CHAPTER 2

REVIEW OF RELATED LITERATURE

In the search for relevant literature, the approach was that the study concerns mostly graphics, design principles and idealistic patterns and thus studies in these fields were mainly searched for. The following sections of this chapter discuss some of the important issues found in the literature.

2.1 GRAPHIC COMMUNICATION

The following studies on graphics are reviewed:

- *Architecture: Form, Space and Order* (Ching 1979)
- *Graphic Thinking for Architects and Designers* (Laseau:1980)
- *The Digital Architect* (Sanders:1996)

The above three books were chosen because of their contribution to the subject in terms of graphic drawings portraying design principles, graphics as a communication tool and computer graphics in the architectural practice respectively.

Graphic studies are widely used by students and architects in the design process. The books of Ching and Laseau were also successful commercially - each book has been published in several editions over a period of twenty years. The books are also both in the 'reserved collection' at the local university library, students can only work on the books in library hours or make copies of pages relevant to their study.

2.1.1 Architecture, Form Space & order

The use of graphics is well described by Ching (1979:11): *'On the following pages is an overview of the basic elements, systems and orders that constitute a physical work of architecture. These constituents can all be perceived and experienced. Some may be readily apparent while others may be more obscure to our senses. Some may dominate while others play a secondary role in a building's organization.*

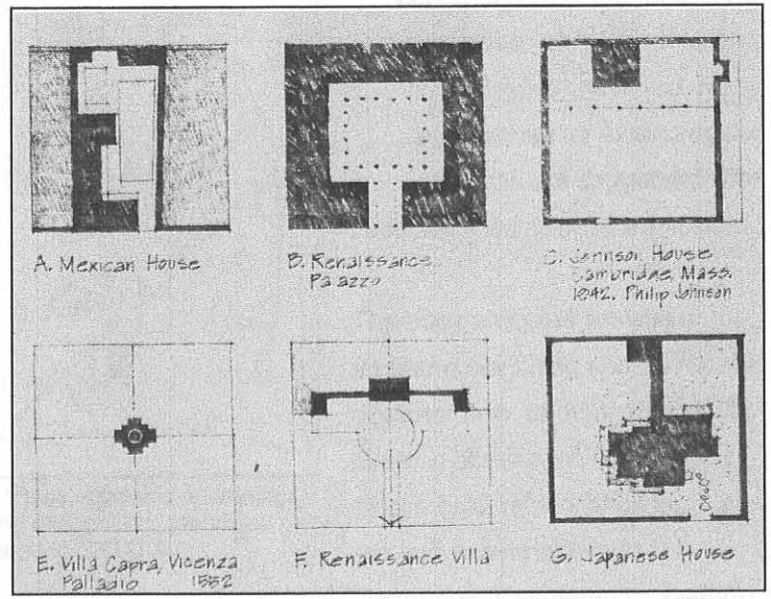


Fig 2A Ching: *Architecture: Form, Space, Order*; hatching used for elements to explain principles

Some may convey images and meaning while others serve as qualifiers or modifiers of these images and meanings.'

The book is mostly graphic, with well-executed sketches done in pencil, illustrating design principles *(see fig 2A).* Not all the examples or patterns are analysed in the way that the design concept was discovered, or in terms of how the design developed. Where this is done however, the illustration of the specific principle is a lot more effective. The variety in rendering technique obscures clear communication, as there is not always a standard way of presenting the graphics to the reader.

Hatching is used, sometimes to great effect to highlight elements, for example for structures that create space, or in other examples the space that it creates (such as a courtyard or square). There is no use of colour in the entire book, which could have enhanced effective communication.

Annotation is always in separate columns. Integrating it with the graphics could have been more effective. The reader has to look at the graphics and then read the text column.

The book is probably popular because of the large number of drawings of noteworthy architectural designs and the way they are categorised and elaborated upon. The graphics communicate the principles in such a way that architects and students can use it as a 'design manual' for inspiration. (It is also reviewed under design principles.)

2.1.2 Graphic Thinking for Architects and Designers

Laseau's (1980:1) remark regarding the drawings of Leonardo da Vinci, indicates his own purpose in writing his book:

'The thinking is exploratory, open-ended; the sketches are loose, fragmented, while showing how they were derived. Many alternatives for extending the ideas are suggested. The spectator is invited to participate.'

