' refers to the dissertation of prof.dr. A. van der Woud on the 19th century physical planning in the Netherlands, titled: *Het lege land. De ruimtelijke orde van Nederland 1798-1848* (*The empty country. Town and country-planning in the Netherlands 1798-1848*), Amsterdam 1987. This study stresses the opening up of the country by fast and secure connections. The dissertation contains a short English summary.

2. The lecture was published in the conference-proceedings, pp. 35-49. EAAE-Conference & Workshop 24, April 22-25 1992, Faculty of Building and Architecture, Eindhoven University of Technology, the Netherlands.

3. Joel Garreau, *Edge City. Life on the new frontier*, Doubleday, New York 1991.

4. The terms: 'de-territorialization' and 're-territorialization', are derived from: Gilles Deleuze & Félix Guattari, *A Thousand Plateaus* (Translated by Brian Massumi), The Athlone Press, London 1988.

5. Bernardo Secchi, '*Progetto di suolo*', Casabella 52/521, pp. 18-25. Secchi can be regarded as one of the central figures of a new Italian movement in urban design, focusing on the regional scale of current urbanization phenomena, and trying to formalize an alternative typology. For an examplifying case-study of the Milan region, see: Stefano Boeri, Arturo Lanzani and Edoardo Marini, *Il territorio che cambia, Ambienti, paessagi e immagini delle regione milanese*, Abitare Segesta Cataloghi, Milan 1994.

6. Corboz tries to typify each period with a decisive treatise, formulating the main theory of designs from that period. The period of the garden City, from 1900 till circa 1930, is typified by Ebenezer Howard's book: *Tomorrow, a Peaceful Path to Real Reform* of 1898, and by Camillo Sitte's: *Der Städtebau anch seinen künstlerischen Grundsätzen* of 1889.

7. Examplifying the theories of the CIAM (*Congrès Internationaux d'Architecture Modèrne),* founded in 1928. The strategies, formulated at their various conferences influenced practically all European town extensions, satellite towns and reconstructions of the 1960s and '70s. An important treatise, typifying this period, is Le Corbusier's *Charte d'Athènes* of 1943.

8. Aldo Rossi's *L'Architettura della citta* of 1966 is an important document to typify this period, although it can not be regarded as a manifesto. The range of architectural and urban designs of this period (1970s till '90s) is too diverse to be reduced to one text. Urban renewal projects (Bofil, Krier; Eisenman, Libeskind) typify the revaluation of the concept of history in architecture and urban design.

9. Corboz points out the lack of a sufficient terminology ('*vide lexical*') for describing current urbaniziation phenomena. Recent terms for describing the European 'megalopolis' (Spengler 1922, Gottmann 1961) are: 'città diffusa' (Secchi 1991),

'ville territoire' (Corboz 1991), 'hyperville' (Corboz 1993), and 'generic city' (Koolhaas 1995). All these terms focus on the extensive, polycentral muliplicity of the current 'cityscape'. The choice to use Corboz's term, 'ville-territoire', in our research is motivated by the thorough historical research of Corboz and by the 'palimpsestic depth' he ascribes to the territory, leaving scope for a poetic exploration of the landscape. (Contrary to, for example, Koolhaas' Generic City, which is based on the concept of a global tabula rasa).

10. Despite the potentialities of modern communication technology to cause a dispersion of economic and cultural institutions, the opposite effect can be observed. Especially the head-quarters of Multi-Nationals, Banks and Financial Business are, increasingly, being concentrated in a small number of 'global cities', reinforcing their 'local' economies. For an extensive discussion of these issues see: Saskia Sassen, *Cities in a world economy*, Pine Forges Press, Thousand Oaks, California, 1994.

11. Edgar Morin, *Introduction a la pensée complexe*, ESF éditeur, Paris 1990

12. Recent trends in the Netherlands, however, seem to indicate a massive suburbanization, based on the spatial separation of functions. The main ideology of this kind of urban planning is the ideology of the 'tabula rasa', not regarding any already available characteristics of the site. Although the Dutch landscape hardly has any natural relief, its horizon, its flatness and its famous, but often grey skies, could and should be exploited in architectural and urban designs. Secchi's 'progetto di suolo' can be regarded as a compelling example of such a design-theory (see note 5).

13. Reference to the dissertation of Gijs Wallis de Vries, '*Piranesi en het idee van de prachtige stad*' (an English translation is being made), which focuses on Piranesi's conception of the city, and gives an analysis of the Campo Marzio in its tectonic and 'sublime' dimensions; as a treatise on (modern) urban design. Wallis de Vries is co-promotor of the research at hand.

14. Mike Davis, *The Ecology of Fear*, Open Magazine Pamphlet Series, New Yersey 1991. Translated into Dutch in Oase no. 43, 1995, pp. 2-15.

15. O.M.A., Rem Koolhaas and Bruce Mau: *S-M-L-XL*. Uitgeverij 010, Rotterdam 1995. Koolhaas is definitely conscious of the ambivalence of such a typological restriction. In the introduction he distances himself of any claimed coherence: *"S,M,L,XL organizes architectural material according to size; there is no connective issue"* (Ibid.,xix). Although Koolhaas is aware of the very paradoxical situation of architects, being demanded to deal with *"parameters they did not establish, in countries they hardly know, about issues they are only dimly aware of,"* (Ibid.) he still wants to investigate the possibilities of 'another'architecture; *"In other words, this is a painfully utopian enterprise."* (Ibid.) The aspect of architects facing a utopian 'quest' seems to me very important for dealing with the exhilarating challenges of the 'ville-territoire'.

16. The first case-studies investigate Dutch eighteenth century country-estates. Originally, these estates symbolized the 'classical ideal' of a symbiosis of town and country. The glorification of rural life, based on a rereading of classical writers (Pliny, Virgil), however, took place from a typical urban perspective. The conscious enjoyment of nature, embodied by the prosperity of the art of gardening, typifies the fact that these estates were enclaves with a strong urban culture. The high density of country-estates in the Netherlands, sometimes framed in an almost Piranesian configuration, still leaves an imprint on many urban developments and landscapes. The fact that the Dutch country-estates were rather inhabited by urban merchants, politicians and writers, than by the landed aristocracy, induces the revaluation of this concept. Also the issue of 'the magic of leisure' (design-project for students, supervized by Wallis de Vries), calls for a reflection on these 'pre-urbanist' fragments which constituted a by now almost utopian dwelling culture. Further reading: Eric de Jong, *Natuur en Kunst. Nederlandse tuin- en landschapsarchitectuur 1650-1740* (dissertation on Dutch gardening and landscape-architecture from 1650-1740. The book contains an English summary), Thoth, Bussum 1993, or: John Dixon Hunt (ed.), *The Anglo-Dutch garden in the Age of William and Mary*, Journal of Garden History, vol. 8, april-sept. 1988.

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Modern Ways of Urban Space Refurbishment

Scientific attempt to create a foundation of theoretical model for restructuring of urban space in Poland in accordance with free market economy conditions based on experiences in restructuring Krakow's Kazimierz, Poland and Chattanooga, USA.

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Abstract

The switch from Communist to free market economy brought in many East European Cities big changes, resulting in over-investment in some areas and almost complete lack of founds in others. The problem however, seems to appear also in Western countries, even those well developed such as United States. The article sicks solutions to the problem by comparing some of the most recent ideas. It incorporates them into the proposed theoretical model of urban space refurbishment, emphasising the role of private investment and co-operation among City Architect's Office, City Hall, local firms and business societies.

Introduction

Period of transition from Communist to free market economy results in great development of mainly small and medium size investment. This investment obviously needs to adopt or erect its own architectural representation in accordance to business profile and all the other limitations /usually insufficient founds for proper interaction with existing architecture/. The process in most cases even if according to the local building code, usually is not well carried out. Proposed business profile as well as the aesthetics are not well proposed. The problem seems to be even greater in centers of big cities, where some regions are over-invested bringing rental rates to ridiculously high values, while others, even in the extremely close neighbourhood and of the big historical meaning, die slowly. For example on the area of Krakow, Poland the former Jewish district deteriorates rapidly. In other Polish historical city, Czestochowa, its main market square now serves as the parking space with the express road connecting east and west in the middle. Such way of development is ruled by many social and economical conditions unable to be predicted without specific, professional analysis. Therefore the process being unclear and hard to predict brings the great risk for, especially small and medium size, investors.

Based on the above, questions appear, how to reanimate with the proper guidance of private investment, "dying" urban spaces and how to preserve their usually great historical character.

The only right answer seems to be the complex data handling, incorporating all kinds of possibly encountered problems and pointing solutions. In the past few years this

kind of thinking becomes more and more common in many urban planning offices, resulting in development of data handlings and putting them into the real life.
With the two of them the author of this article had a direct contact during his scholarship at the University of Tennessee and his professional work in Krakow. Both of these examples will become here a foundation for theoretical model of restructuring urban centers in a free market economy conditions.

Description of Methods Used in Two Projects of Urban Space Refurbishment

Polish example - "Kazimierz Action Plan"[1]
"Kazimierz Action Plan" was created between 1993-94 with the collaboration of European Union organisations dealing with the promotion of eastern Europe cities development - ECOS /Eastern Europe City Co-operation Scheme/. The plan is presently the most modern and the most complex data handling prepared in Poland and has been divided into the four basic chapters titled:

A. "Introduction and preliminary findings" including:
- maps of historical development since the foundation of Kazimierz in 1335 till today,
- information concerning practised religions and the role of the area in entire region's heritage,
- analysis of:
  - population,
  - inhabitants age,
  - employment,
  - apartment size, type of property ownership, household size in Kazimierz and in entire Krakow, housing infrastructure and standard of living, demands for new apartments,
  - education.
- analysis of existing local business units including grocer's, general stores, industrial workshops and others,
- analysis of land use in "key areas" /areas of strategic meaning for city development/,
- basic "strengths", "weaknesses", "opportunities" and "threats" in possible development on Kazimierz area.

B. "Action plan strategy framework" with the basic aims facing potential investors containing:
- definition of civic spine /east-west main space arrangement and composition axis/ with four most important for Kazimierz development "key areas" adjacent to the spine /Szeroka St., Kupa St., Jozefa St., gas & electricity co. sites/.
- General Conservator guidelines for remodelling of the historical district with pointing out possible sources of investment.
- guidelines for tourism development,
- guidelines for local business development,
- guidelines for car movement,

- guidelines for public space development - strict definition of street, square, green area, etc...
- guidelines for pedestrian movement in connection with public and individual transportation, within the boundaries of the entire Krakow.

C. "Action plan measures" i.e. specific proposals for building and development with the calendar of expected actions including:
- detail plans for four key areas, drawn with the incorporation of problems such as: land divisions, property ownership, built up lines, Conservator guidelines, proposed function for local activities, visual axes, parking lots and shapes of newly proposed architecture,
- suggestions for creation and arrangement of the Community Park at the Corpus Christi Church,
- detail program of actions meant to be undertaken during the period of two, five, ten and more then ten years.

D. "ECOS project recommendations" containing:
- suggestions for changes in municipal and federal law /establishing deadlines for ownership claims/
- establishment of local Development Trusts,
- establishment of City Council policy toward potential investors.
- financial help and sponsorship from foreign institutions with initialisation of the project.

American example - "Chattanooga Downtown Plan"[2]
"Chattanooga Downtown Plan" was created between years 1990 and 1993 in the City of Chattanooga Architect's office, with the close collaboration with the City Council, most influential local business societies and the firms responsible for social and economical analysis. Authors of the project had to deal with the constant deterioration of urban space and movement of social and cultural city life from downtown to the perimeter areas. This problem, almost typical for majority of small and medium size American cities, has been treated here with the extreme concern. The positive effects of putting this project into life are now very well seen.
The described data handling has been prepared under well established free market economy conditions and even though the source of the problem - domination of car - is a little different than the one in East - European countries, the problem itself /urban space deterioration/ remains the same.
"Chattanooga Downtown Plan" assumes two basic stages of project development.
The first one analyses the present conditions of employment, population, the amount of land given for transport and communication and the present city income. The second one creates detail plan of area development and has been divided into five major chapters, backed up with well prepared maps of suggested actions for each chapter.

Chapter one "Growth" establishes the general development plan and distinguishes five most important areas of interest:
- apartment area
- university area

- industrial area
- recreation area
- business area

It also assumes creation of clear "park & ride system" based on existing public transportation. The above plan has been backed up with the following strategies of development:

- economical - growth of private and public business sector,
- marketing
- investment in new buildings especially those developed among existing historical structure.

All newly designed investments could not, by any chance, endanger the area by increasing the crime rate, pollution or traffic intensity including lack of parking spaces.
Based on the new analysis, the increase of city income from municipal taxes has been established according to the growth of tax payers' number /new residential, commercial, business and parking areas/. Three stages of development have been announced /1990-94. 1994-2000, 2000-2010/ describing city's preferences toward potential investment /type and location/ as well as the tax policy /tax reductions for investors proceeding strictly according to project guidelines/. The rest of city income was to be collected from tourism and the sale of real estate.

Chapter two "Public Spaces" is dedicated to the first stage of development /1990-94/ and describes the growth of transportation and communication system along with the entire net of pedestrian walkways.

Chapter three "Accessibility" assumes:

- development of public transportation in connection with "park & ride" system,
- spatial development of so called "gates to the city",
- creation of more attractive riverside spaces incorporated into "Public Spaces" system.

Chapter four "Housing" defines all the city areas for potential housing deve-lopment with the specific look at the close neighbourhood of the University and downtown. The role of green areas has been also emphasised here, as those increasing real estate value.

Chapter five "Historic Preservation", besides listing all the monuments of historical value /according to federal and municipal lists/. contains also suggestions for possible ways of public participation in preservation and restoration /tax deduction, placement of sponsor's names on the restored objects, etc./. Chapter five also defines material, maximum height and roof shape suggested for use in historical regions.
The entire project ends with the precise calendar of expected actions, points out responsible for their success and provides a list of potential investment sources.

General differences in creation of both projects
Based on the above characteristic, both projects have a lot in common. The analysis of present condition are very similar, though Chattanooga plan puts more pressure on city's financial situation, annual income and percentage rate of municipal taxes. As far as the projects go, Polish version seem to emphasise the importance of proposed spatial

and architectural solutions, including specific shapes and forms. American project leads to solutions, which because of possible tax reductions, almost force investors to strictly follow guidelines shown by plan. The great importance here has also the fact that "Chattanooga Downtown Plan" is an integral part of the official development strategy while "Kazimierz Action Plan" is /at least for today/ more like a theoretical matter then obligatory development program.

Scientific Attempt to Create a Foundation of Theoretical Model for Restructuring of Urban Space in Poland in Accordance with Free Market Economy Conditions

Because of the great amount of actions necessary to create a sufficient data handling, the entire project has been divided into three stages of work;

stage one - detail analysis of existing conditions,
stage two - detail project of possible and necessary changes,
stage three - calendar of actions.

In spite of the type of urban space one has to deal with /its size, population, the degree of deterioration/ all of the described in this model steps should be closely considered, however it is up to the authors of a specific project to determine, which are more and which are less important.

The bearing of the document /it needs to become a guideline for an official city policy/ requires the plan to be made in City's Architect's Office and his urban planning department, with the close co-operation of City Council and firms, preparing social and economical statistics.

Stage 1: Aanalysis

1. SOCIAL AND ECONOMICAL STATISTICS
   Creation of analysis concerning:
   - structure of age, population and education,
   - areas of the highest and the lowest employment rate, as well as their leading profile/s/,
   - areas of the highest and the lowest tax income for city budged,
   - the most and the least successful investments in the past few years /according to the existing legal procedures/.

