CHAPTER 1

SETTING THE PROBLEM

INTRODUCTION: THE PURPOSE OF THE STUDY

The importance of light as part of the expression of an architectural language, as well as historical style is apparent. Light as a topic of research, with the focus on architectural expression and meaning beyond the realm of the purely scientific and quantifiable, has received little attention from both theorists and historians. The few sources existing are, for the greater part, sensual and subjective or anecdotal. The purpose of the study is to integrate such sources into a substantive text exploring the development of the poetics of light in architecture from Classical Antiquity and culminating in an investigation of the origins and meaning of the glass architecture of the Modern.

1. The problem and its setting

1.1 The statement of the problem

To uncover the role and importance of light in the poetics of architecture, with reference to the origins and meaning of glass architecture and the emergence of the glass metaphor and its manifestation as a Modern phenomenon.

1.2 Subproblems

1.2.1 The clarification of the term "poetics" with reference to architecture.
"Poetics"(POETIK) is derived from a Greek verb, meaning, "to make". Historically, from Plato (428-347 BC) to Gaston Bachelard (1884-1962), this word has been used to address the aesthetics of genesis. The relationship between "poetics" and the semantic origin of the terms "architecture" and "architect", referring to the act of creation, are explored. Poetics may evolve out of a given tradition, informed by experience or precedent, but usually transcends the mimetic towards a more dynamic form of criticism and selection. Architecture belongs to this complex category of poetics which is contemplative, rigorous and mentally, spiritually and scientifically demanding. It aims at creating works addressing the multitude of human needs. Viewed in this light, "poetics" is deemed an apt term in expressing the multivalent dimensions of making architecture, from the physical to the metaphysical. The first reference to be found, referring to a poetry of architecture, is that of Nicolas Le Camus de Mèziéres (1721-1789) in *Le Genie de architecture ou*

l'analogie de cet art avec nos sensations of 1780. It confirms the premise of the mid eighteenth century being the birth date of Modernity in architecture. Poetics also implies "creating out of nothing" which relates to the intangible and unpredictable qualities of light found in architectural space.

1.2.2 The role of light in the poetics of architecture.

It is assumed that space and the making of space are the central concerns of architecture and as such a poetics of space exists. Light, it is argued, reveals space and amplifies spatial intentions. Therefore a poetics of light exists. To the same extent that spatial concepts have conformed to specific paradigms throughout the history of architecture, light, and the use of light, have been encoded with meaning. Light can be considered and investigated as an artefact; it is a fundamental component in the language of architecture, following the same rationale as the other elements of that language. Within a framework of a poetic approach, principles with reference to the "making" of light, can be identified. To arrive at an understanding of the complexity of light, as part of the poetics of architecture, themes are defined and investigated:

Light as architectural form.
Light as an interpretation of spatial concepts and expression of an architectural language.
The sensual and super-sensual perception of light.
Metaphorical and allegorical light.

1.2.3 The clarification of the concept Modern, with reference to a period in architecture.

The premise is that Modern architecture originated in the mid-eighteenth century. It is argued that radical changes occurred at this time, altering subsequent theories of architecture to the extent that ideals previously foreign became recurring themes, rather than following an evolutionary succession, as was the case in preceding epochs. The Modern period is articulated as a paradigm, characterised as an age of scientific development. The concurrent development of the picturesque aesthetic of Romanticism is taken into account. This dualism, as recurring theme in the Modern is identified. Relationships between various disciplines and doctrines are investigated, insofar as architectural expression can be identified. Modern ideals are identified.

1.2.4 The study of glass architecture as a uniquely Modern phenomenon and the use and meaning of light.
Examples of glass architecture are identified as artefacts of the Modern period and interpreted as the expression of ideas surrounding the concept of light. It is argued that these artefacts are a direct result of Modern ideals, as previously defined.

Themes, as a framework for interpretation, are identified:

Light as an expression of Functionalist theory.
The ideal of *shadowless* light.
The multiple readings of transparency.
Origins of the crystal metaphor and its expression in glass architecture.
Cubist light
Photography and light in architecture
The ideal of creating light

1.3 Hypothesis

1.3.1 A poetics of architecture exists.
1.3.2 Light plays a definitive role in the poetics of architecture.
1.3.3 The Modern period in architecture can be defined, with reference to a unique approach to the use and meaning of light.
1.3.4 Examples exit, providing artefactual evidence of glass architecture as Modern phenomenon.

1.4 Delimitations

1.4.1 The discussion of the poetics of architecture will be limited to light as an element thereof.
1.4.2 A selective approach will be followed with reference to examples and periods referred to in the study of light in architecture. The focus will be on Western architecture from Classical antiquity to the Modern. Contemporary examples conforming to Modern principles may be included.
1.4.3 Architecture is the main concern of discussion. Reference to related disciplines is limited to their direct and discernible relationship to architecture.
1.4.4 The qualitative aspects of light in architecture, as opposed to quantitative aspects are investigated.

1.5 Definition of terms

1.5.1 All terms refer to their Oxford English Dictionary meaning, except where usage and meaning is the subject of discussion.