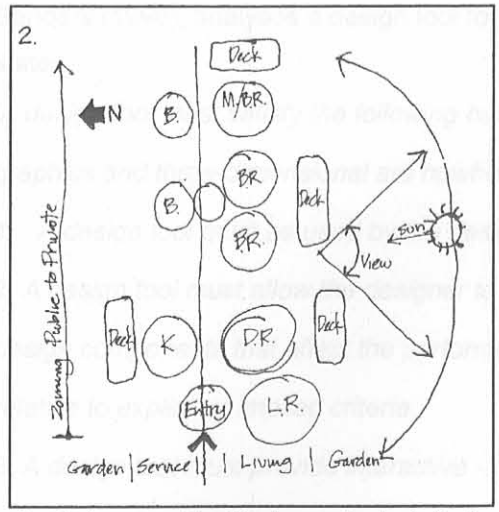


Fig 2B Laseau: *'Positioning and orientation'* illustrated utilising relationship, modifiers and identities- see Figs 2C,D & E

The book analyses the use of freehand sketching and shows the designer how to think graphically. Graphic abstraction is portrayed by symbols, relationship(such as arrows) and modifiers (a diagrammatical hierarchy system) to create what Laseau calls *'a Graphic Language'.* It is never shown in combination with a design project however, but rather as separate graphic diagrams.

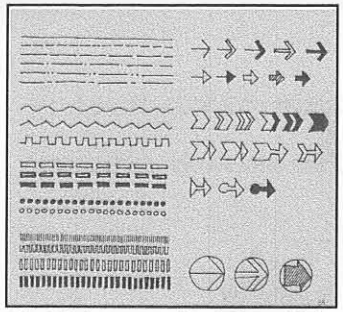


Fig 2C Laseau: *'Relationship'*

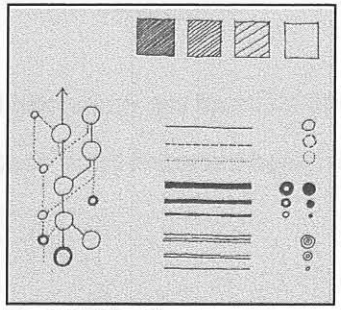


Fig 2 D *'Modifiers'*

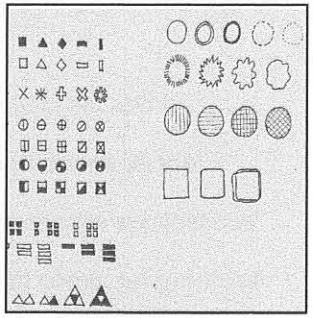


Fig 2E *'Identities'*

The author seems to think in two different graphics spheres: design diagrams and design sketches. Combining the two would have been more effective in communication.

The graphic analysis of the following aspects of a project are shown:

- Context
- Site
- Form
- Scale and proportion
- Mass and balance
- Unity and diversity

The book also analyses the design processes graphically. It is successful in showing architects the possibilities of how graphics may be utilised. The popularity of the book is probably because it shows the *different ways* of illustrating designs graphically. It also assists the graphic thinking of the designer.

(See also Graphics as Communication, Chapter 3)

2.1.3 The Digital Architect

Sanders (1996), analyses a design tool for the architectural practice. He states:

'A design tool must satisfy the following basic criteria (Note that the terms graphics and three-dimensional are nowhere to be seen):

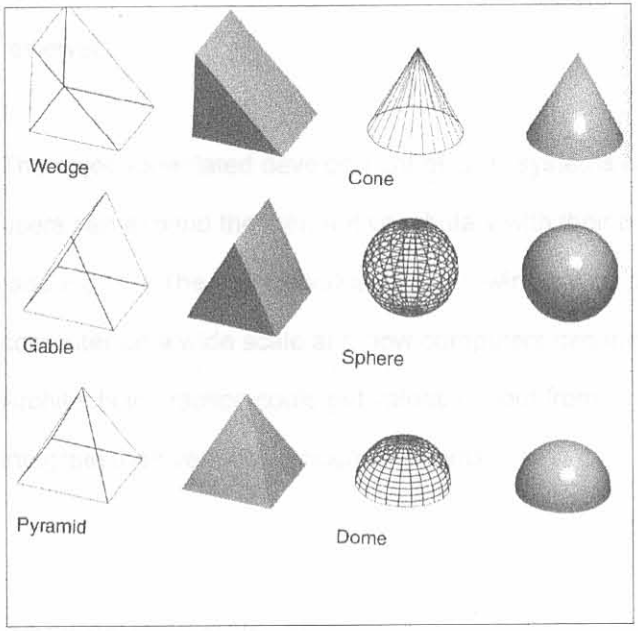
1. A design tool must be used by the designer, not the surrogate.

2. A design tool must allow the designer to define the relationships between design components that affect the performance or appearance of the design, relative to explicit or implied criteria.

3. A design tool must provide interactive -(preferably dynamic) feedback concerning the performance or appearance of a design as the designer modifies its geometry.'