2. HISTORY
   Creation of maps and calculations concerning:
   - present condition of historical spaces and monuments /technical condition, function, its role in nation's heritage/,
   - type of ownership,
   - general income from tourism.

3. TRANSPORT AND COMMUNICATION
   Creation of maps concerning:
   - present transportation system with calculations of traffic intensity,
   - technical conditions of roads,
   - existing net of public transportation and parking areas,
   - transportation areas located in the close neighbourhood of high business interest areas.

4. BUSINESS
   Creation of maps concerning:
   - main commercial districts /location, connection with public walkways and transportation/,
   - places historically dedicated for trade.

5. HOUSING
   Creation of maps and analysis concerning:
   - areas according to the dwelling intensity,
   - areas according to the existing crime rate,
   - areas according to the living standard and costs.

6. INDUSTRY
   Creation of maps and analysis concerning:
   - existing industrial and post industrial areas,
   - establishment of most devastating factors for the environment,
   - the role of industry in the structure of employment.

7. TOURISM
   Creation of maps and analysis concerning:
   - existing tourist attractions,
   - existing hotel and information service,
   - tax income from tourism to city budged.

8. GREEN AREAS
   Inventory of green areas /sport & recreation, water resources, public walkways/.

Stage Two: Project

1. SOCIAL AND ECONOMICAL STATISTICS
   Creation of analysis and expectations concerning:
   - population growth,
   - preferred by city hall structure of employment,
   - placement of the highest and the lowest tax income area,

   Consulting and receiving approval from the local public and business societies, city hall, police specialists in order to predict potential conflicts of interests.

2. HISTORY
   Predictions concerning:
   - number and location of necessary investments,
   - the role of historic monuments in the future city live,
   - the possible changes of ownership,
   - the possible increase of city income from taxes.

3. TRANSPORT AND COMMUNICATION
   Creation of maps and predictions concerning:
   - proposed hierarchy in transportation system,

- newly designed “park & ride” system according to growing needs,
- the development of public walkways,

4. BUSINESS
   Creation of maps concerning:
   - proposed main commercial districts /location, connection with public walkways and transportation/,
   - the development of Central Business District.

5. HOUSING
   Creation of guidelines for:
   - areas requiring new housing on so called “empty” ground,
   - areas requiring investment in the existing historical structures,
   - areas requiring renovation.

6. INDUSTRY
   Creation of analysis concerning:
   - possible location and function of industrial areas,
   - the role of industry in overall structure of employment.

7. TOURISM
   Creation of analysis concerning:
   - necessary investments in promotion of the refurbished area,
   - necessary investments in new hotels and information services,
   - expected increase of tax income from tourism.

8. GREEN AREAS
   Creation of analysis concerning:
   - necessary and possible development of green areas,
   - increase of land value.

Stage Three: Promotion and Calendar of Actions

Stage three is the final part of entire project and contains the following suggestions:
- the project should become in the fastest possible time the official document of city policy and as such should be incorporated into the detail development plan.
- city policy of tax reductions for those strictly following the guidelines should become an integral part of the project,
- the promotion of tax reductions should stand on the first place in the marketing strategy of the area.
- all documents allowing investment in the refurbished area should have a priority of considering.
- the project should be published and given to a wide variety of potential investors,
- the project should establish a calendar of actions together with names of people or institutions responsible for them.

- the city itself should only invest in the development of communication /business remaining in government's hands/, as the main factor in the development of all other sorts of private investment.

Conclusion
In the conclusion of this theoretical model it is necessary to emphasise two important statements which come out as the result of the above analysis. First of all, well prepared project is the absolute base for future success, while clear and stable city policy is far more important then the investment itself. Second of all, the creation of project should be accompanied by a general idea of space organisation /civic spine/ and its relationship with social and historical limitations.
It is also necessary to finally solve the legal problem of ownership and privatisation at the legislation level, which is the first condition for full and complex refurbishment of urban space in Poland.

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Designing Greenstructures and Development of Nature in Dutch Metropolitan Areas

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Abstract
People living in cities want nature areas and outdoor space within easy reach. In the absence of a 'genuine' wilderness half-natural ecosystems are developed. The more the Randstad in the Netherlands becomes a metropolis, the more nature is worshipped. What is called nature is in fact a human artefact. Nature areas, city skylines, open spaces, lanes and vistas dissect the urban landscape and connects its parts. Nature commands respect, not just in representative outdoor spaces, but also as wilderness. Greenstructures provide a framework in the landscape and contribute to the contact between city and nature.

Introduction

Outdoor spaces and natural areas are valued as the counterparts of the city. The open landscape is very popular with those looking for the rhythm of the seasons or a sunset on the horizon. In a time when the western part of the Netherlands is integrating into a metropolitan area (Taverne 1994), woods and bushes are being planted on a large scale. Rough and empty areas are supposed to imitate 'wilderness'. If possible, semi-natural ecosystems are maintained as parts of the man-made landscapes. 'Wild' species however die out on a large scale because of intensive land use. The land dries up and the intersection of waterways and roads splits it up. In the decades to come there are plans for 150 thousand hectares of scrub, where nature is allowed to have its way (Bink et al 1994). In addition space must be created for a million new houses (van Dijk 1994) and hundreds of kilometres of railroads and motorways (Provoost 1995).

Definition of notion and method

The local government is responsible for development and management of outdoor space. Cities draw up their greenstructure concepts. The regional landscape is seen as the nature-development integration framework. A greenstructure plan is defined like this: a coherent set of aims, concepts and issues for the desired quality of outdoor space of a city or town, resulting in sustainable-development proposals and the concomittant tuning in of responsibilities and finances (Meeus et al 1989).These greenstructure plans follow a common strategy. First characteristic landscape types are being discerned. Then value for land use, nature value and sustainability will be discussed. Entry is by way of themes, fabrics or atmospheres. This creates a distinction between useful areas which can be filled in flexibly on the one hand and a framework consisting of 'long lines' for the future on the other. Finally the couleur locale adds its indiosyncrasies. A short description of the aims:

- Bringing about the efficient use and management of outdoor space
- Enhancing the coherence in space

- Increasing diversity in nature
- Bringing nature to the people (Croonen et al 1995, Vroom 1992).

Below are two examples: the town of Voorschoten behind the dunes of Holland and the city of Almere in the Flevoland polder. An outline of their characteristics is followed by references for the future and a discussion of the design notions.

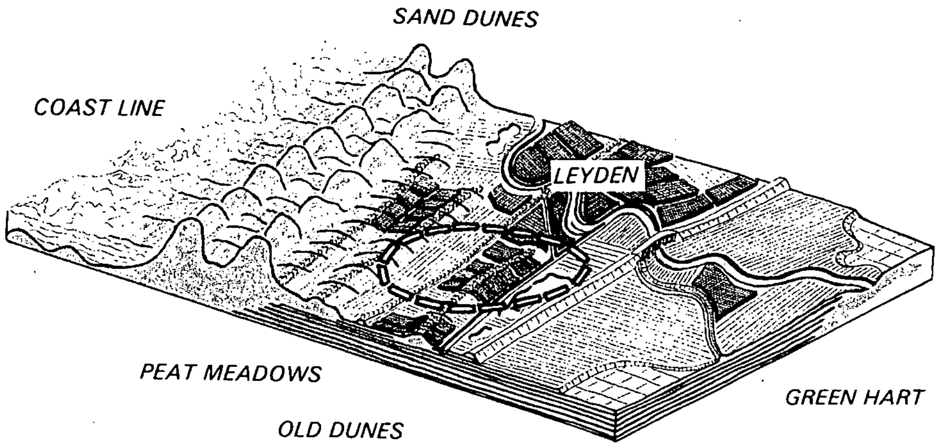

Figure 1

An eventful history of nature and settlement

Voorschoten is a suburb of The Hague and Leyden, sheltered by the old dunes. The area has a long natural and cultural history. Thousands of years ago the sea brought in the sand for the high and dry 'beach walls'; in between the peat was growing in low and wet 'beach planes'. This landscape divide has determined the development of nature and settlement. In the Middle Ages the beach wall was the site for castles and trade routes. After the Middle Ages the primaeval bog in the beach plane was reclaimed. In the Renaissance rich townspeople had a number of estates, lanes and gardens created on the beach wall, overlooking the open meadows (Boelting et al 1992). These lanes did not survive the times without damage. Age-old oaks had to make way for modern traffic. The historical garden heritage can still be experienced in old park woods. Fear of wet feet kept people, even until very far into this century, from building on the meadows. They became the places of rest for the meadow birds, which had been chased away elsewhere (Bink et al 1994). Watercourses, meadows and parkwoods are nature's deep fingers into the city, the outdoor space being furnished with lawns and rosebeds. In the year 2000 there will be room for over 20,000 inhabitants, some castles, several estates and a lot of meadow birds. Landscape and nature confine the settlement expansion. To prevent The Hague and Leyden from growing together, a zone will be made for nature and landscape experience.

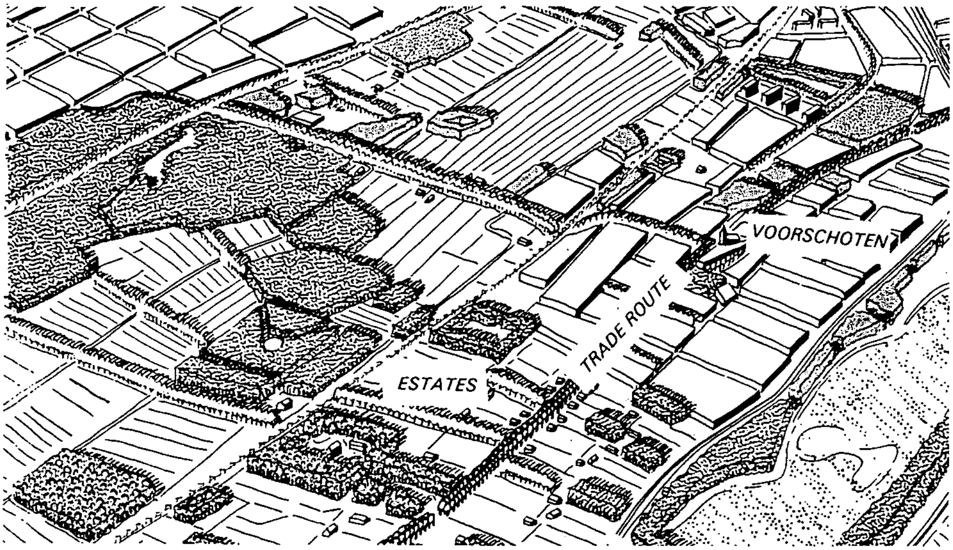

Figure 2

Diagnosis of the Voorschoten greenstructure
The outdoor space links up historic relics with contemporary user space. In the city representation is predominant, outside nature, so valuable from a cultural historical point of view, prevails. Sometimes the small scale neighbourhoods looks like 'patchwork'. The lanes and the vistas which catch the eye seem to have been outlawed. Starting-point in the plan is the landscape dichotomy; it appreciates contact with nature and reintroduces the trade route as a long lane intersecting the settlement.

Figure 3

Estates and lanes

The difference in character between the small scale beach walls and the open beach planes determines Voorschoten's past, present and future. Where possible, the estates along the beach wall are reconstructed with an alternation of park woods, groups of trees, lanes and open areas. Lanes along trade routes and vistas across the meadows will be managed sustainably. Not only do they keep alive the memory of history but they also offer points and lines of orientation.

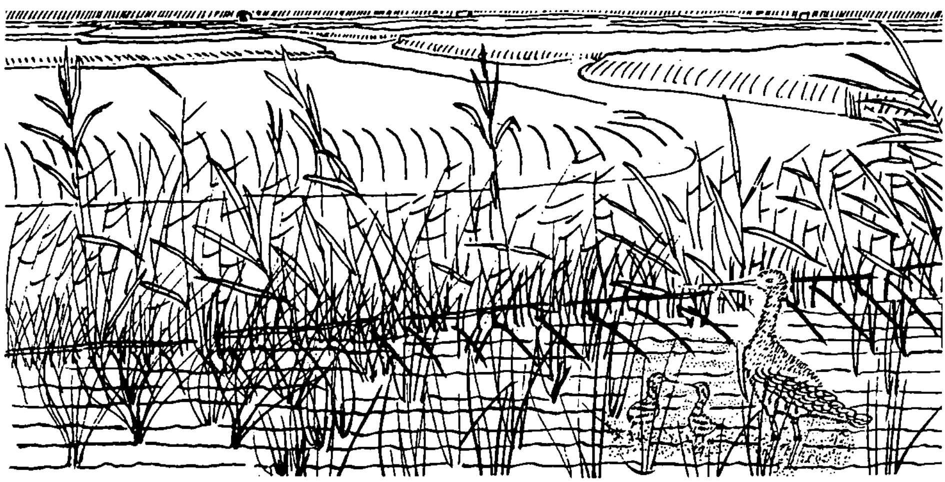

Figure 4

Contact between settlement and nature
At first sight the beach plane space seems to be an indeterminate space. You have to have the gift of a blind photographer to see just cows here. The meadows and the sky are filled with birds. The wealth of meadow birds are controlled the agricultural way. Black-tailed godwit, peewit, reshank and summer-teal raise a dam to stop meadow building. Watercourses and verges between settlement and meadows must make the contact between city and landscape tangible, by means of a natural vegetation full of flowers. Sustainable greenstructures revive the old man-made landscape (Meeus & Wijermans 1993).

Full speed ahead in the newtown of Almere (Flevoland)
Almere is Voorschoten's counterpart, in nearly every aspect. There is little history in a newtown on the bottom of the sea. From 1976 Almere was born out of nothing in the recently reclaimed Flevoland polder. The growthrate is unprecedented and will remain very high in the next century as well. Each year an average of 3000 houses are built and thousands of trees are planted. Within two decades (1976-1994) the first 100,000 inhabitants took up residence. In about 2010 their number must have grown to 200,000. After the year 2015 the number of residents will probably have reached a final quarter of a million (Anon. 1992). Just over half of the city will have been laid out, designed and furnished in 1996. Roads and waterways make up immense draught-boards of plots, covered in bright yellow colza, pioneer woods and waving cane. Each year over 100 hectares are being prepared for building houses, firms and for outdoor space. The pre-planting of woods and lanes gives the empty polder plane a measure, scale and shelter, well before the residents settle in. On the nutrient-rich clay trees are growing almost into the sky: poplars grow about two metres a year. 'Wind', 'water', 'work', 'sports' and 'games' characterize the colonisation phase (Anon. 1984). The second wave makes the cliché of a sleepy satellite town of Amsterdam come to an end by making an effort for 'trains', 'schools', 'going out', 'art' and 'culture' (Anon. 1992). On the future agenda: 'sustainable management', 'contrast with nature' and 'contact with landscape' (Meeus & van Wijlen forthcoming).