1.5.2 The term "Modern" will be used in capitalised form, designating the period 1750-1950.

1.5.3 "Modernism" is defined as a stylistic reference to the formal language of the Modern Movement in architecture – in the style of the Modern. Although widely used, it is viewed as inappropriate to the discussion of Modern architecture in this study. The focus is on the conceptual principles of the Modern movement.

1.5.4 "Window" will be used as describing any opening or aperture designed with the express intention of receiving and modulating light.

1.6 Assumptions

1.6.1 The study of light in architecture will reveal poetic intent.

1.6.2 Such intent is directly related to the paradigm of a specific architectural period.

1.6.3 Light in architecture has encoded meaning and can therefore be considered an artefact.

1.7 Sources

Few conventional sources exist with reference to the specific area of study. Key word searches have mainly resulted in securing scientific sources relating to the quantitative qualities in day-light design, with little relevance to the research topic. Noted theorists and historians in architecture make little reference to the use and interpretation of light as part of the language of architecture. Pertinent texts are limited to articles and essays. In an effort to substantiate arguments, a wide selection of sources is utilised and relevant information cross-referenced and synthesised to insure academic reliability. This is done as an integrated part of the text rather than in a review of sources.

SELECTED BIBLIOGRAPHY

The following are primary sources related to the themes of the study:

ANTONIADES, A.C. 1992. *The poetics of architecture. Theory of design*. New York: Van Nostrand Reinhold.

Antoniades provides an important apology for using the term "poetics" with reference to the multiplicity of architectural creation. Design strategies are comprehensively explored

on both physical and metaphysical levels, providing insight into the use of, for instance, metaphorical reference directly related to the use of light in architecture.

BACHELARD, G. 1965 *The Poetics of Space*. Translated from the French by Jolas, M. Boston: Beacon Press.
Although not directly related to architecture, insight into the phenomenological aspects of space and perception relating to architecture is provided. The multivalency of "poetics" and its appropriateness in discussing the complexity of architecture becomes apparent. This source will be used in defining and interpreting the term "poetics".

BROGAN, J. (Ed) 1997. Light in Architecture. *Architectural Design* vol. 67 no 3/4.
Designers, revealing poetic intent, discuss contemporary examples of glass architecture. Essays referring to light as a function of glass architecture are included. Important references to additional sources are provided.

BAEZA, A.C. 1994. Architectura sine luce nulla architectura est. Around light. *Domus* 760 May 1994. pp. 86-89.
Through a critical survey of the role performed by light in the architecture of the past, its central importance as architectural material is affirmed. Different types of light are defined and interpreted to arrive at universal principles applied throughout the history of architecture - beginning with Roman examples.

BAIRD, G. 1995. *The space of appearance*. Cambridge (Mass): MIT Press.
Baird probes the conceptual lineage and critique of Modern architecture, revealing the failure to develop a politically engaging and publicly affirmative architecture.
Chapter 5 deals expressly with the idea of Panopticism, which can be related to the origins of transparency in architecture.

BANHAM, R. 1978 [1962]. *Age of the Masters. A personal view of Modern architecture*. London: The Architectural Press.
First published as "Guide to Modern Architecture", a concise and contemporaneous discussion of the theory and seminal examples of twentieth century Modern architecture. Pertinent aspects relating to Modern theory of space and the occurrence and interpretation of glass architecture are discussed.

BANHAM, R. 1959. The Glass Paradise. *Architectural Review 125, no 745* (February 1959) p. 87-89.

This article supports the argument of the ideal of glass architecture as expression of Modern social theory and establishes or resurrects the importance of the German Expressionist movement, in particular Paul Scheerbart, in the development of the Modern Movement in architecture.

BLETTER, R.H.1981. The Interpretation of the Glass Dream – Expressionist Architecture and the History of the Crystal Metaphor. *Journal of the Society of Architectural Historians 40, no 1* (March 1981), p. 20-43.

A comprehensive discussion of the origins of German Expressionist architecture of the early twentieth century. Essential information on the influences leading to the formation of the "Glass Ring" and an extensive interpretation of their work, is provided. Bletter's research is one of the most profound texts regarding the Expressionist movement and traces back its origins to the Old Testament descriptions of Solomon's Temple and palace as the original source of the crystal metaphor.

BONTA, J.P. 1979. *Architecture and its interpretation a study of expressive systems in architecture*. London: Lund Humphries.

Chapter 4 deals with the emergence of a canonical interpretation of architecture with reference to Van der Rohe's Barcelona Pavilion, offering a semiological explanation of an important glass buildings of the twentieth century.

BORDEN, I & DUNSTER, D. (Eds). 1995. *Architecture and the sites of history. Interpretations of Buildings and Cities*. Oxford: Butterworth Architecture.

This source provides an interpretative overview of architecture from the Renaissance to the present. Because of its analytical position, important deductions about the rationale behind movements and trends can be made. These can be related to the changes in approach to the use and understanding of light.

BORNSTEIN, E. (Ed). 1987. *The Structurist* no 27128 1987/88.

Special edition of *The Structurist*, exploring the relationship between Structurist theory and transparency. Contributors represent a wide spectrum of disciplines and vary with reference to academic viability.

COLLINS, P. 1965. *Changing ideals in modern architecture*. London: Faber and Faber.