The book is a study of computer graphics in the architectural practice and examines how computers can be harnessed to design projects. Not many books are published on this subject, and with computer technology growing rapidly and continuously, some aspects of the book will already be out of date.

Most publications on digital technology are found on the Internet and in magazines. However, the book is still important because it shows all the possible applications of computer graphics in the practice situation.



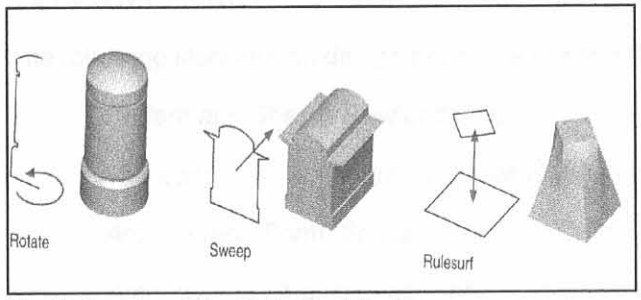


Fig 2F Sanders, *The Digital Architect*:
3D modelling, standard forms and special forms created on CAD

The book shows three-dimensional (3D) modelling and indicates how different designs can be illustrated on the same site by creating block models of mass and scale. It shows the terminology and techniques used in computer graphic renderings, also how hand drawn sketches can be scanned into graphic programmes and coloured in on computers. He also says the following on the advantages of the computer in process of design:

'The design process at it's core is an iterative one. Schemes are identified, explored, measured, revised, enhanced - and the loop repeats. As digital tools compress the loop and make it easier to iterate design alternatives and evaluate their effectiveness, they in theory can improve the quality of design. Some architects equate digital design tools with three-dimensional CAD, but powerful design tools can emerge from other desktop programmes as well...'

The impact of technology on the architectural practice is clearly defined, planning and implementing technology in the firm is addressed, training, tools and the language of the digital media, operating systems, hardware and on-line resources are shown. Even the future trends in the computerised practice are forecast. The appendix indicates world-wide-web sites containing architectural resources.

The illustration of bitmap images - hand drawn images scanned into computer programmes with colour added with the digital tool, are shown as well as

several CAD - images in all it's formats, from wire-frame renderings to fully rendered animations and digital video presentations. The CAD software versions of Autodesk (AutoCAD) and Bentley (Microstation) are mostly reviewed.

The object-orientated development of CAD systems is shown, where CAD users can expand the element vocabulary with their own custom drawn objects (see Fig 2F.) The book is valuable in showing how a practice can utilize the computer on a wide scale and how computers can integrate various functions. Architects in practice could get valuable input from this book, on how to integrate their various computer-systems.

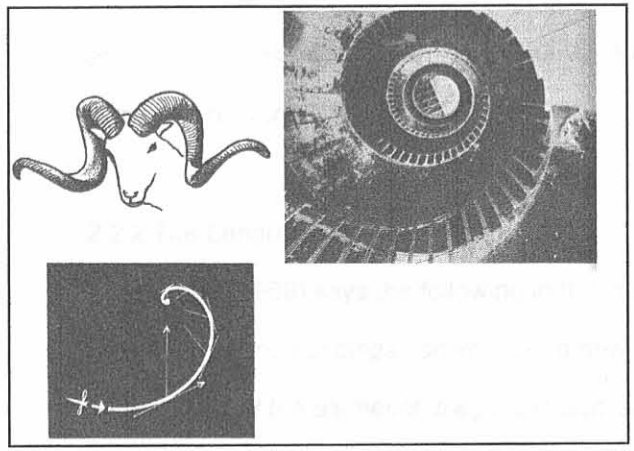


Figure 2H Rowland : *Patterns and Shape: spiral* shapes in nature and spiral staircase

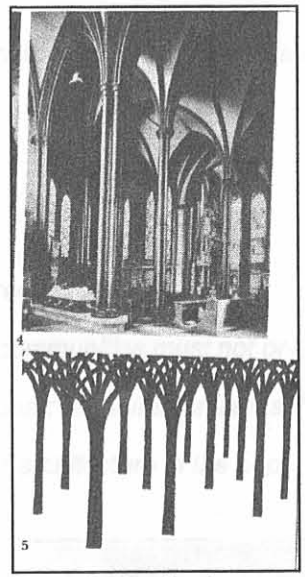


Figure 2J Rowland: *Patterns and Shape :* Forms in architecture derived from nature

2.2 DESIGN PRINCIPLES

The following literature on design principles are reviewed:

- *Pattern and Shape,* Rowland (1964)
- *The Language of Architecture,* Hesselgren (1969)
- *Architecture: Form, Space and* Order, Ching (1979)
- *Archetypes in Architecture*, Thiis-Evensen: (1987)