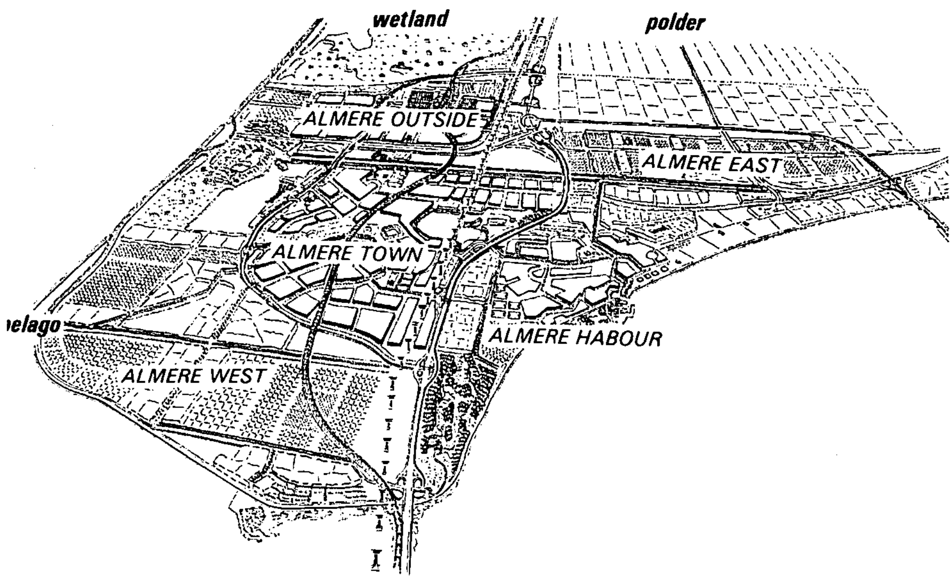

Figure 5

Diagnosis of nature and landscape in Almere

Dynamism is the rule, sustainability an exception in Almere. Before the residents have grown used to the playground, the pioneer trees have to give way to permanent kinds of trees or to new housing, the building of which has been delayed. The body of the city is not made from polder clay in one go. On several sites in the city freestanding districts are being created. First there was Almere Habour. In 1996 the central district of Almere Town and Almere Outside, to the north, will be built. In the future, districts in the western and eastern part will be developed, thus ensuring the city's flexibility in time. In between the districts are the high- and ringroads, the city woods, recreational and nature areas, which have to dissect the city and combine its parts. According to the Structure Plan Almere should not only be flexible but also become a 'diverse' and 'complete' city, right from the beginning, leaving the residents freedom of choice and a selection of experiences (Anon. 1984). All kinds of functions are brought together and knocked up in no time, creating a tightly-knit surplus of provisions in the old neighbourhoods of Almere Habour and Almere Town, bringing about little coherence and much confusion in space. In Almere Outside the policy is changed radically and there is straightforward building and planting, as part of the existing polder grid (Vroom 1992). In the nineties differentiation in architecture and outdoor space is used to give entire districts their identity. 'Coherence', 'dissection' and 'connection' are the objectives, materialized by means of canals, lanes and cycle tracks (Wezenaar 1994). The greenstructure is the link between design, lay-out and management of outdoor space and implies a vision of the future of city, nature and landscape. The transition between land and water and the dynamic nature are characteristic of Almere and deserve extra attention. Moreover, in a city that expands, covering a space of 16 x 16 kilometres, it is becoming more and more important to know where you are. Below a description will be given of the four city concepts for which Almere wants to be noted: 'Harbour front'. 'Polder settlement', 'Wetland dorado' and 'Watertown archipelago' (Meeus & van Wijlen forthcoming).

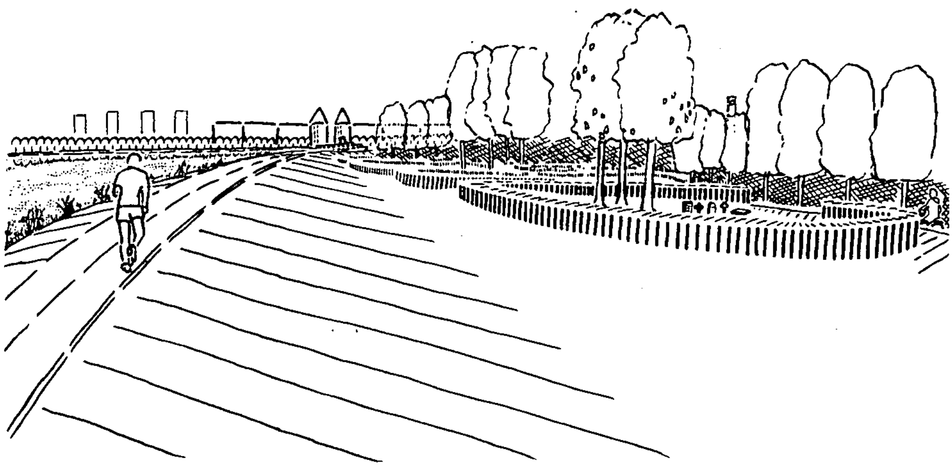

Figure 6

Harbour front
Almere Habour is similar to Voorschoten in the number of inhabitants: slightly over 20,000. To break the wind coming from the open polderland the settlement has been locked off almost completely from the outside world. The enclosed residential area consists of small-scale gardens, houses, canals and yards. Up to now the tree limit has always been the building limit. Large building blocks and long lanes are as scarce as the vistas. There is an absence of hierarchy in the city composition. Nicely planted canals, roads and paths complete the labyrinth. 'OUT' signs indicate that orientation is far from perfect here. In the residential area there is a surplus of trees which have to be removed. The difference between canals and navigable watercourses will be expressed by cutting the trees and shrubs respectively. The development of high-rise buildings and a boulevard at the harbour front must change the lack of 'coherence' in Almere Habour as a whole. In contrast between the small scale, densely built-up and vegetated areas, this large landscape have to bring some openness in the city-edge. The cemetery behind the dyke, made of gentle hills, neatly trimmed hedges and separate groups of trees, may give a feeling of protection and comfort (Vroom 1992). Views of the church tower nearby and the harbour front far away are the links between tombs and town. The cemetery is open to the public. Nobody has to rattle the gate, you just cycle straight through the park. A combination of intimacy and everyday use helps to prevent vandalism. The cemetry provide a peaceful oase in a hectic environment.

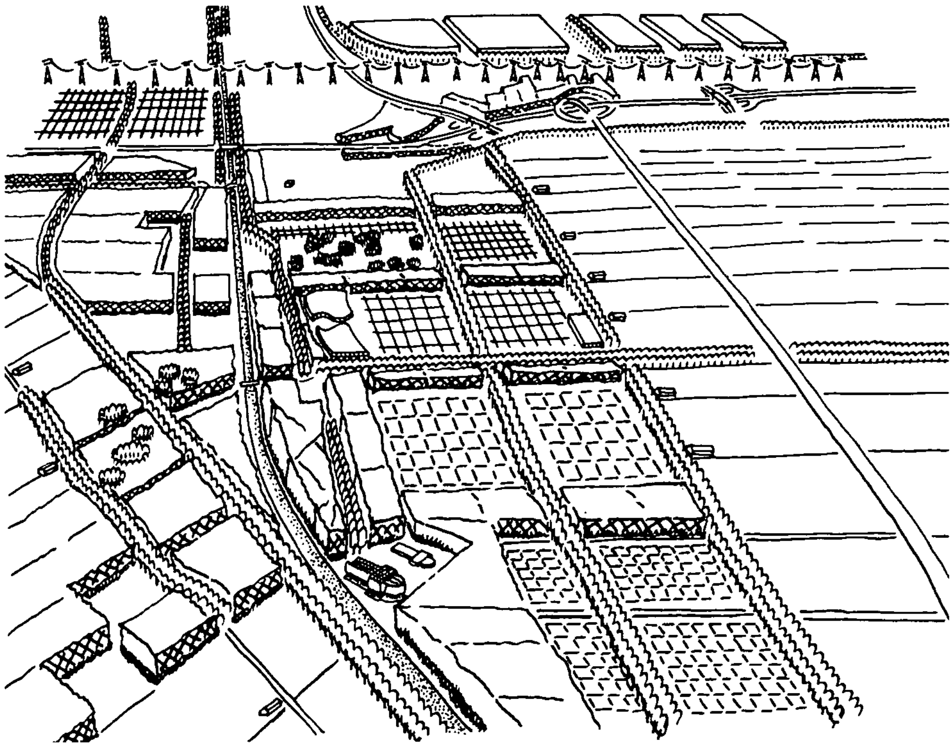

Figure 7

Polder settlement

From the future eastern city district of Almere the windows to the polder are opened wide. A solid framework of lanes and trees must provide this distant polder plane with a structure. By slightly raising the motorway the eye is drawn to the horizon. To this end the watercourse is lined with woods and lanes. The closer to Almere Town, the more lanes and building fronts appear along the water. In the summer there is a panorama of coleseed flowers for new districts and in the winter there are vistas of shiny furrows, cut out in the rich polder clay. Cycle routes prevent detours to and from the centre. Fishermen, golf players, art tourists and villa dwellers slowly take over the area. The challenge is to cash in on the openness of the settlement. The examples are set by Dutch historical gardens and estates (de Jong 1993) and contemporary landscapes (Vroom 1992, Smienk et al 1993).

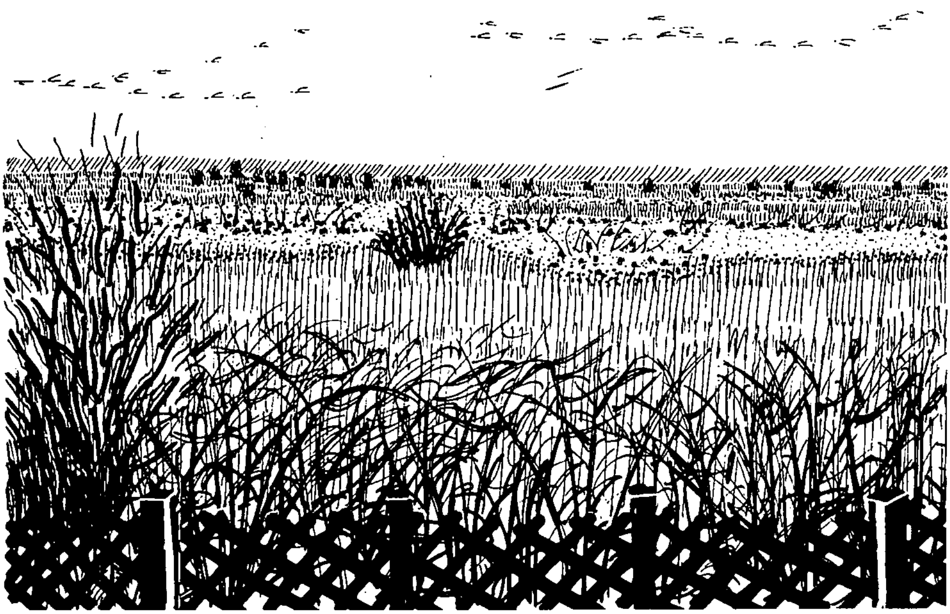

Figure 8

Oostvaarderplassen

Oostvaardersplassen, Wilde Wilgenbos and Lepelaarsplassen were not brought under cultivation the usual way but spontaneously colonized when the polder was made. Wild geese keep open the transition of water and land. Large groups of other birds of passage have discovered the area as well. In the Oostvaardersplassen the water is periodically raised to enrich the marsh-ecosystem. By turning open the tap and playing with the polder level, there is remote control of a wetland-under-creation, with the grandeur of a 'wilderness', without any visible human influence. Along the banks of the Oostvaarderplassen 'wild' cows and horses are used as hedge clippers to turn the spontaneous vegetation of cane and willow into a scenery with alternating closed and open spaces (van Eerden et al 1995). This creates a picturesque landscape and a rare-bird dorado. What is called 'nature' is in fact the work of man, an artefact, composed according to the rules of landscape paintings or English picturesque landscapes (Crandell 1993).

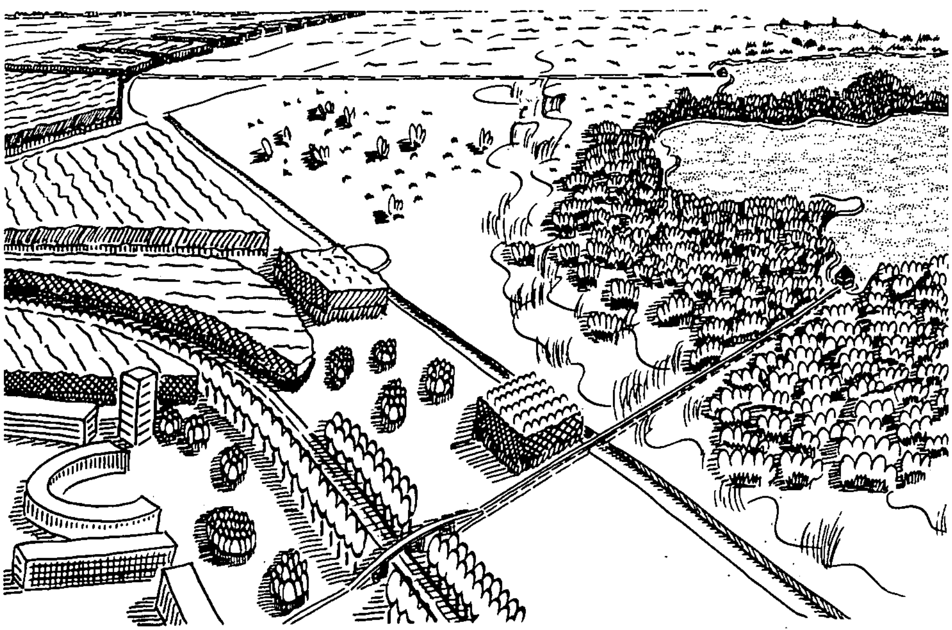

Figure 9

Wetland dorado

To expand the habitat and forage grounds of the birds of passage, a wide connection zone of marshes and wet lands between Oostvaarderplassen and Lepelaarsplassen is being dug. This area is too beautiful not to be considered in urbanisation. That is why the birds and the bird watchers are lured to the edge of the city, by linking Lepelaarsplassen and Oostvaardersplassen with the forage and breeding grounds, which can be watched from quays, balconies and concealed bird huts. A fine-meshed network of natural banks goes very deep into the urban fabric, with some occasional sites for fishing.

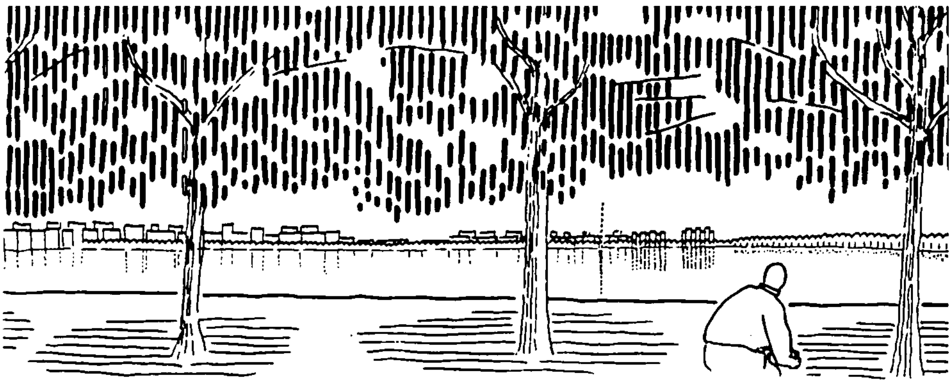

Figure 10

Watertown archipelago
Almere Town's orientation is the Weerwater, an inland lake, where there is an unobstructed view of two kilometres. Here the city centre is created with high-rise buildings, offices, shops and public facilities. Wide boulevards, sturdy quays and tall trees accompany the front of the city (van Dijk 1995). The Noorderplassen along the city edge are developed by allowing part of the bank to be occupied by houses and creating wetlands for birds in another part. Marinas and locks are part of the plan as well, allwoing free trasition from the Noorderplassen to the wide space of the Ijsselmeer (Anon. 1992). In addition there will be a water-axis though the new western part of the city, with natural banks connecting the lakes and marshes.
A newtown of 250,000 residents on what used to be the bottom of the sea cannot imitate the complexity of a historic city. This is a pioneer situation in which accelerations and decelerations demand improvisation and flexibility. The outdoor space offers options for use and experience, and for dissections and connections. Environmental features provide inspiration for the future. Four very diverse quadrants determine the relation between town and landscape.