Collins traces the origins of Modern architecture back to the mid 18th century. The profound changes in architectural theory, occurring at this time are explained. This source is invaluable in defining Modernism and the Modernist paradigm.

CONSTANT, C. 1990. The Barcelona Pavilion as landscape garden: Modernity and the Picturesque. *AA files. Annals of the Architectural Association School of Architecture*. No 20 Autumn 1990, p. 46-54.
This article interprets the Barcelona pavilion from a Picturesque point of view, establishing an important link between eighteenth century aesthetic theory and twentieth century glass architecture.

EVANS, R. 1995. *The projective cast. Architecture and its three geometries*. Cambridge (Mass) MIT Press.
Evans explores the relationship between geometry and architecture. Of importance is the chapter concerning the fragmentation of existing geometries since the early twentieth century and the relationship between Cubist geometry and the occurrence of glass architecture.

FRAMPTON, K. 1996. *Studies in tectonic culture*. Cambridge (Mass): MIT Press.
Chapter 6 deals with Mies van der Rohe and the avant-garde. The evolution from the brick cube to the glass box is investigated, revealing the underlying tectonic concerns of liberating space as manifestation of social ideals.

GELERNTER, M. 1995. *Sources of Architectural Form. A critical history of Western design theory*. Manchester: Manchester University Press.
This text provides a substantial framework through which diverse theories may be understood and scrutinised. It links the act of design in architecture to value systems forming part of the broader cultural fabric. Major design theories are critically exposed within a chronological framework from Vitruvius to Deconstruction.

GIEDEON, S. 1967. *Space, time and architecture*. Cambridge: Harvard University Press.
This source provides an investigation of the relationship between Cubist painting and Glass architecture. As opposed to a geometrical interpretation, the analyses concentrate on the expression of transparency and simultaneity.

GRILLO, P.J. 1960. *Form, Function & Design*. New York: Dover Publications.

Grillo follows an emotive approach in his interpretation of architectural principles. A substantial part is devoted to the orientation of buildings regarding the quality of resulting light and the design of openings from both an emotive and pragmatic point of view. Climate is seen as an important function, not to be considered clinically, but as synthesised with human experience.

HAYS, K.M. 1992. Inscribing the Subject of Modernism. The Posthumanist Theory of Ludwig Hilbersheimer. In *Strategies in Architectural Thinking*. Edited by Whiteman, D Kipnis, G. Burdett, R. Cambridge (Mass) MIT Press, p. 114-129.
Humanist and post-humanist theory pertaining to the foundation of the Modern Movement is investigated. Hilbersheimer was an important protagonist of glass architecture and the author of an influential treatise on the subject regarding a Rationalist approach.

KAHN, A. 1991. The invisible mask. In *Drawing Building Text.* Edited by Kahn, A. New York: Princeton Architectural Press, p. 85-106.
This essay investigates the origins of the transparent ideal from Rousseau to the execution of the Crystal Palace, exploring real and perceived transparency and the misappropriated ideal of glass architecture as capitalist expression.

KRUFT, H-W. 1994. *A History of Architectural Theory from Vitruvius to the Present.* Translated from the German by Taylor, A., Callander, E and Wood, A. New York: Princeton Architectural Press.
Kruft provides a critical and cohesive anthology of the most significant Western architectural theories and theorists from Vitruvius to the Modern. Major works of theory are identified and extensively cross-referenced. Analyses are based on primary texts.

LAUGIER, M.A. 1977 [1753]. *An Essay on Architecture.* Translated from the French by Herman, W. Los Angeles: Hennessey and Ingalls.
Laugier's treatise is considered to be the first expression of a Modernist theory of architecture. Its Rationalist approach confirms a radical break with former Formalist convention towards Functionalism.

MIDDLETON, R. 1990. Boullée and the exotic. *AA files. Annals of the Architectural Association School of Architecture.* No 19 Spring 1990, p. 50-55.
The metaphorical inspiration of major projects is related. Boullée's debt to Le Camus de Mézières is related with reference to the use of the term "la poésie de l'architecture" and its adjunct "la lumière mysterieuse". The architect's reinterpretation of light in architecture

of shadow, illustrated in the Newton cenotaph, is placed within the exotic context of the Zoroaster cult. Through Nietzche a relationship with the German Glass Ring may be established.

RILEY, T. 1995. *Light Construction.* New York: Museum of Modern Art.
Published as companion to an exhibition at MOMA of the same title, it traces the history of glass construction during the twentieth century focusing on recent developments. The leitmotif of glass architecture is investigated with reference to the Rationalist versus Expressionist dualism. The references are of value.

ROWE, C. 1976. *The Mathematics of the Ideal Villa and other essays.* Cambridge (Mass): The MIT Press.
This work contains Rowe's highly regarded essay *Transparency: Literal and Phenomenal* (p. 171). Written in collaboration with the painter Robert Slutzky, it offers a critique of the literal transparency of glass architecture in favour of the complexity of phenomenal transparency. This is defined as the abstract, theoretical sense of transparency resulting from a cerebral manipulation of opaque surfaces in the construction of space and façade.