2.2.1 Pattern and Shape

Rowland (1964) analyses shapes(forms) and patterns in everyday life. He says the following in the foreword (p2):

'*The object of the book is to encourage the rising generation to examine the shapes and patterns which form the background of human life. The author believes that such an experience will provide them with standards of value which may be applied to everything they see.'*

This study will also attempt to transmit values (design patterns) by visual, graphic illustrations, that should give the designer application possibilities. Rowland analyses patterns and shapes in the following chapters:

- Thinking about patterns,
- Patterns caused by materials,
- Patterns from our surroundings,
- Town and Country patterns,
- The same and yet different,
- Nature's patterns,
- Solid patterns and light,
- Seeing all around: looking at forms from all angles.

This book, written for school children, addresses some very important issues: How a pattern changes appearance because of the position of the person viewing it; how new materials have brought about new shapes; what relationships exists between materials and patterns; how nature influences patterns and shapes. Viewing forms from all angles to gain an idea of the flow of the form is also discussed.

Although the book is simplistic, it shows some important aspects of visualisation and ways of looking at patterns and shapes. Photographs are mostly used, with some line drawing illustrations.

2.2.2 The Language of Architecture

Hesselgren (1969) says the following in the introduction:

'*The houses and buildings constructed in new communities must not only provide shelter against the elements, they must also 'speak' to their inhabitants. It is the purpose of this book to analyse the language of architecture in the hope that such*

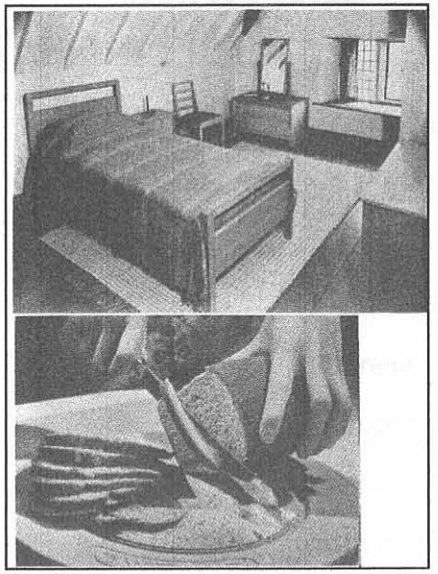


Fig 2K Hesselgren : *The Language of Architecture* : Interior of room creating feeling of 'cut Rye-bread'

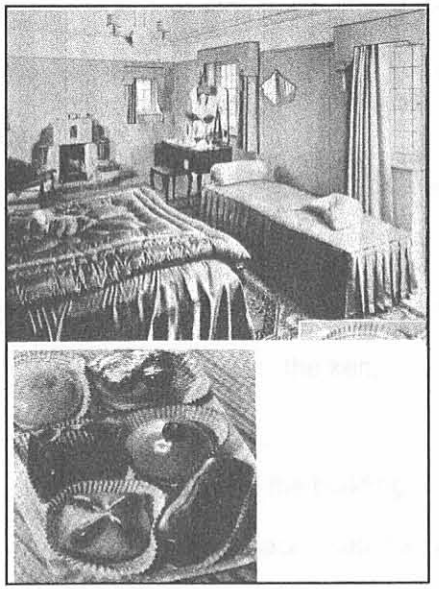


Fig 2L Hesselgren: Interior of room creating feeling of 'sweet pastries'

an analysis makes a contribution to a more effective approach to architectural problems, an approach which will not only incorporate experience and intuition, but which will replace superstition by conscious knowledge based on scientific research.'

He describes the language of architecture (in terms of visualisation) with:

- Facts about perception, (see Fig 2K and 2L),
- Formal aesthetics in visual form, colour, texture, rhythm etc.
- Architectural expression,
- Perception, expression and emotion, architectural form and townscapes.

The book is based on his doctoral thesis and the subject is approached exactly as he describes it above: *a scientific research*. The problem is probably that some of the topics are examined too scientifically. He proposes fundamental rules for the aspect of aesthetics, which is regarded generally as an art form (not a science.) The graphics do however show some interesting visual material which show the way all people, not only architects, perceive graphics and forms and symbols.

2.2.3 Architecture: Form, Space and Order

Ching(1979:8-9), portraying design principles by graphics, provides the following analysis:

- PRIMARY ELEMENTS: point, line, line to plane, volume.
- FORM: visual proportions, shape, primary shapes, platonic solids, regular and irregular forms, transformation of form, dimensional transformation, subtractive forms, additive forms, formal collision of geometry articulation of form etc.
- FORM AND SPACE: the unity of opposites, form defining space, defining space with horizontal elements, ditto with vertical elements, qualities of architectural space, elements defining space.
- ORGANIZATIONS: organizations of form and space, spatial relationships, spatial organizations .
- PROPORTIONS AND SCALE: proportion, proportioning systems: golden section, the orders, renaissance theories, the modulor , the ken, anthropomorphic proportions, scale.
- CIRCULATION :circulation elements, the approach to the building, building entrances, configurations of the path, path/space relationships, form of the circulation space.