Conclusions and summary
Metropolitan areas not only need 'Love for the city' (Fortier 1995) but also contact with nature. In the urban fringe nature is usually at its peak. Rare plants and animals have been chased from town and countryside and take refuge in the edge of the city.To develop the qualities that make old landscapes, nature areas and new towns special, a unifying concept is needed. In the next century the lay-out model of Dutch metropolitan landscapes has to be extended with 'continuity', 'orientation', 'bio-diversity' and 'landscape-character'.

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Public Urban Open Space

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Abstract
In large metropolitan areas, the value of urban open space has always been recognized by society. The open spaces in a city are a reflection of the state of the society and of the complexities of social life. Social experience in cities is gained through finding satisfaction and pleasure in relationships with other people, carried out in public open spaces. Thus looking at city centers and public urban life, the role of open space needs reconsideration. The study of late 20th-century city centers in the North American context can be synthesized into the particular experience of five types of open spaces which are predominant in urban environments today: the plaza, the street, the parking lot, the park, and the void. All of them are specialized places, which have in most cases been reduced to its technical function. Open spaces today are missing one essential quality - accessibility. Social satisfaction, meaning that which attracts people most in a city, i.e. other people, cannot be achieved in public open space. Open spaces in North American city centers are a location of individual experience, not of social congregation, in fact, they even are closed to the public at large.

Open Space and Public Life

Architects tend to look at cities in terms of buildings and in terms of structures, mainly in terms of the built environment. But the collective perception of cities depends on the landscape of open spaces, it is the open spaces rather than the buildings that we experience and remember[1].

In large metropolitan areas, the value of urban open space has always been recognized by society, although its quantity, form and function have varied with time and place. The open spaces in a city are a reflection of the state of the society and of the complexities of social life. They are an expression of public opinion[2] and of political action, an indicator of social growth and change, and a source of information. They foster a sense of community[3], and they reveal the society's vision of how life in a city is or should be. Social experience in cities is gained through finding satisfaction and pleasure in relationships with other people, with strangers[4], carried out in public open spaces.

Open space is where public life occurs[5]. It is an evolving environment whose population is constantly changing in numbers, constellation, attitudes, ethnic background, reflecting work routines and leisure preferences. The need for public life is even greater now than it once was: families are smaller, working hours are shorter and more flexible, the proportion of retired people is growing[6].

Thus looking at cities and public urban life, the role of open space needs reconsideration. The city is a collage of numerous built structures and diverse open spaces. The study of late 20th-century city centers in the western world can be encapsulated or synthesized into the particular experience of five types of open spaces which are predominant in urban environments today.

The Plaza

The piazza is an open-air
heterogenous concentration
of activity and focus of the city.
(Mark Chidister)

Encouraged by zoning laws that allow extra height and bulk in return for amenities at the ground level, the skyscraper has devoured a disproportionate amount of sky in city centers. The resulting open space, the plaza, has too often been proved to be sterile and windy, its overall design seems to be calculated to prevent the public from making too intimate, enthusiastic or informal use of it[7]. There also seems to be a deliberate attempt by developers to discourage seating since they cannot control the users of these spaces[8]. Moreover, downtown plazas are hardly residential[9]. People come to the centers of cities to work in their offices. Plazas are not really bounded spaces. They become high-speed footpaths in which pedestrians are not invited to stay, except during lunch, suggesting that the plazas are in too many ways more like public relations gestures than urban space to use[10].

The urban plaza is a defined, enclosed space, which interprets urban open space as a rare and precious commodity. It celebrates itself; it is exclusive and one-dimensional in terms of how and by whom it is used. It seems to be planned for paying tourists and consuming yuppies. And it is, perversely enough, but as a perfect expression of its intention, often gated, thus closed at night. Therefore it is not a public open space.

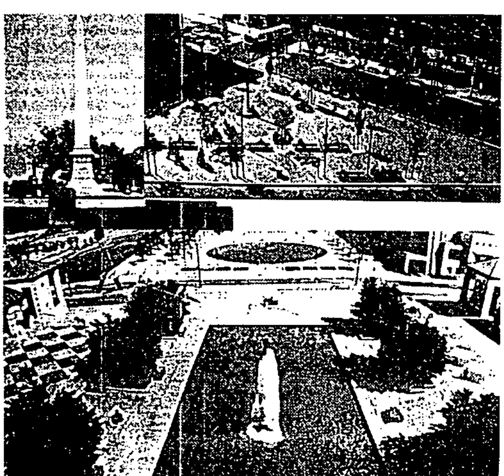

figure 1

The Street

The best theater in our
town is our street corners
(William H. Whyte)

A street is a linear surface - sometimes straight, sometimes curved, and often paved - on which people and things travel back and forth. Streets are the largest single resource of open space; almost one third of our city is comprised of them[11].

Streets are mainly associated with congestion, pollution, danger, waiting in traffic, pushing through crowds[12]. Most streets are dedicated to the manifestation of American individualism - the car, not to the human being. Therefore it is not a public open space.

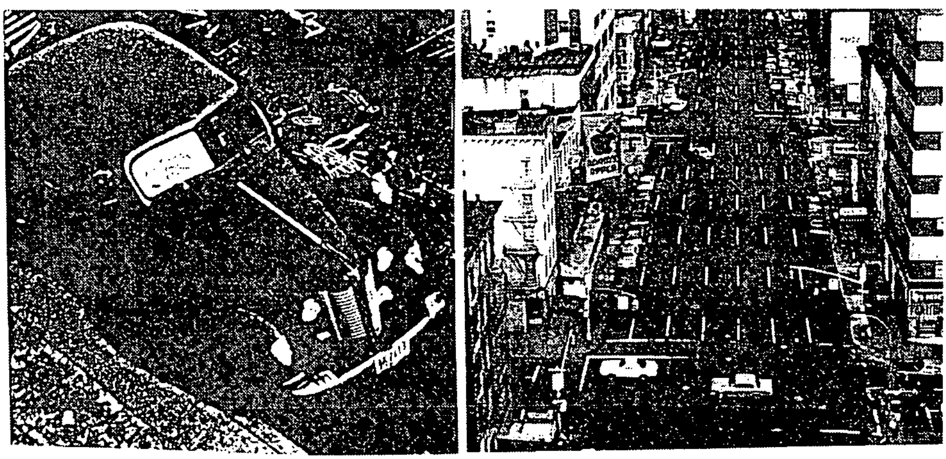

figure 2

The Parking Lot

The automobile is an
achievement of genius
- unique in its total support
of individual freedom.
(Bernhard Winkler)

A parking lot is a space meant to accommodate cars while not moving. It is a highly specialized, yet single-purpose, backyard-like open space. It is the indicator of todayÕs egocentric, unecological behavior of irresponsible, atomistic individuals, using, sealing, violating, polluting common open space. This space is not even intended for use by human beings. It is highly unappealing and uninviting, often gated, and closed to the public. Therefore it is not a public open space.

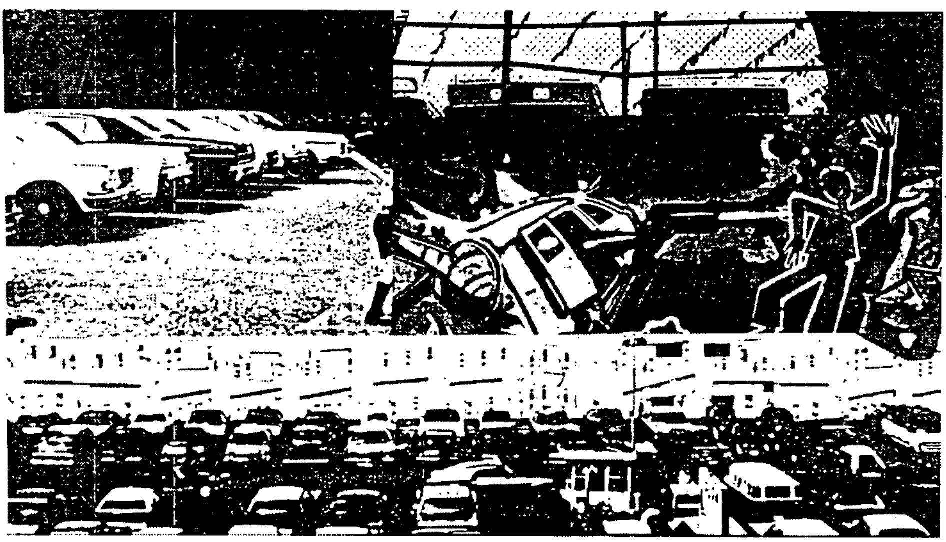

Figure 3

The Park

The formal, structured park or garden, the park as work of art for passive enjoyment is essential as an urban amenity
(J. B. Jackson)

Parks as natural environments within reach of urban people have always been justified in psychological and social terms. Park planners and conservationists argued that the role of parks was to refresh the mind and soothe the nerves of city people[13]. Parks are still assigned a high value regardless of class and status differences[14]. They also serve several environmental roles, such as microclimate modification. But at the same time, they are often viewed as dangerous or threatening and as a consequence used less and less.

Moreover, the design of the late 20th-century formal park such as the 'ethnic' garden (e.g. Chinese Garden, Montreal) or the 'architectural' park (e.g. Parc de la Villette, Paris) governs the users« behavior and does not allow an informal and spontaneous use. Also they often require entry-fees.

Children and dogs provide the excuse people need to use parks[15]. Social interaction only takes place, if at all, between the same groups of people. An adult without a requisite (child, dog) or a reason (sports) to use the park is excluded. Therefore it is not a public open space.

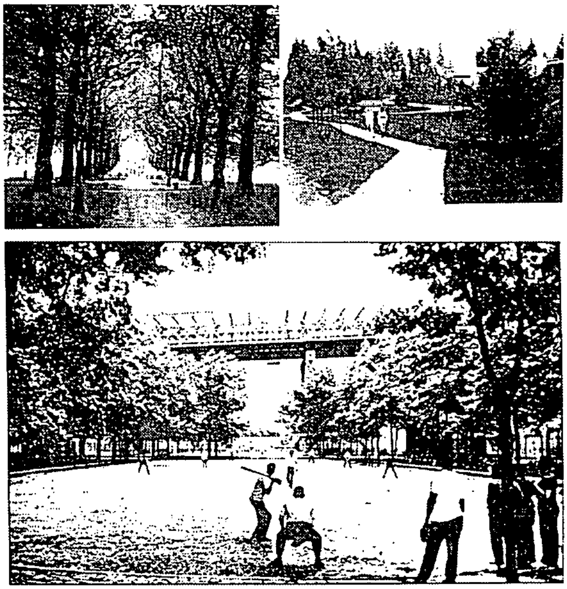

figure 4

The Void

There really is no limit
to the use of vacant city
space - except imagination.
(Kevin Lynch)

A void is vacant land not yet developed, a place of transition, wasteland sometimes out of sight and mostly out of mind; often the province of the young and the derelict.

The successful use for open-air concerts, art exhibitions, sculpture workshops, flea markets, dog runs, and mobile recreation units reclaims underutilized and neglected areas, new microcosms arise.

Vagrants make informal use of odd-lot spaces, turning abandoned and decayed sites into informal communities. Homeless people find their temporary homes under freeways, in forgotten, leftover, unoccupied spaces.

Voids provide a realm for unfamiliar cultures and for subversive actions, but the interim use of vacant city space builds a territory[16)] with its own rules[17)] and defines and specializes it for the sole use of one group socially segregated from society. Therefore it is not a public open space per se, although it still is the most social, interactive and holds the most potential of the five outlined types.

figure 5

Privatization of Public Life

A substantial portion of urban public life is shifting from open spaces to indoor realms, tending to decrease the density and diversity of activities outdoors. These indoor spaces, such as shopping malls, are mostly privately held and managed. They exclude undesired individuals and groups from using this space.

A different kind of public life is emerging in forms that have no physical space. Social and political exchange is conducted via the media (interactive television, internet) and not through meeting in a public place. People have electronic substitutes for physical participation if they can afford it. They receive news and the opinions of the powerful at home, summarized and put in perspective[18]. People do not have to leave their houses anymore, and the open spaces are being reduced to tourist attractions.

Both, indoor shopping malls and virtual media are harbingers of the increasing privatization and control over public life[19].

Conclusion

According to this analysis, open spaces in city centers are in fact closed to the public at large. Social satisfaction, meaning that which attracts people most in a city, i.e. other people, cannot be achieved in public open space. There has been a substantial loss of public life. Open spaces today are a location of individual experience, not of social congregation.

There is hardly any network of similar multi-use open spaces but a combination of specialized places, which have in most cases been reduced to its technical function. They are not open to local action or improvisation, and they do not encourage imaginative use. Open spaces today are missing one essential quality - accessibility. The city is separated into functional units, and so are the open spaces. The fragmentation of the city parallels the inability of open spaces to be the focus of city centers and the alienation from public life[20].

Architects and urban planners should no longer ignore this situation and the consequences. There is a potential to reclaim and to revitalize those degenerated forms of open space and public life. For every professional concerned with the quality of life and the collective environment, this presents a tremendous challenge.

What is needed, always, is innovative vision. Perhaps the greatest urban open space - if we will open it - is our imagination (C. Ray Smith).

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Sustainability

Re-conception en conservation/restauration du patrimoine

Une contribution á l'épistémologie du projet d'architecture

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Abstract
In order to achieve the above-mentioned reconception process in the conservation and restauration of heritage buildings, we are formulating the 4 following hypotheses: First, the uncertain durability of buildings; second, the nonfulfilment of conservational and restaurational problems; third, the difficulty of solving uncertain issues; fourth, the open-ended nature of theory and practice in this field. The intended outcome of our study will consist of orienting conservation and restauration policies towards an integral recreation and reconversion approaches. This procedure will be complemented by an attempt to relate the evolution of cultural heritage (to wich buildings are related) to the evolution of the natural environment (to wich humans are related). This intended doctoral research is meant to overcome the traditional epistemological gap by suggesting a new type of relationship between theory and practice.

Ce travail recouvrira les champs d'investigation des sciences naturelles et humaines, de la philosophie des sciences et de la théorie et de l'histoire de l'architecture, tout en privilégiant plus précisément le dialogue instauré entre, d'une part la *Logique et la connaissance scientifique* telles que Jean Piaget l'a présentée dans son ouvrage du même nom et, d'autre part, le projet de conservation du patrimoine dans le sens prescrit par Georg Dehio et son ouvrage intitulé *Konservieren nicht restaurieren*. Cette perspective inter- et trans-disciplinaire qui caractérise la base de références de ce projet de thèse de doctorat a conduit l'un d'entre nous à le proposer à l'Institut Universitaire Kurt Bösch à Sion (CH) qui s'est orienté depuis sa constitution en 1992 vers l'enseignement et la recherche inter- et trans-disciplinaire.

Initialement, cette recherche est issue de deux motivations à savoir tout d'abord d'un approfondissement de la relation entre théorie et pratique du projet d'architecture en général et du projet de sauvegarde du patrimoine naturel et construit en particulier puis d'un élargissement pluri-disciplinaire inspiré par l'apport des sciences naturelles et humaines et par celui de la philosophie des sciences. Le bénéfice escompté pour l'épistémologie du projet d'architecture serait aussi bien concret, s'agissant du projet en tant que produit « s'enroulant » dans un lieu et une action, que conceptuel, s'agissant du projet en tant que processus « se déroulant » dans le temps. Cette recherche sur cette double contrainte produit/processus pourrait ouvrir une nouvelle lignée de recherche doctorale dans laquelle la complémentarité d'un projet et d'une thèse agirait de façon heuristique et intensifierait l'aspect créatif de cette démarche universitaire aujourd'hui devenue quelque peu autosuffisante.