ROWE, C. 1994. *The Architecture of Good Intentions. Towards a possible retrospect.* London: Academy Editions.
This text presents a retrospective evaluation of the complexities of Modern architecture measured against the themes of epistemology, eschatology, iconography, mechanism and organism. It reveals objectively the strengths and weaknesses within the Modern Movement and traces the origins of essential views informing and directing the development of Modern aesthetics.

VAN DE VEN, C. 1978. *Space in architecture. The evolution of a new idea in the theory and history of the modern movements.* Amsterdam: Van Gorcum Assen.
Van de Ven elaborates on the argument that the articulation of space is fundamental to architectural expression. Spatial theories are investigated, compared and related to philosophical and cultural paradigms. This investigation substantiates the premise that a poetics of space exists in architecture and provides valuable references to supporting sources.

VON MEISS, P. 1991 *Elements of architecture. From form to place.* London: E & FN Spon.
The importance of openings as an element of architecture is discussed with reference to the sensorial experience of space through light. The sineasthetic qualities with which ar-

chitectural space has been imbued by the design of considered openings are explained by examples from history.

ZEVI, B. 1990. Light as architectural form. *World Architecture vol. IX no 5,* p. 56-59.
Zevi deals concisely with light as architectural form, providing a definition of the term and its interpretation in examples taken from Roman to contemporary architecture.

CHAPTER 2

THE TERM "POETICS" WITH REFERENCE TO ARCHITECTURE

SUBPROBLEM 1

The clarification of the term *poetics* with reference to the act of creation in architecture.

HYPOTHESIS 1

A poetics of architecture exists and the term aptly describes the genesis of creation.

2.1 INTRODUCTION

The purpose of this chapter is to justify, through definition, the use of the term "poetics" pertaining to the deliberate and thoughtful act of "making", with reference to architecture and allied disciplines. The origin of the term is discussed, and its appropriate association with architecture and aesthetics is examined.

2.2 DEFINING *POETICS*

The *Chambers Twentieth Century Dictionary* confirms the *Oxford English Dictionary* interpretation and defines *poetic* in the context of its common use as a literary term describing, that "which is of the nature of or having the character of poetry, or being suitable and pertaining to poetry." (Macdonald, 1975: 1033). The *Fontana Dictionary of Modern Thought* paraphrases this definition as: "The theory and/or practice of poetry: alternatively, an exposition of such theory or practice" (Bullock et al, 1988 [1977]: 657).

The use of the term as adjective in a non-literary sense generally refers to an emotional, sensory or idealistic view or experience of a phenomenon, as for example in the phrase "poetic justice". It is within the parameters of this limited definition that the earliest association of the term with architecture is found.

2.3 THE ORIGIN OF THE USE OF THE TERM IN ARCHITECTURE

The use of the term *poetics* or *poetry* with reference to architecture is by no means recent, and can be traced to the mid-eighteenth century. Collins (1965: 244) argues that of the allied arts, lit-

erature exerted the least influence on architecture, because of its non-visual nature. He concedes that certain fundamental ideals, for example the artistic virtues of ugliness, the question of what constitutes "goodness" and a sensitivity to the importance of sincerity, connected to literature, had a drastic impact on architecture. Literary criticism gave birth to architectural criticism, which naturally affected architecture.

It is in precisely this realm that we find an early, albeit literal association between the idea of poetry and architecture. Collins (1965: 257) refers to Denis Diderot (1713-1784)[1] as the first architectural critic. Diderot, the leading *Encyclopédiste,* deliberately interpreted the critic's task in terms of Horace's aphorism: *un pictura poesis* which could be related to a simplified version of Bachelard's *poetic image.* A typical *Enlightenment* figure, he was greatly influenced by John Locke's (1632-1704)[2] theory of knowledge in terms of sensations (Vesey & Foulkes, 1990: 86). The critic, instead of analysis and an inquiry into causes, undertakes to formulate a verbal equivalent for the aesthetic effects of the work under consideration. This, in simple terms, implies a transmutation of the work into prose form, often including the vivid outpouring of the writer's own sensations, evoked by the visual experience of the work under consideration. The obvious result of such an approach is that it ignores the formal and functional aspects of architecture in favour of the anecdotal.

It is in this domain of the emotional and sensory experience of architecture that the first reference to *the poetry of architecture* may be found. Nicolas Le Camus de Mèziéres (1721-1789) explores, in an elementary manner the way in which one's senses and emotions respond to form and light, when experiencing space. He is the first to use the phrase *la poésie de l'architecture* and its adjunct *la lumière mysterieuse,* in his *Le Génie de architecture ou l'analogie de cet art avec nos sensations* of 1780. The argument is simple: A brilliantly lit and airy room uplifts one; cut out some of the light and a serious mood is evoked, while a further reduction in light leads to melancholy and sombreness (Middleton, 1990: 46-47).

2.4 THE LINGUISTIC ANALOGY

The first use of an analogy between poetic ornament and architectural ornament, according to Collins (1965: 180), can be traced to a speech delivered by F. de Salignac de la mote Fénélon

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[1] Fleming refers to the *Encyclopédie* as the most characteristic expression of the Enlightenment, the result of the confluence of Rationalism and Academicism. Its 35 volumes, edited by Diderot (1713-1784), resulted from the collaboration of the 180 outstanding minds of the time, including Voltaire (1694-1778) and Rousseau (1712-1778). It made available in clear language all the knowledge previously contained in scientific studies (1986: 345).