- PRINCIPLES: ordering principles, axes, symmetry, hierarchy, datum, rhythm and repetition, transformation.

Ching uses graphics to illustrate patterns according to a specific principle. Many sketches, some with different views of the same design, are used to explain a principle (see fig 2M Four Planes Closure.) The book is a graphic study of patterns and case-studies in design and is illustrated mostly with freehand sketches. Architects and students can use it as a design manual. It is a helpful design tool, a thorough basic training for students of architectural design which addresses both modern- and historic architecture. This book has made a valuable contribution to the subject of *design principles*, illustrated by graphics, but at times lacks clarity and order, which can be confusing. A possible reason is the size of the images and the type of rendering utilised, which varies considerably.

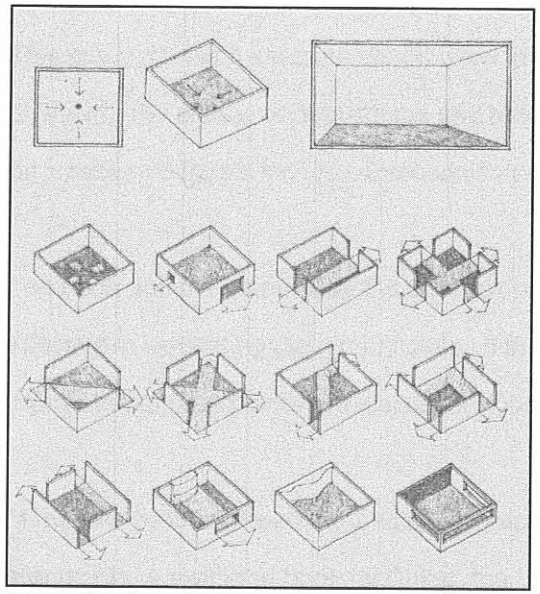


Figure 2M Francis Ching : 'Four Planes Closure' from the book *Architecture: form, space, order*

2.2.4 Archetypes in Architecture

Thiis-Evensen (1987) analyses architectural patterns in three categories:

- the floor,
- the wall,
- the roof.

He says the following in his introduction:

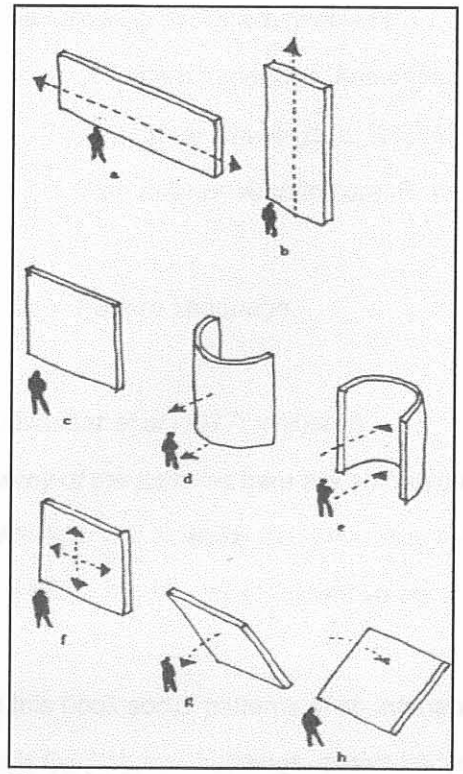


Figure 2N Thomas Thiis-Evensen: *Archetypes in Architecture : 'wall experiences'*

'The book has a design-orientated goal. With a more precise knowledge of archetypes and their variations, it is possible to replace the schematic architecture of recent years without necessarily falling back on and copying motifs from the past... Moreover its intent is to point out the possibilities which lie at the roots of architecture, and which in the hands

of a creative practitioner can give the art of building a more humane countenance.'

The principle analysis is probably clearer when the stylistic rendering of the final design is omitted. However, it is inspirational, inviting and open-ended. It analyses the patterns in elements of architecture in a wide variety of archetypal themes which Thiis-Evensen calls 'the grammar of architecture'.

This study makes a valuable contribution to the subject of *design principles* in analysing the elements of buildings and how they are experienced. It is also based on a research thesis for Thiis-Evensen's doctorate at the University of Oslo.

The book doesn't emphasise the style of the design pattern. It is probably more effective in illustrating design principles than those illustrated by Ching. However, many elemental patterns are discussed (floor, wall or roof elements.)