Nous formulerons pour cette communication quatre hypothèses portant sur l'incertitude de la pérennité des ouvrages, l'incomplétude de la position des problèmes de conservation/restauration, l'indécidabilité de la résolution des dits-problèmes et finalement sur la propension de la théorie et de la pratique de cette problématologie qui entraînerait une re-conception ouverte. La conclusion présumée présentera le principe de la re-création/conversion comme projet de sauvegarde. Elle sera alors complétée par une ouverture provisoire autorisant un parallèle entre l'évolution du patrimoine culturel auquel appartiennent les ouvrages architecturaux et celle du patrimoine naturel auquel appartient notamment l'espèce humaine.

La pérennité des ouvrages : une problématique ouverte ...

Hypothèse 1

La pérennité des ouvrages en tant qu'objectif prioritaire de la conservation/restauration du patrimoine est constamment remise en question par la réflexion et l'expérimentation portant sur l'évolution de la position et de la résolution des problèmes que la théorie et la pratique re-connaissent et re-créent de façon permanente. De même, la re-précision constante de la notion de patrimoine et la ré-interprétation itérative des données pluridisciplinaires liées aux ouvrages suggèrent également que leur pérennité est soumise à un principe d' incertitude car leur issue demeure conjoncturelle.

De manière générale, l'architecte ne saurait se passer des différents acquis de la théorie et de la pratique de la conservation/restauration du patrimoine qui se sont accumulés en strates complexes au cours de l'histoire de la spécialité. Cependant, les paradigmes au sens de Thomas S. Khun (*La structure des révolutions scientifiques*) aussi bien que les projets exemplaires de référence qui font autorité ne sont pas homogènes entre eux. De plus, leurs incohérences relatives laissent apparaître des divergences de points de vue quant à la position des problèmes et à leur résolution selon le découpage préconisé par Paul Valéry (*Les cahiers*). A titre d'exemple, la comparaison détaillée,article par article, des chartes d'Athènes de 1931 et 1933 et de Venise de 1964 est éloquente à ce sujet. Ce genre d'analyse comparative démontre clairement que la pérennité des ouvrages en tant qu'objectif prioritaire de la conservation/restauration du patrimoine est constamment remise en question par la réflexion et l'expérimentation portant sur l'évolution de la position et de la résolution des problèmes que la théorie et la pratique re-connaissent et re-créent de façon permanente.

Dans le même ordre d'idée, deux phénomènes marquants peuvent également illustrer ces propos. Il s'agit tout d'abord, de la re-précision constante de la notion de patrimoine qui s'est affinée au cours des siècles, témoignant de la dérive et de la capacité d'adaptation de toute notion ou concept eu égard à l'acceptation fluctuante aussi bien du contenu que du cadre de référence sémantique qui leur sont liés. Nous en voulons pour preuve la récente classification de Gérard Genette exposée dans son ouvrage *l'oeuvre de l'art* qui re-précise la typologie des oeuvres d'art en fonction de critères d'immanence et de transcendance fort utiles lorsqu'il s'agit de préserver non seulement l'oeuvre originelle, mais encore ses manifestations complexes. Ainsi, il est d'usage actuellement d' admettre une extension de la notion de patrimoine aussi bien géographiquement qu' historiquement et ainsi permettre d'étendre la sélection des objets patrimoniaux à l'ensemble de l'environnement naturel et construit, y compris le paysage, l'architecture industrielle, les ouvrages d'art des ingénieurs, les oeuvres d'art (mobilier, tableaux, sculptures et documents divers) etc.... La portée de cet élargissement doit également être complétée par un approfondissement de l' intention prêtée à la notion de patrimoine dont les objets concernés peuvent être observés à l'échelle macroscopique du territoire et de la ville, ou encore à celle microscopique des ouvrages et des composants d'ouvrages fixes ou mobiles jusqu'aux niveaux les plus élémentaires. De cas en cas une stratégie d'inventorisation appropriée à cet élargissement sera établie, soit en se basant de façon rétrospective sur des références méthodologiques existantes pour d'autres disciplines ou en d'autres lieux, soit en préconisant de façon prospective une nouvelle méthode personnalisée à caractère essentiellement local, selon les besoins propres des ouvrages considérés.

Il s'agit deuxièmement de la ré-interprétation itérative des données pluridisciplinaires liées aux ouvrages et recueillies par de nombreux protagonistes qui devient la principale caractéristique contemporaine du projet de conservation/restauration du patrimoine. En effet, de nos jours, conservateurs, architectes restaurateurs, historiens, archéologues, ingénieurs du bâtiments, restaurateurs d'art, spécialistes, experts et autres artisans oeuvrent en commun pour une mission collective et culturelle de conservation/restauration patrimoniale.

Ainsi, la re-précision constante de la notion de patrimoine et la ré-interprétation itérative des données pluri-disciplinaires liées aux ouvrages suggèrent également que leur pérennité est soummise à un principe d' incertitude, car leur issue demeure conjoncturelle comme l'a bien démontré Manfred F. Fischer dans son ouvrage intitulé *Wie lange dauern die Werke?.*

La réception du projet-produit de conservation/restauration : une aide à la position des problèmes!

Hypothèse 2

Si le recours aux sciences naturelles & humaines peut permettre l'amélioration et l'optimisation de la réception du projet-produit de conservation/restauration et par conséquent apporter une aide à la réflexion et à l'expérimentation portant sur l'évolution de la position des problèmes qui reste soummise à un principe d'incomplétude, car toute position ne demeure que suspensive...

La position des problèmes de conservation/restauration que découvrent l'anamnèse et le diagnostic des ouvrages pourra être modélisée dans le cas d'un objet de recherche fondamental et appliqué retenu pour son caractère d'exemplarité: le palais Stonborough de la Kundmanngasse à Vienne, oeuvre d'architecture moderne du philosophe-architecte Ludwig Wittgenstein conçue en 1926, construite peu après et restaurée en 1976 par une agence Viennoise sans grande conviction et magnifiquement présenté par Paul Wijdeveld dans son ouvrage *Ludwig Wittgenstein, Architecte.*

Le contexte scientifique de réfutabilité de cette hypothèse sera orienté de façon pluridisciplinaire vers les sciences naturelles et humaines telles que la physique appliquée aux bâtiments existants, la POE (Post Occupancy Evaluation) ou encore l'analyse multicritère pondérée.

S'agissant là du projet en tant que produit « s'enroulant » dans un lieu et une action, cette étude de cas démontrera comment, à l'aide des sciences naturelles humaines et des outils tels que l'analyse, la phénoménologie ou l'empirisme qui les ont accompagnées , la réception du projet-produit de conservation/restauration peut être améliorée et optimisée dans le but d'apporter une aide à la réflexion et à l'expérimentation portant sur l'évolution de la position des problèmes qui reste soummise à un principe d'incomplétude, car toute position ne demeure que suspensive...

La rationalisation du projet-processus de conservation/restauration : une aide à la résolution des problèmes!

Hypothèse 3
... le recours à la philosophie des sciences doit permettre l'amélioration et l'optimisation de la rationalisation du projet-processus de conservation/restauration et par conséquent apporter une aide à la réflexion et à l'expérimentation portant sur l'évolution de la résolution des problèmes qui reste soummise à un principe d'indécidabilité, car toute résolution ne demeure que partielle.

La résolution des problèmes de conservation/restauration que recouvrent le pronostic et le programme d'intervention ou de non intervention proprement dit de sauvegarde peut être également modélisée dans le cas du même objet.

Le contexte scientifique de réfutabilité de cette hypothèse sera orienté de façon inter- et trans-disciplinaire vers la philosophie des sciences et ce aussi bien vers l'épistémologie des sciences naturelles, vers celle des sciences humaines et sociales ou encore vers celle des « sciences nouvelles ». En ce qui concerne ce dernier point, il s'agit essentiellement des domaines d'investigation suivants : la théorie des systèmes et des ensembles flous, les sciences de l'imprécis, la théorie des catastrophes, les fractales, la théorie de la décision et de l'argumentation, les sciences de la cognition,les sciences de l'esprit, les théories de l'évolution, les réseaux neuronaux, l'ago-antagonisme etc...

S'agissant ici du projet en tant que processus « se déroulant » dans le temps, ce chapitre démontrera comment, à l'aide de la philosophie des sciences et des outils tels que la logique, la méthodologie ou l'épistémologie qui l'ont accompagnée, la rationalisation du projet-processus de conservation/restauration peut être améliorée et optimisée dans le but d'apporter une aide à la réflexion et à l'expérimentation portant sur l'évolution de la résolution des problèmes qui reste soumise à un principe d'indécidabilité, car toute résolution ne demeure que partielle.

Vers une re-conception ouverte de la théorie et de la pratique de la conservation/restauration du patrimoine

Hypothèse 4
Si la pérennité des ouvrages est soumise au principe d'incertitude, que l'évolution de la position des problèmes à celui d'incomplétude et que l'évolution de la résolution des problèmes à celui d'indécidabilité, alors, théorie et pratique de la conservation/restauration du patrimoine seront soummises à un principe de propension qui appelle une re-conception ouverte.

Nous proposerons comme corollaire des trois premiers énoncés particuliers une quatrième et dernière hypothèse de portée plus générale basée sur la notion de propension au sens de Karl Popper (*Un univers de propension*), sur celle de re-conception au sens de Nelson Goodmann (*Re-conception en philosophie*) et sur celle d'ouverture au sens de Ferdinand Gonseth *(Le problème de la connaissance en philosophie ouverte)*.
La mise à l'épreuve et la vérification-réfutation du bienfondé de cette dernière hypothèse prolongera les prestations usuelles de nos doubles carrières d'une part universitaires, en qualité de chargé d'enseignement à l'Institut d'Architecture de l'Université de Genève et de professeur chargé de cours et de recherche à l'Ecole Polytechnique Fédérale de Lausanne, et d'autre part privées, en tant qu'expert des monuments historiques à Lausanne et qu'architecte conservateur/restaurateur à Sion.

Dans le cadre de ce travail de re-conception en conservation/restauration du patrimoine, nous envisageons de constituer un didacticiel consistant en un utilitaire convivial d'apprentissage et d'enseignement assisté par ordinateur (EAO). Ce support médiatique s'apparentera à une base de données et de connaissances à références spatiales pour le projet de conservation/restauration du patrimoine répondant ainsi à la demande actuelle en matière de formation continue des protagonistes concernés. En effet, l'apprentissage par pair et les autres types d'enseignement théorique et pratique expérimentés depuis les ateliers de la Renaissance Italienne sont complétés d'une part par l'apport des réseaux informatisés et d'autre part par la réflexion critique permanente portée sur la pratique professionnelle s'agissant aussi bien de la dynamique apportée par le groupe de travail pluri-disciplinaire lors de l'expertise de l'ouvrage que de l'expérimentation à l'agence et sur le chantier lors des interventions sur l'ouvrage.

Conclusion présumée
Finalement, nous placerons la conservation/restauration dans un cadre déontologique et éthique plus large qui émargera aux conclusions de type analytico-déductif des thèses usuelles bâties sur une accumulation de faits, événements ou études de cas desquelles aucun concept nouveau ne peut surgir.

Concrètement, l'étude de cas permettra d'envisager, le passage de la situation de départ de l'ouvrage à conserver/restaurer à sa situation évoluée telle qu'elle sera proposée dans ce projet/thèse de doctorat, non pas comme le fait d'une nécessité logique mais répondant à certaines exigences de cohérence et d'adéquation ou, pour tout dire en une mot, à certaines exigences d'idonéité. Ce passage synonyme de reprise au sens de Soeren Kierkegaard (*La reprise*) comporte un moment de re-création/conversion. Le potentiel novateur stimulé par une telle recherche fondamentale aussi bien qu'appliquée sera révélé par la thèse de la re-création/conversion comme projet de sauvegarde.

La conclusion présumée de type hypothético-abductif de ce projet/thèse de doctorat dévoilera notre pensée synthétique de la pérennité des ouvrages en tant qu'objectif prioritaire de la conservation/restauration patrimoniale. Nous proposerons alors que toute évolution-propension du patrimoine intègre les triples phénomènes de conservation-restitution, de variation-substitution et d'adaptation-sélection. Le patrimoine se présentera par conséquent comme une mosaïque dont les ouvrages auront une pérennité différentielle et répondront à des exigences mutagènes de cohérence, d'adéquation, voire d'idonéité. Dans cette perspective de re-construction catalytique permanente du palimpseste patrimonial, nous souhaitons pouvoir apporter une contribution à la problématique rituelle de choix culturel que suppose l'itération du sacrifice patrimonial au sens de J.P. Babelon et A. Chastel (*La notion de patrimoine*) qui notaient en 1980 déjà que " dans toute société, le patrimoine se reconnaît au fait que sa perte constitue un sacrifice et que sa conservation suppose des sacrifices".

Ouverture provisoire

A titre d'ouverture provisoire, nous espèrons qu'en retour les résultats de ce projet de thèse de doctorat puissent faire bénéficier la recherche dans le domaine de la pensée moderne de l'évolution au sens de Ernst Mayr (*Darwin et la pensée moderne de l'évolution*) dont la re-conception chronique devient une constante. Il s'agirait également ici de reconnaître un projet de conservation/restauration mais cette fois-ci d'un autre type de patrimoine, celui de l'espèce humaine. Le système immunitaire humain avec son projet de sauvegarde de l'espèce ne trouve-t'il pas son homologue avec l'architecte et son projet de sauvegarde de l'espace? L'architecte comme moteur du système immunitaire oeuvrant dans le but de sauvegarder un patrimoine! Voilà qui semble fonder toute la dimension sociale et culturelle de notre action!

Quoiqu'il en soit, une autre analogie semble pertinente : conservation de l'espèce et conservation de l'espace requièrent une capacité de re-cognition aussi bien de la part du système immunitaire que de celle l'architecte. Ainsi les deux types de conservation s'identifient à un phénomène de re-cognition dont le dénominateur commun est la notion de projet qu'il s'agisse d'espèce ou d'espace ou encore d'espèce d'espace. Nous suggérons de rapprocher alors à titre de premier essai le concept de Projétation de celui de Cognition et, de second essai le concept de Projétation de sauvegarde du patrimoine de celui de Re-cognition. Si la modélisation contemporaine de la cognition fait état d'une connaissance par projet au sens de Jean-Paul Haton (*Les systèmes à bases de connaissances*), nous envisagerons pour la modélisation de la recognition, une reconnaissance par projet de sauvegarde.

Cette ouverture provisoire autorisera un parallèle inter- et trans-disciplinaire entre l'évolution de patrimoine culturel auquel appartiennent les ouvrages architecturaux et celle du patrimoine naturel auquel appartient notamment l'espèce humaine. Gageons qu'il sera porteur de quelques re-conceptions séduisantes.

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Integration of Energy Saving Measures in the Restoration and Renovation of Historic Buildings

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Abstract

This research deals with the integration of energy saving systems, active or passive energy systems and energy conservation, in historic buildings. Restoration and renovation of a building are good occasions to improve its energy performance of envelope and interior.

The introduction of new technologies into historic buildings demands a general rethinking of building systems to make them compatible with the existing situation. In some cases, if this process is not correctly undertaken, improvements to a historic building may alter its environmental balance and induce new causes of decay.