[2] See: *An Essay concerning Human Understanding* 1690.

(dates unknown) to the French Academy of Literature in 1693. He cited the bad in architecture as the equivalent of the defective in bad oratory: "The boldest most ornate works of Gothic are not the best, for one must never allow into a building any element destined solely for ornament, but rather turn to ornament all parts necessary for support".

The first use of this analogy by an architect seems to be Jacques-Francois Blondel[3] (1705-1774), who in his lectures, from 1750 onwards, asserted that: "architecture is like literature; the simple style is preferable to an inflated style, since one only weakens a great idea by trying to raise it up with pompous words", and: "Architecture is like poetry; all ornament which is only ornament is excessive. (Collins, 1965: 180) Blondel would tell his students that style, in architecture, meant the authentic character, which should be chosen relative to the purpose of a building, and was thus the poetry of architecture. Just as there were sacred, epic and pastoral poetry, so there were sacred, heroic and pastoral architecture, and just as some poetry was elegant, some gay and pompous, so architecture likewise could express moods which might either be appropriate or not to the function of the building (Collins, 1965: 63).

The comparison between architecture and poetry was the inevitable counterpart of the analogical comparison between building and vernacular speech. Both were used to explain the distinction between architecture and construction. It advocates the notion that the difference between architecture and plain building, as in the difference between poetry and plain speech, lies not in the use of special elements (vocabulary in the case of poetry), but in the arrangement of those common elements in a felicitous and emotionally life-enhancing way. From this it is understandable why, in the mid-eighteenth century, prose was thought to differ from poetry only by being enhanced and less refined, and why, at a time when the word "style" meant the type of expression appropriate to a literary composition, architectural theorists tended to describe architectural style analogically as poetry. Blondel wrote: "Style is, in a figurative sense, the poetry of architecture; a colouring which contributes towards rendering all an architect's compositions interesting..." (Collins, 1965: 181). His two pupils E.L. Boullée (1728-1799) and C.N. Ledoux (1736-1806), the exponents of *architecture parlante,* or narrative architecture involving the observer in dialogue, were especially taken with the analogy. Boullée in his treatise stated: "The poetry of architecture is acquired by giving monuments their proper character", while Ledoux asserted that "architecture is to masonry what poetry is to literature"(Collins, 1965: 181).

2.5 TOWARDS AN APPROPRIATE DEFENITION OF POETICS IN ARCHITECTURE

[3]Blondel was a director of the Academie Royale d'Architecture (1671-1793) Founded by Colbert, it was the first institution to practise systematic architectural teaching and a forerunner of contemporary faculties. Its responsibilities extended to an overall organisation of all building disciplines and activities.

It is clear from the above examples that the traditional definition and use of "poetics" with reference to architecture ignores the complexity of the process of architectural creation. For a more appropriate definition it is necessary to explore the genealogy of the term and its Greek origin and to investigate its acceptability as an adjunct to architecture.

In its original Greek form *poiëma – poiësis – poieein*, a direct translation of *poetics* would be *to make*. It is this original meaning which Antoniades (1992: 3) explores in his appropriation of the term with reference to architecture:

> "There is something mystical about the term *poetics*. From Plato to Aristotle to Gaston Bachelard to Igor Stravinsky, this word has been employed to address the aesthetics of genesis, the qualitative ingredients of space, the making of music. Poetics comes from the Greek verb that simply means *to make*. The making of space, the making of music, the making of architecture...the making of poems...thus some of the confusion, since many people associate the term with poetry, which is only one of the forms of making – creating with words. Yet there is a lot more to the term poetics than mere semantics. All the books that have been written about poetics and the one at hand address "the making" of a work of art through the lens of aesthetics; that is, poetics has been tackled thus far as "the making" of art through the thoughtful, contemplative path of what is "good", or what would be the promises or subtle differences between the various possible ways of making, with regard to the good."

Greenberg (1995: 7-8), in his apology for the use of *poetics* in describing the dynamics of urban design, confirms this definition, as encompassing all creative acts:

> "To the Greeks, the term *poetics* was not restricted to what we now call poetry. One modern translator of Aristotle's (384-322 BC) *Poetics,* Kenneth Telford, suggests that the Greek might be better rendered as "productive science" and understood to cover any kind of making, including the products of both useful and fine art, but only in respect of their production, not in respect of any external criterion or purpose they might serve. A poem is therefore anything made or produced."

Greenberg's inference is therefore that architecture too could be described as a poem and therefore has poetic quality. He deviates from Antoniades's aesthetic approach of "making that which is good" to a rational approach of usefulness while defining goodness in terms of the ethical responsibility of the maker to produce that which would benefit the user:

> "Because poetics deals with things that are made by people, the rules of making are not inscribed by natural law but drawn from experience, practical reason, and discussion, the method of poetics is to develop an ethos, based on our experience of poetic objects and the people who use them, about how things should be crafted to do what they're supposed to do. Poetics has an ethical dimension in that any object made for human use is a surrogate for the maker's conduct towards the user".