Many sketches are freehand and photographs are also used to convey the idea of a principle. As with the book by Ching, the principles illustrated by design development sketches are more effective in illustrating a principle. Photographs always show the final design and style, which sometimes obscures the analysis of the principle.*(See also Appendix A: Examples of Design Principle Graphics)*

2.3 IDEALISTIC PATTERNS:

Idealistic patterns and case-studies have been the subject of much teaching and research, especially in terms of social and historical values.

The following books are reviewed:

- *A Pattern Language*, Alexander *et al* (1977)
- *Leon Krier Drawings*, L. Krier (1981)
- *Rob Krier on Architecture*, R. Krier (1982)

2.3.1 A Pattern Language

Alexander *et al* (1977: xviii)says:

'Many of the patterns here are archetypal- so deep, so deeply rooted in the nature of things, that it seems likely that they will be a part of human nature, and human action, as much in five hundred years, as they are today.'

In this book social patterns of spontaneous design in building are explored over a wide field (towns, buildings, construction). It is perhaps somewhat rigid in defining

social patterns and in how it relates to buildings, towns and cities. It is a thoroughly empirical, perhaps even pragmatic approach. It does, however, look at the 'forgotten' patterns that people seem to want in today's industrialised, motorised and organised society. It can be argued that Modernism and the industrialisation of building methods have developed many inhumane environments and that people long for the familiar things in social patterns of a bygone era.

Alexander implies that architects have often been guilty of creating buildings that are not friendly towards users. He believes they should exercise a social responsibility; they should not miss the opportunity to create buildings that accommodate people's needs.

Pattern Language summarises and indexes patterns according to a sequence: from the larger patterns to the smaller. From patterns that create structures to ones which *'embellish'* them, to the patterns that '*embellish the embellishments'*. This network of sequences forms the basis of the pattern language. The graphics illustrating the patterns consist mostly of photographs but also use diagrams *(see Fig 2O).*

Broadbent (1990:) critiques Alexander as follows:

'In practice, many of the patterns ring true and they have been applied quite widely. Others must be taken with a pinch of salt nor can these or any other Patterns, be applied in all cultures, all climates, all social conditions.'

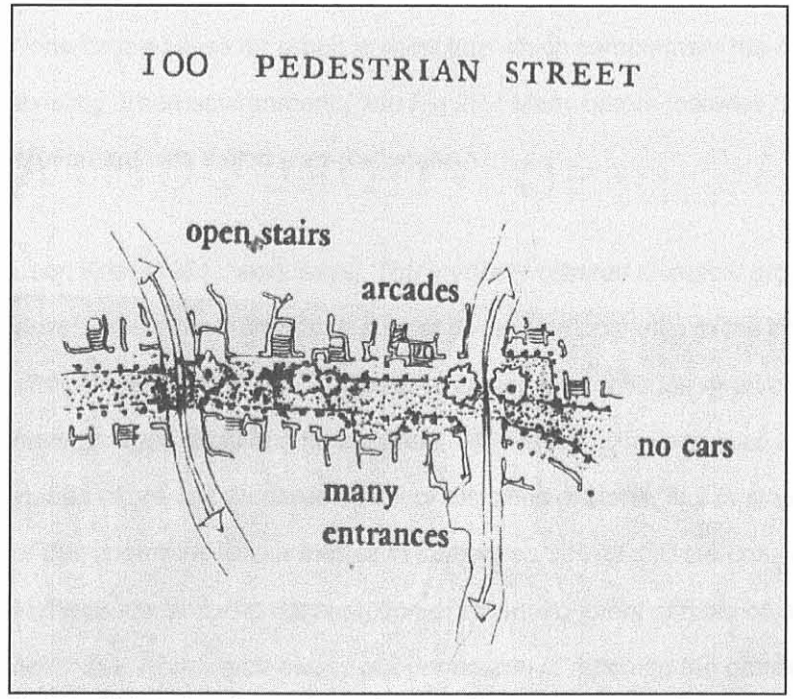


Fig 2O Christopher Alexander and others: *Pattern Language* - Pattern of *'pedestrian street'*

The patterns strive towards a specific social order, from the way cities and suburbs are planned, to the way houses and other buildings are

designed, to the very elements used in designing these buildings. Broadbent is therefore correct to say that the book can't be applied to all cultures and social structures.