The research investigates solutions for reducing energy consumption in historic buildings. The project will bring specific solutions based on case studies into methodological conclusions showing the possibilities of application to a large stock of buildings.

For these buildings solutions for the integration of energy systems will be developed. The solutions will present options for the localisation of the mechanical elements of active energy systems and passive energy systems.

The conclusions based on these solutions are the basis for the elaboration of a methodology relating the reduction of energy consumption of buildings and renovation of historic buildings.

This methodology will be organised into a group of strategies and guidelines for building designers for the integration of energy saving systems in historic buildings.

Introduction

In the second half of this century, the world has dramatically increased its demand for energy. Coal, gas and oil, the traditional fuels, have seen us through the energy needs of this period of industrial expansion. However, these fuels are obtained from sources of energy that will one day be exhausted. The importance of the building sector in energy consumption can be demonstrated from available statistics on energy use. They show that some 40% of the total use of primary energy can be attributed to building services, power to equipment and appliances, and domestic hot water.

The rate of growth of new buildings in Europe lies between 3 and 5 percent per annum, so clearly no real impact on reduction of fuel and power consumed can be made in the short term without tackling the existing stock of buildings. About 80% of the buildings in European cities is more than 30 years old. From this percentage a considerable part is classified as Architectural Heritage that needs to be preserved.

Historic buildings ask special requirements on their rehabilitation for the preservation of their architectural value linked with actual requirements on comfort. Actual comfort and spatial needs demand a re-design and the introduction of new technologies, systems and materials within the original building. Although the number of existing technologies is very large, not all of them are adequate to historic buildings therefore extra carefulness is required in selection and application of new systems.

Finding solutions to reduce energy consumption in architectural heritage in combination with the preservation of historical value of buildings is an urgent matter for the conservation of natural and cultural heritage.

Objectives of the Research

The research develops a methodology for the integration of energy saving systems in historic buildings. This methodology involves guidelines and strategies for building designers and intends to be applied during the restoration and renovation of buildings.
The methodology to be developed intends to relate two problems - restoration of historic buildings and reduction of the building energy consumption - within a final solution building re design.The restoration process involves the replacement and restoration of materials, re-design of the space and implementation of actual comfort requirements within the building.
The reduction of energy consumption involves reduction of heat losses and application of renewable energy systems.
The restoration process of the building will be analysed in parallel to the analysis of the building energy performance for the building. After this analysis a study will take place clarifying the connections and interaction between both.
The development of the methodology will be based on the conclusions from the different building case studies. These conclusions will be organised together into a more general approach to be applied into other buildings.The main goals of the methodology are:

- The selection of the adequate passive or active energy saving systems related with the building's architectural and historical characteristics.
- The achievement of an intimate integration of new materials, systems and architectural features with the existing building features.

The stimulus for the development of the methodology

All buildings need to be renovated during their lifetime, often more than once. The comprehensive nature of many refurbishments is a response to a number of factors, including the normal ageing process of the building and its equipment, changes in the requirements of building occupants, and the development of new technologies which offer advantages justifying the refurbishment.

The functions of buildings have evolved over centuries to meet the changing needs of society. In today society they usually need to perform dozens of functions.
To design buildings that perform all the functions economically and as effectively as possible requires professional building design and engineering. This involves the careful integration of energy components, sub-components, and systems with architectural techniques that perform the above set of functions in a way that best satisfies the pro-

gram needs of the building and recognises the multiple of other considerations that determine the final design.
This task is quite more complex within existing buildings where a constructive reality imposes restrictions in the integration of new parts.
Moreover a large part of existing buildings retains an historical or architectural value which should be preserved for future generations. Hence the purpose of renovation of these buildings is not confined to the re-utilisation of existing buildings but also that people can continue to appreciate the cultural values which gave rise to these works of architectural ideas and concepts.

The re-design of historic buildings should incorporate the new necessary techniques within the architectural characteristics of the building. So emphasis must be given to the understanding of cultural heritage (historic town or building) through its evolution in time as well as through its technological aspects. For this a knowledge and setting up of new techniques to work in the proper manner in historic buildings is required.

The majority of existing buildings were not conceived to answer today's requirements of comfort nor were they planned in times when energy consumption did not present an economical or environmental problem.
Energy efficiency is no longer an optional extra in design or re-design of buildings - it has become a basic requirement for the designing professions. This concept should not be restricted only to the conservation of energy inside the buildings, but include the consideration of utilising renewable energy systems as well.
Renewable energy systems can play a major role in the reduction of energy consumption from traditional sources. However these systems often present a high degree of complexity in the integration within existing building characteristics (eg. colours and compatibility of materials) and a wrong integration can lead to the destruction of the building value.
Partly this problem results from the aesthetical limitations of these systems. In past years solar research has focused on the problems of proving the applicability of solar technology and improving its efficiency. It was not possible to meet all aesthetic requirements as well. In this we are almost at the beginning. It is a task to be undertaken by architects, with the objective of creating aesthetically integrated solar technology.
Solar energy use for energy saving and/or for improved thermal and visual comfort imposes a new order of conditions on architectural design, by affecting both lay-out and building materials. These new conditions must be integrated in the design process.

Purpose of the methodology
The purpose of the methodology here involved is basically the clarification of the possibilities of integrating energy systems in historic buildings and its interaction with the renovation and restoration of buildings.
The basis for the development of the methodology is the clarification of the relation between the application of energy systems in buildings and the restoration process of buildings.

In first instance it is necessary to clarify the relevant components entering the establishment of a renovation strategy, and the components entering the energy performance strategy These components are listed in the following table:

ENERGY EFFICIENCY STRATEGY

1. **Measure of the building energy performance**

2. **Improving the thermal energy storage**

3. **Reducing heat losses**
- by ventilation
- by infiltration

4. **Improving the thermal energy distribution in the building interior**

5. **Integration of passive solar features**

6. **Integration of active solar systems**
- for hot water
- for heating

7. **Integration of photovoltaics systems**
- for electricity production

ARCHITECTURAL RENOVATION STRATEGY

1. **Analysis of the building characteristics**

2. **Identification of the architectural value and relevant features**

3. **Analysis of the state of repair**

4. **Localization of the architectural features to be restored**

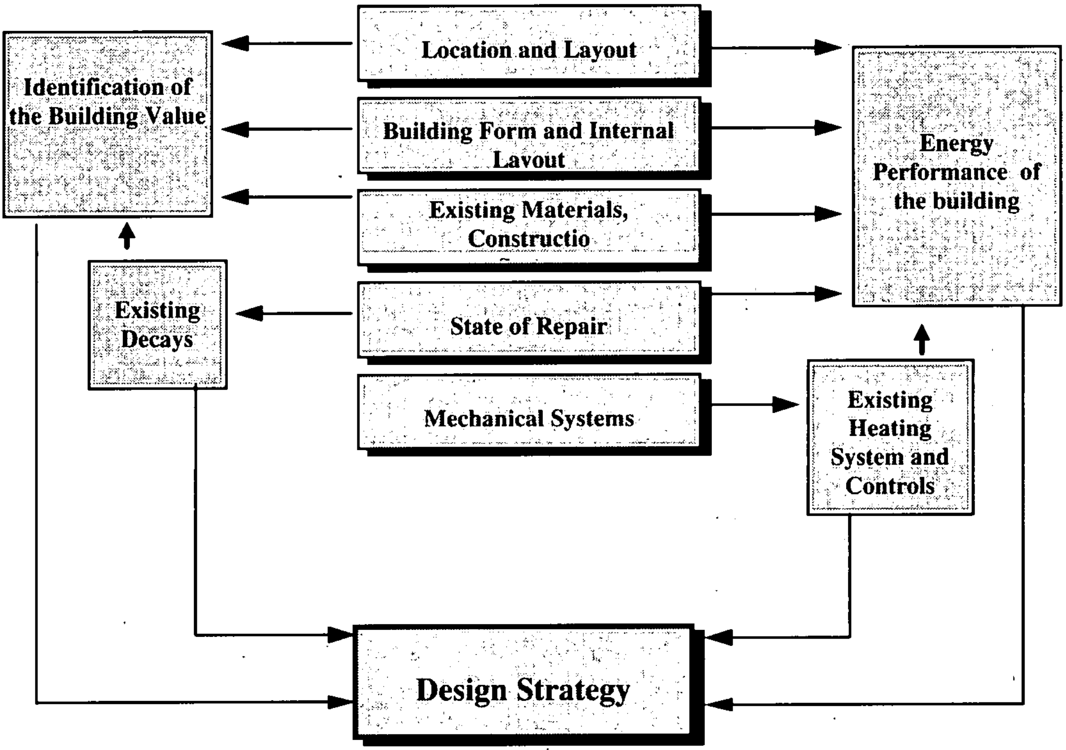
5. **Localization of the architectural features to be replaced**

6. **Identification of the required re-design of spaces**

7. **Study of the adequate function occupation**

Apparently both strategies could be traced independently, yet this is not the correct approach since both are interacting with the architectural elements of the same building. The choices in one will affect, directly or indirectly, the other and the compatibility between both is the basis for the maintenance of the building and the implantation of comfort conditions.

To achieve this relation between both strategies, the research confronts the demands of a renovation project with the energy demands of the building and the energy systems for building integration. The interaction of the totality of these requirements will be analysed in relation with the existing architectural features and the value of the building.
The following scheme clarifies the components implied in a renovation design strategy relating the energy performance and the renovation process of the building:



This scheme clarifies how the parameters affecting the energy performance are related with the parameters affecting the building value, and how both should be integrated within the renovation strategy.

A group of existing buildings are the basis for this confrontation and further development of the methodology. In these buildings energy systems will be tested and analysed. From this analysis conclusions will be drawn intending the development of a comprehensive approach for the application of energy systems to a larger group of buildings. This is the basis for the development of guidelines and recommendations to building designers for the integration of energy saving systems during the renovation of historic buildings.

The work with building case studies

The utilisation, in this research, of a group of *building case studies* aims to develop practical solutions with applications in existing buildings. The existing buildings form a "laboratory" where theoretical concepts of energy performance will be analysed and saving energy systems will be applied.

From the integration of energy saving systems in the selected buildings general conclusions will be drawn. These conclusions involving the total group of buildings are the basis for the elaboration of the methodology relating the integration of energy saving systems and restoration of buildings.

These building case studies will be formed by a group of five or six buildings located in different places and with different functions and architectural features. Several tasks are involved with the building case studies, including the analysis of the building and the restoration techniques, as well as the analysis of the building energy performance. These tasks are listed in the following table:

1. Analysis of the building:
a. Energy performance
b. Historical, technical and architectural characteristics

2. Presentation of the problems related with:
a. Existing energy performance of the building
b. Restoration, renovation of the building

3. Research of possible solutions :
a. Reduction of the energy consumption
b. Maintenance of the historical and architectural characteristics
c. Integration of new energy systems with the architectural solutions fulfilling the new building functions.

Process of development of the methodology

The solutions entailed in each case study will be systematised in order to achieve extensive conclusions to be applied to a larger group of buildings. These conclusions aim to answer the following questions:

- Which are the architectural features that allow the introduction of energy saving systems without disrupting the existing characteristics?
- Does the introduction of energy saving systems in the historic buildings demand considerable changes?
- What are the risks involved with this introduction?
- Which are the existing architectural features that contribute to a good or bad energy performance of the building?
- Are the new technical elements (from the energy saving systems) incompatible with existing materials?
- Which are the energy saving systems likely to be introduced in historic buildings?

- What are the difficulties presented by the integration of new technical elements with existing features?
- Which type of renewable energies are most feasible to integrate in historic buildings?

Methodical answers to the above questions will be the basis for a set of conclusions that the final results aim to achieve. The scope of these conclusions can be formulated as the following:

a. The architectural features of the building that are likely to integrate energy systems.
b. The relation between the existing architectural features and the selection of the energy saving systems.
c. The relation between the historical value and the selection of the energy systems.
d. The relation between the space structure and the selection of the energy systems
e. The advantages and disadvantages of integrating energy saving systems within historic buildings.

Actual Developments

The work with the first group of buildings is currently under development. The architectural and historical analysis have been done and the energy performance analysis is presently in progress.

The conclusions from the first group of buildings are expected to be finished in April. These conclusions will be organised into a more general approach to be applied to other buildings. This is the basis for the first draft of the methodology.

A second group of buildings will be involved later where the first draft of the methodology will be applied giving the possibility of cheking and revising the first approach in order to elaborate the final methodology.

Summary of the Expected Results

The research intends to investigate solutions for the introduction of energy saving systems into historical buildings. These solutions will be organised into a methodological criteria presenting strategies and guidelines for building designers.

The *strategies* will be developed in relation with global restoration and renovation of the building and will deal with:

- Identification of the existing architectural features characterising the value of the building
- Restoration and replacement of existing materials
- Spatial re-design answering actual requirements of comfort
- Re-design of the building typology related with new function or specific functional needs
- Introduction of new materials
- Introduction of necessary mechanical building systems (light, elevators etc.)

The *guidelines* will be organised into different possibilities and examples including the following:

- Presentation of the principles for an integrated approach of saving energy in historic buildings
- Some of the advantages and disadvantages of various building energy saving techniques
- Examples of existing applications of energy-efficient principles in architectural heritage
- Examples of how various measures could be applied in different situations.

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Presentation of Problems from Heavy Polluted Industrial Areas in Poland facing the Growing Needs of Conservation

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Abstract
My research work refers to architectural and planning conditions connencted with conversion of old buildings especially industrials.
The present paper is an attempt to pay attention to the problem of old industrial buildings which have historical and cultural value. Because their functions have been outlived, they usually are useless and undergo a devastation.Most of them could be used for new applications, since their structure is in a quite good condition and only continuos development of new technologies causes those buildings become low efficient. Modern technologies require new technical and building parameters for industrial buildings. Because of that new uses for post industrial buidlings are almost never connected with production pruposes. There are not many historical buildings with architectural value in old industrial areas. Ordinarily old buildings or industrial complexes become the symbols of the place indentity. They grow into the landscape of towns and open areas and confirm the history and tradition of those areas. The same problem we have on the area of Upper Silesian Agglomeration in Poland. Industry, mainly exploitation and metallurgy, has been the most important factor of this area development and also development of our country. On the areas surrounding coal-mines, steel works and factories human abodes were arising many years ago. Centrally planned socialist economy created fast industrial development without environment protection. Results of those activities condusted to many ecological, space-planning and health problems. Presently, after economic and political changes of 1990s some new problems as economic, cultural, social problems appeared. Liquidation of many industrial complexes is connected with conversion of abandoned buildings and areas. This is a really serious architectural and space-planning problem which I try to present in my paper.