2.6 TYPES OF POETICS

The difference in focus between Greenberg and Antoniades concerning their definitions of poetics implies that different types of poetics exist. If poetics refers to all creative acts, leading to both tangible and intangible creations, even thoughtless creation could be deemed as being poetic. Antoiniades (1995: 8) describes this as the poetry of the arbitrary, belonging to the realm of the critic, as previously discussed.

Poetics that evolve out of a given tradition, using precedent and example, thus relying on the thought processes of others and in particular that of our predecessors, can be termed *traditional poetics*. In other words it is the making of things contemplated and resolved previously by others. It is the making through endorsement, albeit thoughtful, rather than original creation. Antoniades (1995: 7) distinguishes between two possibilities for such traditional poetics, the mimetic and the dynamic. The second is superior to the first, having the merit of relying on one's own mind and being critical and selective towards the exploitation of contemporary methods and technologies that apply to the peculiarities of a specific time. Greenberg's definition relies on the latter type of poetics.

The third category of poetics is highly contemplative, rigorous, and mentally, spiritually and scientifically demanding. It aims at the creation of works that satisfy the multivalency of human needs, both on a functional and spiritual level. According to Antoniades (1995: 4), architecture belongs to this category of complex or *contemplative* poetics. Architecture has, throughout history, experienced all three types of poetics, but the third is the most appropriate. The complexity of multifaceted societal frameworks demands a poetics, which utilizes a conscious and systematic process of problem solving.

2.7 THE NATURE OF ARCHITECTURAL POETICS

The third category of poetics is inclusive by nature, which Antoniades (1995: 5) defines as:

> "Inclusivity means the attitude of exploring ideas and the making of a work through many more points of contemplation (not only the functional, not only formal, not only spiritual, not only as part of a historical/ traditional or contemporary milieu) than limited or one sided ones. In this sense the poetics of architectural inclusivity is the making of architecture through a process of genesis (creativity) in which the aesthetic argument addresses a greater range of potential aesthetic constants while at the same time operating on totally nondoctrinaire grounds while giving the benefit of the doubt to and exploring the advantages and disadvantages of the various creative possibilities and aesthetic systems."

2.8 THE TEMPORAL AND ORIGINAL QUALITY OF POETICS

It is clear from the previous discussion that poetics refers to the creative act. This implies a moment(s) in time, which means that poetics has a temporal quality, a moment of coming into being. In the context of architectural space revealed in light, the assumption is that such a space is conceptualized by the creator as a poetic image before its physical creation. This "flare up of being in the imagination" as Bachelard (1964: xiv) describes the poetic act, is considered to be the moment of original creation.

2.9 THE SEMANTIC RELATIONSHIP BETWEEN POETICS AND ARCHITECTURE

The essentially definitive human activity is to fabricate or to make. It is a poetic act. If we look to the Greek roots of the term, to inquire into this defining activity we find, presiding over this activity described by the Greek word *technê*, the architect or "master producer (Meagher, 1988: 159) The architect is distinguished from the mere worker as standing nearer to the origins, the foundational principles of the activity of production. The architect is the pre-eminent producer, the practitioner and theoretician whose vision guides others in the process of making.

Meagher (1988: 160), in his exploration of the role of the architect as master producer, defines *technê* as follows:

> "*Technê* is making something into what it is not. Ploughing and seeding a field and as a consequence, producing a crop is not properly considered *technê,* for in this we are merely participating in a process which has its own purposes, without intervening in, much less contravening, these purposes... Neither is it *technê* when we make a joke, for jokes are made, as it were, from thin air. Thoughts are immaterial as, for all practical purposes are words. Finally, any chance, random, or inadvertent activity, despite what it may produce, is never a true instance of *technê*, which may be defined as the conscious, wilful working or reworking of matter until it becomes not only what it is not, but also what it is our intention it should become. Thus it is an instance of *technê* when we cut down a tree to make lumber for a house, or logs for a fire, or paper for a book."

From this definition we may derive at the essential principles of making/producing in architecture. It is conscious, wilful, materially violent, and materially productive. There must be a "leap of imagination" (Meagher, 1988: 160) before it becomes a practical undertaking. In the exercise of *technê*, imaginative freedom is essential and prior to violence. That the architect possesses such freedom is apparent, whether altering an existing structure or envisioning an as yet non-existent one. The architect's freedom is always constrained and limited by matter; for every architectural vision must in the end refer to matter. The architect is a maker and not a creator (Meagher, 1988: 162).

The semantic comparison between the interpretation of the terms *poetics* and *architecture* indicates a clear similarity in meaning. Therefore the assumption is that a poetics of architecture exists and that the appropriation of, what is to be considered a literary term, is acceptable in the context of architecture.

2.10 SUMMARY

2.10.1 The original use of the term *poetics,* in architecture, can be traced to the mid-eighteenth century, where it was used analogically to infer the appropriate application of style. This was referred to as the *poetry of architecture*. This use was extended by Le Camus de Mèziéres to describe the sensory and emotional experience of the (poetic) qualities of light in architectural space.

2.10.2 A semantic analysis of the word reveals its historic use in addressing the aesthetics of genesis and provides examples of its appropriate application in architecture and allied disciplines.

2.10.3 Different types of poetics can be identified, of which the contemplative and inclusivist category is the most appropriate in describing the complexity of architectural production.