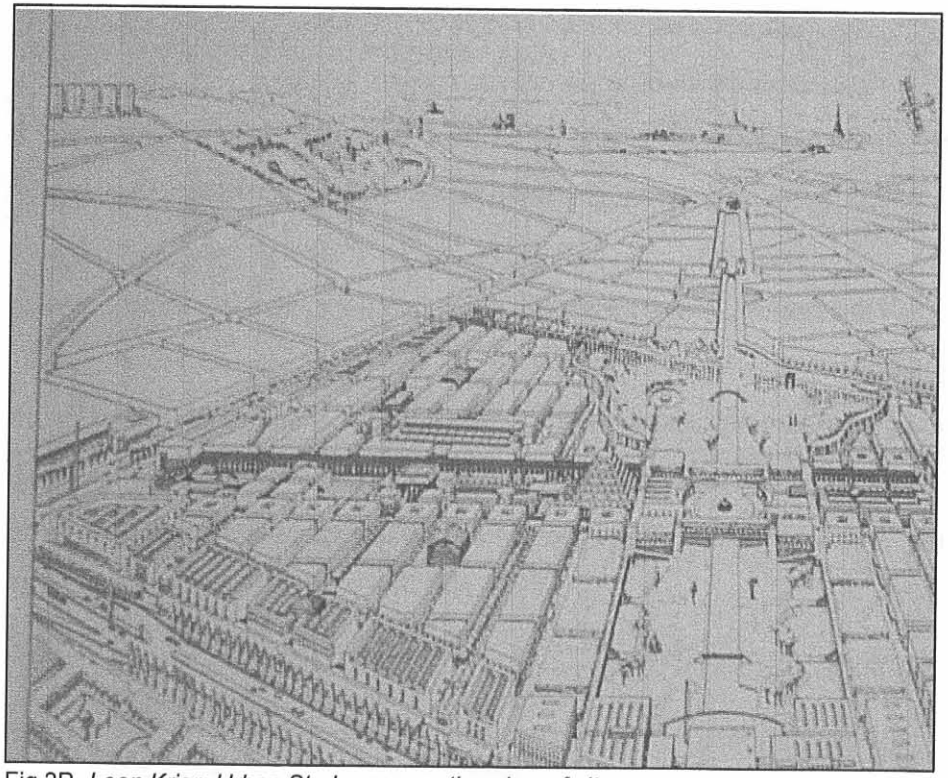


Fig 2P *Leon Krier Urban Study :perspective view of city*

2.3.2 Leon Krier: Drawings

While Alexander and colleagues attempt to be the custodians of social space, brothers Leon and Rob Krier are the idealistic custodians of urban space and order. Both groups protest against the detrimental effects of an industrialised society, the first upon social behaviour, the latter upon old cities. Leon Krier has done case-studies for urban architecture which complement the context of the existing urban environment (see Fig 2P.) Many others followed his thinking; the movement was called Neo-Rationalism..

Leon Krier (1981 : xxv), says*: 'The myth of unlimited technical progress and development have brought the most developed countries to the brink of physical and cultural exhaustion. The fever of immediate profit, the empires of money, have ravaged cities and countryside. We have now to recognize the absolute values of pre-industrialized cities, of the cities of* stone. *Not to stop the destruction of this enormous labour means to subject ourselves and the coming generations to the production and consumption of an environment of futile objects. The enormous work which awaits our generation in repairing the damages and destructions of the last thirty years, must be undertaken in a perspective of material permanence.'*

Alexander wrote about archetypal, deeply rooted patterns, while Krier speaks of the absolute values of pre-industrialised cities, especially in Europe.

2.3.3 Rob Krier: On Architecture

Rob Krier (1982:10) states the following:

'The 1960's revealed the need for a more coherent theoretical approach in the social sector. It is now time for architecture to consolidate the theoretical foundation of its long-established craft, the art of building, to re-discover the basic elements of architecture and the art of composing with them.'

The book shows design projects done by the author, many typologies of variation of themes for urban space, on plan ,elevations and three-dimensional drawings (see Fig 2Q). As with Leon Krier the sketches are well executed works of art and sometimes rendered beautifully. Some of the sketches have poetry alongside, some sketches are abstract showing elements that Krier wants to revive in the European city, such as:

- The wall
- The column
- The bridge

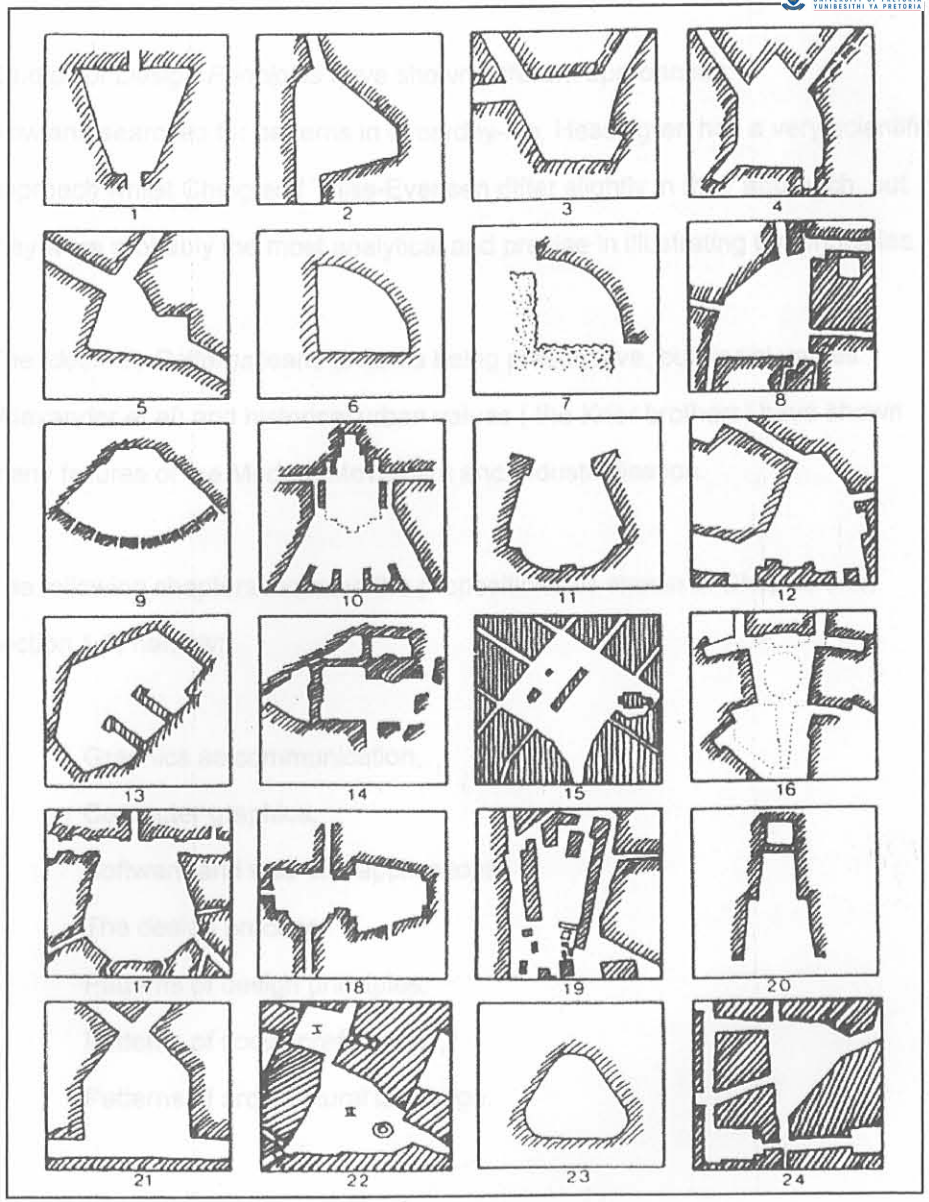


Figure 2Q , *Rob Krier: Squares as urban spaces*

Urban design in Europe has been widely influenced by the Krier brothers' projects and writings. Their work should also be seen in the context of the old cities of Europe and the tremendous historical and social values their urban building patterns have. Modernism and industrialisation have ignored many of these values and it can be argued that they may even have destroyed them.

The Krier brothers and Alexander, all practising architects, analyse the 'absolute values' of peoples' preferences over the centuries. According to them, the patterns in these 'absolute values' should appeal to the designer and it should be reintroduced in the practice of design. It may be argued that people will never move back to these values, that they have adopted new values because of modern lifestyles, but it could also be argued that people will always move back to the familiar things of the past. (*See also Appendix B : Graphics of Social Preferences.*)

2.4 CONCLUSION : REVIEW OF RELATED LITERATURE

Graphics and *Computer Graphics* were examined, and valuable contributions to the subject of graphics were found in the books of Ching, Laseau and Sanders. They all showed some imperfections, though.

Studies of *Design Principles* have shown different approaches: Rowland searches for patterns in everyday-life, Hesselgren has a very scientific approach whilst Ching and Thiss-Evensen differ slightly in their approach, but they were probably the most analytical and precise in illustrating the principles.

The *Idealistic Patterns* leans towards being prescriptive, but social values (Alexander *et al*) and historical urban values (the Krier brothers) have shown many failures of the Modern Movement and Industrialisation.

The following chapters examine the propositions as shown in Chapter one, section 1.3, namely:

- Graphics as communication,
- Computer graphics,
- Software and web-site applications,
- The design process,
- Patterns of design principles,
- Patterns of social preferences,
- Patterns of architectural language.