The Upper Silesian Agglomeration is the largest and the most destroyed urban and industrial agglomeration in Poland. The development of this area was started on the turn of the 18th century. This region is situated in the south part of our country and consists of fifteen cities and towns with a combined area of 1000 sq km and a total population of about 2,5 min inhabitants. The density of population amounts 891 persons per 1sq km while the country average is 116 persons per 1 sq km. On the area of Upper Silesian Agglomeration about 25% of the land is used by industrial acomplexes based on raw materials:

- coal industry - about 28% of industrial area
- metallurgical industry - about 25% of industrial area
- power industry - about 10,9% of industrial area

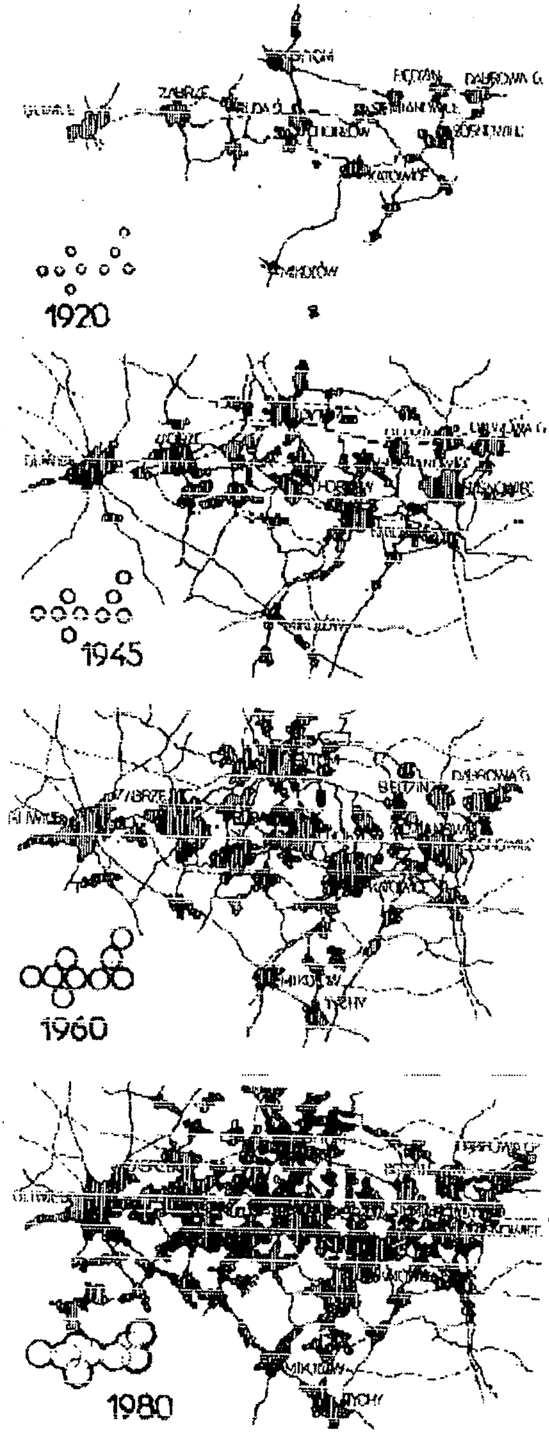

Figure 1: Development of urban areas of the Upper Silesian Agglomeration

Lands degregated by industry occupy 9% of agglomeration area. 50% of working people is still employed in heavy industrial branches. Consequenses of 19th century conception, which according to traditional development of housing estates in close proximity of industrial plants, are well seen in existing spatial arrangement of Upper Silesian Agglomeration. This peculiar spatial arrangement can be described as a complicated system of movements from workplace to domicile, so-called amorphous arrangement.

Till today the uniderectional economic development of Upper Silesian Agglomeration was turned towards the wasteful exploitation, which has caused loss of balance between manufacturing process and environment. These actions have negative effects in ecological, social and space-planning spheres. Some of them are presented below:

A. *Negative effects in ecological sphere*
- air pollution
- water pollution
- climatic changes
- earth surface transformation caused by exploitation and slag heap
- deforestation
- death-rate of some animals
- disturbance of rock mass
- industrial waste lands
- changes of land using
- the increase of industrial effluent water

B. *Negative effects in social sphere*
- the increase of occupational and cicilisation diseases
- the increase of martality among men in production age
- the increase of mortality of babied
- often occurence of prematurity
- often occurence of birth defects
- the increase of morbidity of community
- often industrial accidents
- shorter life time than national average

C. *Negative effects in space-planning sphere*
- the disarray in space arrangement
- the decline of borders between cities and towns
- the lack of clear functional division in space-planning
- the increase of derelict areas
- settlement location near industrial areas
- a lot of low standard housing estates
- rigid system of inefficient railway
- the lack of total conception for solution of industrial protection zones
- not many green areas
- poor development of cultural, educational and commercial network

The development of industry in the Upper Silesian Agglomeration has influenced the economic development of the whole country. Many people were coming there because of job prospects. Presently dustiness, chemicalisation of environment, the increase of ambient noise, crumps, urbanisation and all above mentioned effects create inconvenient conditions of life. Bad condition of environment and health hazard of inhabitants has caused that in eighties of the 20th century the situation of Upper Silesian Agglomeration was called as the ecological disaster but nothing more had been done for improving this situation. The Upper Silesian Agglomeration was still a subject of negative adjustments which strengthened the traditional branches of industry. I was to indicate that buildings reborn and environmental retrieval would not be needful

In socialist countries the economic and political changes of 1990 have influenced the decline of large industrial complexes based on old, inefficient technology/ The same happened in Poland, especially on the Upper Silesian Agglomeration area. The industrial plants which have been held away in polish economy have become the most susceptible to economic recession. Coal-mines represent the most numerous group of industrial plans in the Upper Silesian region. For more vital presentation of the problem of conversion of industrial plants and industrial areas coal mines were chosen as the example. On the ground of coal mines studies were display:

1. Coal-mines which are on the declune, situated on the premises of intensively urbanised areas or near their boundaries.
2. Coal-mines which are stabilised, situated near the boundaries of intensively urbanised areas.
3. Coal-mines which are stabilised, situated near the boundaries of intensively urbanised areas or outside of this areas.

It is very important that areas of coal-mines which are on the decline are situated on intensively urbanised areas. If their exploitation is finished about 1200 hectares of industrial areas will be abandoned. Dumping grounds, industrial waste lands, railways and other areas, which are situated byond the coal-mine area but their activities are connected with the coal-mine, don't be enter into account. Industries which decline in natural way as also liquidation of inefficient industries create a lot of economic, social, space-planning, and cultural problems as: unemployment, abandoned buildings, changing of old places character, etc. In this elaboration these problems are limited to issues which refer to conversion of buildings and areas of coal-mines. The location plan of coal-mine assumed a shape in the second part of 19th century. The main buildings and shafts are situated in lines parallel to railway tracks. In old coal-mines headframes, buildings of hoisting machines and boiler house formed the symmetrical scheme around the central situated chimney. Buildings of baths, offices and supercisors' dwellings were situated beyond of coal-mine fencing in the vicinity of settlements. Despite of the fact that new buildings were built on the area of coal-mine the principles of this scheme are still existing. Some groups of buildings can be displayed based on function and space-planning arrangement:

1. Engineering structures, e.g. headframes.
2. Encased technological structures, e.g. boiler house.
3. Hall buildings, e.g. engine house, workshops, stores.
4. Multi-room buildings, e.g. baths, offices, calibrator's room

The coal-mine is the longest-lived place of employment in comparison with other industrial plants. Its operation time is average from 100 to 250 years. Stability and care about technical condition characterise buildings of coal-mine, especially those which are situated near the zone of entrance: administration buildings, houses of mine's owner, social buildings for personnel.
The aspiration for elegant appearance is visible in historic-like, monumental and richly decorated facades of industrial objects. Some of them were demolished or rebuilt in wrong way. In many coal-mines often only marginal and peripheral buildings were remained without changes.

The watchword "renascence of town" has been repeated in town and country planning trends since 1970. At the same time the monumental value of old coal-mines buildings and also others industrial buildings has been noticed. These trends come into prominence especially in relation to old, traditional industrial regions where are not many historical buildings of great architectural value. New look at post-industrial areas means necessity of restructuring these areas and afterwards fresh land development, new look at old industrial buildings means necessity of finding new uses for them, which have to be efficient. Conditions of exchange economy cause that rehabilitation of post-industrial areas is frequently connected with demolition of buildings and removal of production facilities and a little number of buildings only is refurbished. It had been stated that new use of old industrial buildings almost never refers to production. In consideration of buildings of coal-mine probably only buildings of administrative and social area as: baths, offices, calibrator's rooms and also buildings of boiler-rooms are the best ones for conversion: adaptation, modernisation, rebuilding, etc. Other objects as: hoist towers or water towers emphasise the monumental character of engineering structures but only some of them can exist unchanged or be transformed.

Data presented in the table (Fig.2) describe how conversions of coal-mine buildings are achieved. It is clear that they take place slowly but in Polish reality the beginning of the process is really important. We don't have any special regional or national policy developments but recently the local authorities of Upper Silesia region have been entered into contract with government called "contract for Upper Silesia". Maybe this treaty gives answer how to prepare program for conversion and involve different kind of authorities or private investors into this issue. Foreign experiences show that refurbishments of industrial centres are possible and create impressions, e.g. North-Wet England, the Ruhr, Nord-Pas du Calais. In Poland especially in the Upper Silesian Agglomeration we are just the day before these enterprises. Unfortunately, foreign experiences cannot be adapted directly into our ground of application. Individual researches are needed for particular buildings and also post-industrial areas to qualify them as appropriate to transform.

Based on researches of areas of coal-mines are on the decline some statements can be given concerning researches on possiblity of conversion of industrial areas in Upper Silesian Agglomeration. The should define:

1. Size and scope of land reclamation in comparison with built over and non-built over industrial area which is situated to the boundaries of industrial plants.

2. Size and scope of land reclamation situated outside of industrial plant in comparison with waste land, transportation means and other things connected with production.
3. Possibilities of further using of objects afte modernisation, adaptation, rebuilding, etc., situated on the area of industrial plant. Especially cultural value, technical condition, localisation of building in relation to surroundings, cost analysis elaborated for some variants of building reborn should be deeply investigated.

	original	**date of erection**	**present use**	**technical condition**
1	main hoist tower	1905	no changes	good
2	side hoist tower	1908	no changes	good
3	chimney	1906	demolished	
4	water tower	1920	demolished	
5	chimney	1921	demolished	
6	main hall of hoist machine	1920	hall of heating exchange	good
7	shaft top building	1905	no changes	good
8	air shaft	1913	no changes	good
9	side hall of hoist machine	1908	workshop	good
10	boiler room	1905	swimming pool	very good
11	bath	1920-1922	no changes	very good
12	tranformer station	1943	building of cut-out	very good
13	mine's owner house & offices	1910-1911	surgery	good
14	calibrator's room	1907	no changes	good
15	fire-brigade building	1920	electrical workshop	good
16	old bath	1907	breakfast room & tool-room	good
17	coal containers	1906-1907	no changes	good
18	sorting plant	1905	no changes	good
19	compressor hall	1908	no changes	good
20	forge & fitter workshop	1905	no changes	good
21	compressor hall	1926	store	medium
22	apartment building	1920	workshop & registry	good

Figure 2: Examples of development of "Kleofas" coal main buildings

However, not only these factors are important and shoudl be careful considerated. As important as above mentioned ones is also human emotional sphere. Sphere of our emotion and feeling connect us with our permanent residence. Because of mixin housing and industrial areas in the Upper Silesian Agglomeration industrial complexes

grow into the landscape of towns, cities and open areas and confirm the history and tradition of these places. In general, they become the symbols of the place identity. Additionally, conversion of these buildings and areas will cause that the ones have chace to become also the symbols of place quality.
For a long time industry on the Upper Silesian Agglomeration area has regarded the environment as a source of raw materials and also used it as a waste-sink for dumping unwanted by-products. It is high time to change it and take care of decent living conditions of people from this region.

Research in Technical, Economical and Cultural Effects of Sustainable Building

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Abstract

Building and constructing contribute for approximately 50 % to the environmental problem. Sustainable Building tries to give a solution to this problem. Although many technical solutions have been developed, the organisation of our society contains legislative, economical and other obstructions still blocking a succesfull introduction of Sustainable Building methods into architecture. Especially the economic feasibility is an important factor obstructing diffusion of Sustainable Building techniques.

This research tries to reveal these obstructions. The outcome is a set of recommendations concerning legislation, organisation and economics.

However, if sustainable building is not merely a technical problem and organisational problems will be overcome, the question still remains if sustainable building techniques are going to change the significance of architecture?

In the field of sustainability as well as in architecture there is a lack of appropriate research methodology. Part of the research can be executed through existing methods of research, known from social and technical sciences. Several parts of the research, concerning the application of sustainable building techniques and the report on cultural effects of introduction, ask for new methods of research, like for instance design research.

This paper will contain information about the used methodology for architecture and environmental research. Then the first results of the research, about how sustainable building can be introduced technically and structurally, will be presented. Finally the presentation will describe a possible research method to report cultural effects and significance of sustainable architecture.

Introduction

In the field of sustainability as well as in architecture there is need for appropriate research methodologies. This paper explains the used methodology for a combined architectural and environmental research. Some parts of the research can be executed through existing methods of research, known from social and technical sciences. Specific parts however ask for new methods of research, like design research. This research in sustainable building addresses several research disciplines. Therefore an interdisciplinary approach for this research is needed. To communicate with representing colleagues in other fields of research, I choose the Dutch National Environmental Policy (NEP) as boundary object. The Dutch National Environmental Policy (NEP) shows enough common fuzziness to please all participants. On the other hand the goals claimed in the NEP can be given a concrete form in any of the scientific fields.

I will present the preliminary results of the research in combination with a brief explanation of the research methodologies used to achieve these results.

Lack of time

According to Wiek Röling the main reasons for the deterioration of Dutch architecture are (Röling, 1992):

1. the high building density due to the high population density;
2. the lack of consent in how to solve the problem of the high building density;
3. the lack of time given to the architect to design and help solve the problem;
4. and the curious way of investing money in building activities;

The built-up area has severe effects on the environment. These problems might be an important symptom of the architectural disease. This research assumes that architecture can improve and gain significance by introducing sustainable building methods as integral part of building technology and design.

Context and environment

The basic theme of the research is to analyse the influence of the environment (not only the environmental problem) on the form of architecture. Christopher Alexander speaks of context in the same way I use the word environment (Alexander, 1968). If the context would be able to produce a proper solution, a designing architect would not be necessary. In the same way Taeke de Jong argues that design research creates new possibilities, instead of repeating problem solving methods, that just reproduce existing probabilities (de Jong, 1995).

The main questions are how people produce, use, maintain, reuse, perceive, feel and understand architecture and how can this information be related to sustainability. However it also is important to analyse the way in which the sustainable approach in architecture can be put into practice, without causing more of the same social and cultural problems (Eilbracht, Riedijk, 1994). This implicates that production of architecture and the introduction of these techniques can not be seen separately from its social-economical and cultural context.

Developing processes

The basic assumption of this research is that the development of architecture can be supported by introducing sustainable building methods as integral part of building technology and design.

To formulate my assumption more precisely I would like to postulate three hypothesis:

1. sustainable building is not a technical problem;
2. the structural obstructions of sustainable building can be overcome by proper legislative and economic administrative adjustments;
3. the cultural effects of sustainable building should be investigated thouroughly before introducing this concept into society on a larger scale;

The research is horizontally formed by conditional definitions of the architectural terms function, building structure and form defined by Prof.Dr.ir Taeke de Jong (de Jong, 1992).

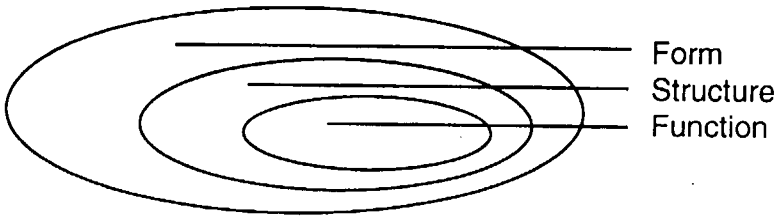


***Figure 1:** conditionally linked function, building structure and form in architecture (de Jong 1992).*

These three aspects are vertically linked to the trialectic relation of technological development defined by Prof.ir Willem Riedijk (Riedijk, 1988).
Sustainable techniques and the effects of their implementation can only be understood properly as part of three interrelated development processes:
1. the development of sustainable techniques;
2. the development of sustainable (infra) structures;
3. the development of criteria, norms and values producing sustainable techniques and sustainable infrastructures;

With the interrelated definition of technology, existing of a technical, structural and a cultural axe I can attach the technical development of architecture to development processes in society. Riedijk distincts three driving processes in society:
1. technisation, efficiency of the development process;
2. structuration, effective of the development process;
3. individualisation, significance of the results;

Each of this processes can develop in opposite directions (see figure 2). Technisation leads from craftsmanship to automation, structuration leads from democracy to bureaucracy and the individualisation of people turns them into alienated humans instead of emancipated persons.