2.10.4 Poetics has a temporal and original nature, implying the existence of a definable moment of creation and identifiable authorship, which stands autonomous of subsequent experience and interpretation.

2.10.5 A clear semantic relationship exists between the interpretation of the meaning of *poetics* and *architecture,* confirming the pertinent use of the term in reference to the wilful, conscious and demanding act of creation in the making of architecture.

2.10.6 A poetics of architecture exists, encompassing the abstract and concrete aspects of architectural production.

CHAPTER 3

THE POETICS OF LIGHT IN ARCHITECTURE
SUBPROBLEM 2

The role of light in the poetics of architecture

HYPOTHESIS 2

Light plays a definitive role in the poetics of architecture

3.1 INTRODUCTION

"Also marvellous in a room is the light that comes trough the windows of that room and that belongs to the room. The sun does not realise how wonderful it is until after a room is made. A man's creation, the making of a room is nothing short of a miracle. Just think that man can claim a slice of the sun" (Louis Kahn in Devillers, 1992: 151).

In this chapter the importance of light in the poetics of architecture is investigated by example of artefacts and supporting theoretical sources. The methodology follows from the assumption that the distinctive architectural periods from Classical Antiquity to the Modern may be defined by equally definitive attitudes towards the expression of spatial constructs which in turn are underscored by a particular employment of light to enhance this expression. This approach implies that the survey is focused on light and its relationship to interior space, or light as architectural form.

3.2 LIGHT AS ARCHITECTURAL FORM

Le Corbusier's (Charles Edouard Jeanneret-Gris, 1887-1965) (1985: 202) definition of architecture as "L'architecture est le jeu savant, correct et magnifique de volumes assemblés dans la lumière"[4], refers to light as intrinsic to architectural composition and as part of the architect's vocabulary: "The architect has worked plastically[5]. He has brought the play of light and shade to the support of what he wanted to say...they are pure invention which makes the outward aspect radiant or dulls it." (1985: 202) This reference to the role of light in the poetics of architecture implies specific intent but views light as an exterior condition. Many examples, such as Hellenic architecture, exist where the significance of light is limited to the illumination of exterior volume and sur-

[4] "Architecture is the skilful, accurate and magnificent play of masses seen in light".

face. Although it is accepted that such use of light constitutes a poetic application, the scope of this study excludes this "architecture of light" as defined by Zevi (1990: 56). Zevi continues his definition to include a critique of the "architecture of light" as having the potential of being independent of the illuminated architecture, of being a condition of illumination and surface decoration. A prime example of this is the early period of Spanish Renaissance architecture (1492-1556), or Plateresque that is notable for grafting Renaissance detail on to Gothic form. The *Casa de las Conchas*, Salamanca (1514) with its curious scallop shell embellished wall surfaces is typical of this period.

Light as architectural form, on the other hand, is inseparable from architecture's characteristics. Architecture is qualified as space within, "space that can be lived in, in a dynamic way." (Zevi 1990: 56) a definition supported by Van de Ven (1993: 357): "Architecture is the art of space and all architectural innovations arise from new concepts of space." Davey (2000: 4) refers to the act of enclosing space as the most basic act of civilisation and the revelation of enclosed space in light as fundamental to architecture. Louis I. Kahn (1901-1974) went so far as to declare that architectural space can only exist where it is revealed in natural light (Devillers 1992: 151). This qualification of architecture and the use of light as architectural form, present the foundation for the following analysis of the relationship between space, light and poetic intention.

3.3 LIGHT AND POETICS

In chapter 2 the term poetics with reference to architecture was defined as the wilful, conscious and demanding act of architecture. Through the analysis of historic examples and supporting theoretical discourses the defining importance of light in this act of making architecture is explored.

3.3.1 LIGHT IN THE ABSENCE CREATIVELY CONCEIVED SPACE: LIGHT IN CLASSICAL ANTIQUITY.

Zevi (1990: 58) states that when space is not creatively conceived, there is no need for light to qualify and enhance it. As example he refers to ancient Greece and the play of light on volumes and their components, columns, mouldings and cornices, an acknowledged reference to Le Corbusier's description of Greek architecture as "free and pure volumes under light" and not the light through and inside the volumes. A comparison is drawn with Roman architecture in which a similar attitude is found, but with a further qualification: Where inside space exists but is static and

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[5] The meaning implied in the use of the term "plastically" refers to both a rational (cerebral) and formal intent.

isolated and no relationship to exterior space is intended, light remains an entity in itself. De Bruyne (1993: 321) describes the atrium of the Roman *domus* as a "cut out piece of heaven from where the zenithal light came in". This enclosed "living cocoon" is enlarged by perspective interplay, while light streams in unimpeded and destined for the inhabitants alone.

This dismissal of Greek and Roman architecture with reference to light as architectural form might be contentious and singular examples indicating the contrary may be found. It is, however, supported by the absence of any reference to the importance of light in *De architectura libri decem* (33-14 BC) of Vitruvius (b 84 BC), the only major text on architecture to have survived Classical Antiquity. The only mention of openings to be found is in Book III with reference to the design of doorways in temples and this is limited to a discussion of construction and decoration. In other sections the reference to light is cursory. An example occurs in chapter III of Book VI on private houses and relates to the proportions of the principle rooms: "In the displuviate, there are beams which slope outwards, supporting both the roof and throwing the rainwater off. This style is suitable chiefly in winter residences, for the roof-opening, being high up, is not an obstruction to the light of the dining rooms." (1960: 177). The attitude to light is purely functional and has little bearing on architectural expression.