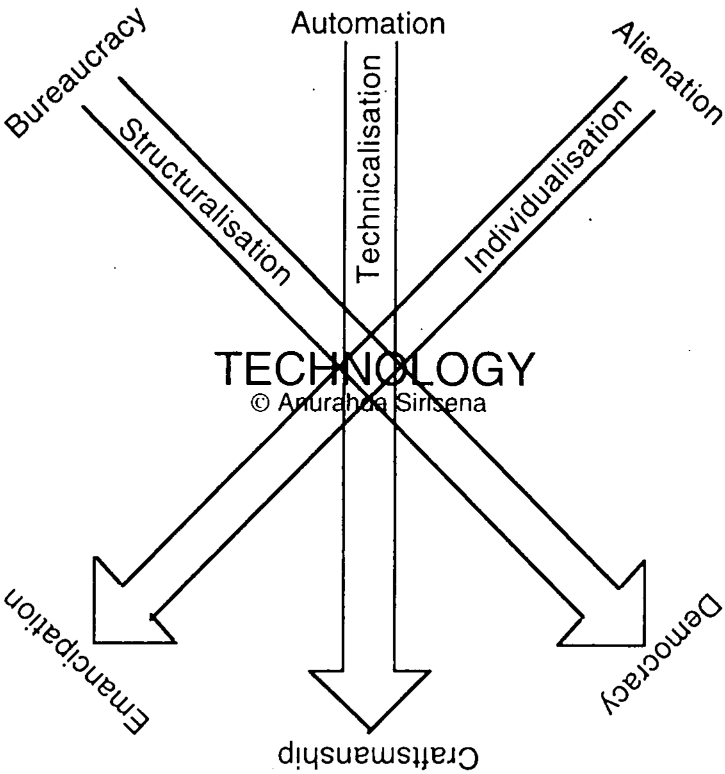


Figure 2: Development axes, technique, structure and culture with the driving processes in society (Riedijk, 1988, page 22).

Basic question behind this conceptualisation of technology in development processes is the question of its significance for society. In this study the significance of these processes in architectural terms has to be researched by asking the questions:

1. does sustainable building initiate self-supporting technologies?
2. does sustainable building support self-government?
3. does sustainable building achieve self-development of cultural identity?

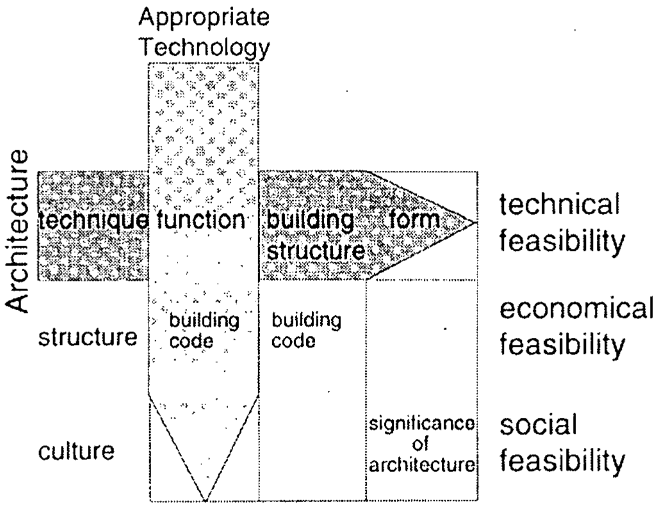


Figure 3: Horizontal and vertical research routes to connect the technical research in function, building structure and form of architecture attached to the development processes of architecture in society

Research methodology for technical effects of Sustainable Building

Design

I built three extremely sustainable dwellings in The Netherlands and an office building in Germany to prove that sustainable building is technically feasible. In the three one family houses in The Netherlands I surpassed the technical conditions of the Dutch National Environmental Policy (NEP).

In the office building in Germany the goal was, next to proving that sustainable building is a very easy thing to do, to show that architectural form also can be used to give the building a special meaning. The significance of the Isofloc office building in Hessisch Lichtenau is that a former nazi bunker can be converted into a monument of possible future development (Ravesloot, 1992).

If the buildings would meet the following criteria for a scientific design they could be considered to be the result of a scientific design process if it (Ravesloot, Meijdam, 1995):

1. Makes stock of existing designs, types and models;
2. Shows new possibilities;
3. Analyses the effects of the design on several aspects;

The product of a scientific design process is a set of drawings with a text.

Design research
I executed technical research in the three aspects of architecture: function, building structure and form. Starting with the three pillars of the Dutch National Environmental Policy (NEP): energy conservation, integral chain management and quality improvement, I will design ecological improvements on the structure of buildings. Then I will report the changes in function and form of the building. Can the building still be used for housing and did the form and therefore the significance of the building change because of the sustainable building measures?

Energy conservation
The first pillar includes the execution of energy calculations, which proves that the goals of the NEP can be reached within existing technical solutions easily. The most interesting discovery I found is that passive solar energy is not as rewarding as was accepted until now. Higher insulation standards simultaneously introduced with the new building code provide a perfect basis for energy conservation in heating. Because of this high standard in newly built row houses and in multy-story apartment blocks, the cooling off at night is minimised. In most cases the sun comes in at nine o clock in the morning. By that time the few degrees decrease in temperature during night-time has been compensated by a short heating of the house during breakfast of the inhabitants. Afterwards most houses are abandoned to go to work (Ravesloot, 1995-I), leaving a perfectly comfortable house.

To distinguish a scientific approach of this kind of technical research the following set of questions have to be asked (Ravesloot, Meijdam, 1995):
1. Is the proposed methodology suitable for this research?
2. Can the problem be described and put into a scientific research program?
3. Does the research refer to its sturdiness?
4. Did the research help finding a possible solution to the technical problem, or at least help find a possible route of further research?
5. Can the used research methodology be transferred to fellow researchers?
6. Is there a systematic approach in the research, can the parameters be put in logical order by means of mathematical, logical or linguistic operators?
7. Did the researcher add an analysis of the methodology in its scientific context?
8. Does the research point out the conditions in terms of general or unique validation of the proposed technical solutions?
9. Can the solutions and conclusions resulting from the research lead to practical improvements in building techniques?
10. Is there an analysis of the technical, economical, environmental and social-cultural consequences of the new technology in case of introduction in society?

Integral chain management
In the second pillar of integral chain management I will alternate some designs of existing dwellings to prove that with existing technologies ecological building is technical feasible. Within the typology of common Dutch dwellings I will design renovation-like improvements with sustainable building materials and sustainable building techniques. One of the most important alterations is the extra insulation with cellulose from old newspapers. This material has the most clean Life Cycle Analysis (LCA) of

all insulation materials, but also meets an outstanding technical performance. This part of the research has to be executed this year.

Quality improvement
As a third step, within the pillar of quality improvement, I will show through technical research that with all these alterations the physical comfort of the houses will improve and dangers for human health can be controlled and minimised, possibly even increased.

The scientific criteria for this kind of design research are (Ravesloot, Meijdam, 1995):
1. Makes stock of existing designs, types and models;
2. Provides new possibilities;
3. Fits a unique design (time, place and user uniqueness) into a general model, exactly naming the conditions validating this model;
4. gives an effect analysis of the design on several aspects;

The product of design research is a written text with drawings.

Both the scientific design and the scientific design research are types of research starting with the means for achieving a goal by looking for possibilities. This in contrast with the traditional research starting with a problem and trying to achieve the goal of fixing the problem by optimisation of existing techniques. The design research is means oriented research, it lacks academic consensus and methodological tradition. However, according to de Jong (de Jong, 1995), this type of research is the only possible methodology to create possible solutions for the combined architectural and environmental problem.

Research methodology for structural effects of Sustainable Building
The organisation of our society contains legislative and economical obstructions still blocking a successful introduction of sustainable building methods. Especially the economical feasibility seems to be an important factor. Next to this, the building code and its practical handling are of important influence.

Building Code
In 1993 I already showed that the existing Dutch building code, although not specifically designed to support sustainable building, is not obstructing diffusion of sustainable building techniques (Ravesloot, 1993). However the introduction of the new building code in 1992 caused a radical change in approach. The research shows that with perseverance at both sides and optimal use if the build in legislative flexibility even a non specialised architect should be able to plan and design sustainable architecture that meets the requirements of the building code.

Uncertainty about used technologies and price consequences of these technologies are the main reasons for principals, contractors and architects not to get involved in sustainable building. My practical field research shows that these uncertainties mainly evolve from the inaccuracy of the architects work in drawing and designing. Besides that the so called economical feasibility has little to do with building, but more with administrative and emotional arguments used by both the principal and the contractor.

Building costs and maintenance costs
In the process of decision making both investment arguments concerning development and building costs as well as those concerning maintenance and management costs should be taken into account. Extra investments now can save money later. Especially environmental techniques in architecture often pay of after a long period of time. In many cases extra costs in planning and designing are considered to be caused by environmental techniques. Research shows that margins of inaccurate drawing and building are far bigger then the extra costs of sustainable building. Apparently many participants in the production of architecture can afford to spent money on products of inferior quality.

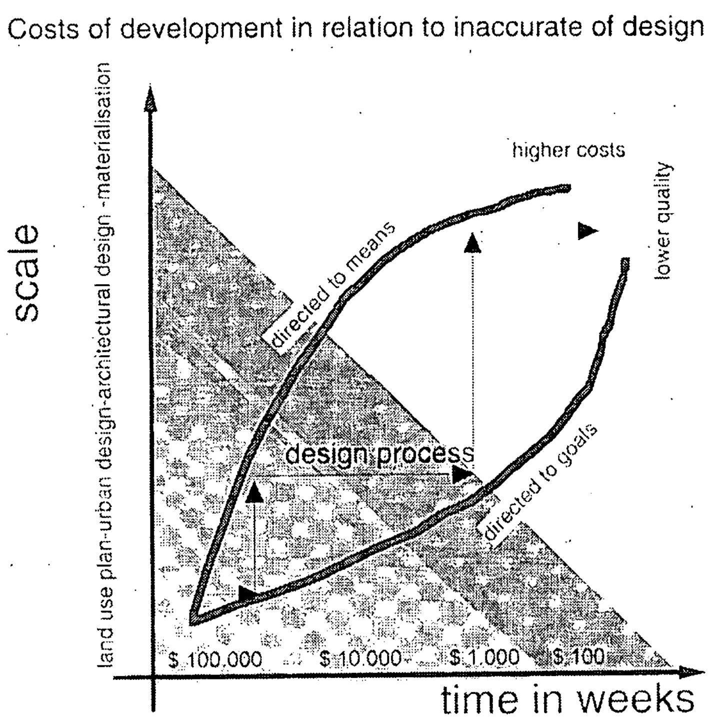


Figure 4: The influence of time management and accuracy of drawing and design on the building budget and the achieved quality (Ravesloot, 1995-II).

There is a very strange way of people investing their money and there is lack of time for architects to design a building. This causes an average of 5 to 10 % overdraw of the budget. Particularly when investments in sustainable techniques are concerned there is a set of pure administrative factors like the pay back time, the writing off and the administrative registration of property rights and renting contracts, blocking economical feasibility. Only a small part of decisions during the process of developing a building have to do with sustainable building as such. In a sustainable building project in Zwolle, The Netherlands, I monitored the exact procedure of decision making. After the architect finished his first set of drawings, the contractor started calculating the costs. He then notified the principal that there would be a budget-overdraw of approximately 20 %, caused by sustainable building techniques. Both architect and contractor joined hands to economise the design. However 90 % of the propositions for building costs reduction were related to design improvements, not to higher expenses of sustainable building techniques!

Research methodology for cultural effects of Sustainable Building

If sustainable building is not merely a technical problem, and organisational problems will be overcome, the question still remains if sustainable building techniques are going to change the significance of architecture?

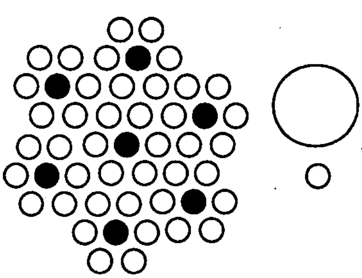
Morphological reconstruction

In June 1994, the town council of the Amsterdam quarter 'De Baarsjes', gave a rare opportunity to Prof.Dr.ir Taeke de Jong and to me, to develop a methodology to regulate visual quality of the buildings in the quarter 'De Baarsjes' (de Jong, Ravesloot, 1995).

The method is based on two assumptions:

Visual quality can be defined in terms of repetition and variation, too much repetition is boring, too much variation is chaotic. This theory is based on the tolerance curve of variation and repetition in perception, known from the ecology of plants. For a proper definition of visual quality on basis of variety and repetition in the architectural environment, a second theoretical basis is inevitable: the so called scale paradox (de Jong, 1992).

The developed morphological reconstruction methodology defines visual quality in terms of repetition and variation without scale-adulteration. Visual quality can be objectively defined from the sale of a city at a scale of a circle r = 10.000 m until the smallest detail like for instance a doorknob r = 0,1 m.



	external	internal
grain	similarity	difference
grain	difference	similarity

Figure 5: Scale Paradox after Prof.Dr.ir T.M. de Jong, within the same chosen grain (angle of view) an internal and external difference can appear. With different grains the view can be different or similar. Without specific information about grain and direction of viewing, observers can never communicate properly. There is a possibility that they look at the same picture but see something else, or look at different pictures and draw the same conclusion.

There are many possible applications for this morphological reconstruction method. This method can be used to control sustainable renovations of building facades. The method defines the aesthetic visual quality rather objectively, before and after the planned renovation. If the visual quality did not gain by the planned renovation activities, the decision of renovating could possibly be replaced by a decision to rebuilt the planned area.

The best way of improving the Life Cycle Analysis of a building is to increase its lifetime (Cuperus, 1995). Building part on several scales in the building must have the possibility to be exchanged. Doing so special demands are put on flexibility of connections and details. The method of morphological reconstruction provides exact information on which scale repetition can be sustained, in order to provide maximum flexibility and to show at which scale too much repetition would be effecting the visual quality negatively. In addition the analysis provides information for possible automation in the production process. The building parts with maximum repetition are not only suitable for maximum flexibility, but also suitable to be prefabricated before being transported to the location to be assembled.
In this way ecology, economics and aesthetics could go hand in hand.

Conclusion
In the field of sustainability as well as in architecture there is a lack of appropriate research methodology. However my research shows that the tradition of research within architectural sciences can be developed very easily unto an appropriate scientific level.
The techniques to fulfil the demands of the NEP have been developed, tested and approved. Seen from the technical point of view, goals can be achieved easily. There is no doubt about the technical feasibility of sustainable building techniques.
With some simple adjustments in building cost-calculations and maintenance cost-calculations economical feasibility can be increased significantly.
Most obstructions however are formed by some kind of cultural and social cause. Therefore the cultural aspects of sustainable architecture have to be considered and researched thoroughly. Social independence and cultural identity might be important values to be secured.

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