A possible foundation for the neglect of light as architectural resource might lie in the importance afforded Plato (428-347 BC) and the *Timaeus*[6] regarding contemporary and thus architectural thought during the period of Classical Antiquity. In summarising Platonic theory Van de Ven (1993: 9) draws attention to its Positivist[7] attitude and a reliance on the visible and the tangible as proof of existence. Space, along with earth, air, fire and water became a tangible constituent of the world. The physical definition of space relies on the creation of boundaries and for this reason the tangible in architecture became the overriding concern with a resultant obsession with the articulation of surface and volume – an architecture of light rather than light as architectural form.

Although an example of the "static and isolated space" referred to by Zevi, the Pantheon in Rome (AD 120-124) presents a singular confluence of architectural form and light in Classical Antiquity. The Pantheon was so called, according to Dion Cassius (AD 155), because it was both dedicated to the deities of *Gens Julio* and resembled the curved canopy of heaven (Fletcher 1956: 157). To reinforce this perception the lighting of the Pantheon was limited to that entering the space through a nine meter oculus at the apex of the dome: "This method of lighting produces the most solemn and impressive effect, and this great eye may have had a symbolic meaning, the idea

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[6] The *Timaes* presents the defense of Plato's most influential philosophical work *The Theory of Form*. Scholars disagree about its date but place it at around BC 376, corresponding to the founding of the Academy in Sicily (Vesey, G. et al, 1990:223).
[7] A doctrine which holds that the reliability of knowledge resides in sense-experience.

being that worship in this temple of all the gods should take place in a building open to the vault of heaven. It is a matter of no small surprise that from this one single source ample light should be thrown round all parts of the building"(Fletcher 1956:158). Davey's view concurs: "...as is proper in a temple to all the gods, the great ray descending from the hemispherical vault (itself a metaphor of the heavens) turns the place into a three dimensional celebration of time, the weather and the seasons" (2000: 4).

This allusion to the heavens is also apparent from Kostof's (1985: 217-8) interpretation which suggests that the deities were arranged to allow the "eye of the sun" to illuminate each, one by one during the course of the day. Reference is also made to the bronze rosettes that decorated each coffer of the dome and "shone like stars." Campo Baeza, in a somewhat lyrical allusion, describes the oculus of the Pantheon as the "most wonderful trap that human beings have ever laid out for the sun's light" (1994: 88).

De Bruyne's analysis of the illumination of the Pantheon refers to the interplay of light, darkness, volume and shadow. The technique, of accentuating the illuminated area so that it appears to be a surface cut out of an infinite light source is applied with maximum expressive force in the Pantheon (1993: 320-1). The space is integrated with the cosmos, while the interior is given a salient autonomy from the solid mass of the exterior. Kostof (1985: 217) refers to the deceptive grace of the interior in relationship to the 6m thick walls. The various gradations of light are concentrated within the single space and the interaction of space-mass and the natural effects of light expose symbolic values (fig. 3.1, see Appendix A).

From these references to light and the significance of its manifestation on the sensory experience of the space and the cognition of the metaphysical meaning it alludes to, it may be concluded that the illumination of the Pantheon presents an instance of a poetics of light in Classical antiquity. It is also a prologue to the establishment of a direct relationship between the expression of divinity, light and architectural space that informed the articulation of light as architectural form until the eighteenth century. In conclusion the illumination of the Pantheon presents two universal and timeless (Campo Baeza, 1994: 88) concerns regarding light as architectural form: Light is used to dematerialize mass and form, as a counterpoint to the effects of gravity on structure and at the same time, through the articulation of surface to receive light, light is materialised to afford it a tangible quality, associated with Platonic theory.

3.3.2 ROMANESQUE AND BYZANTINE LIGHT

The most revealing examples of the poetics of light during the Romanesque and Byzantine periods are to be found in its ecclesiastic architecture. During this period the church stood as an image of heaven as the City of God (Kostoff 1985: 331). This image was based on two biblical texts describing the City: the Book of Tobias and the Apocalypse of St. John the Divine. What distinguishes this period from subsequent and comparable analogies in church architecture is the predilection of Romanesque art to elucidate the terrible, cataclysmic events that will occur before entry to the City of God. This translates into an introverted architecture similar to that of the Pantheon where the relationship between interior space and the exterior is consciously avoided. The inner world of the City of God is cut off from the real world outside. Where this architecture departs from the Classical examples, is in the absence of exterior articulation and embellishment of surface, an indication of the shift in importance between volume in light and light as architectural form. Zevi (1990: 58) notes that it is at this moment that light becomes a protagonist of architecture.

In typical examples such as San Vitale in Ravenna (AD 527-547) the tectonic consistency is dissolved as a result of the envelope being covered by mosaics. Depth is lost and walls become flowing surfaces, creating a weightless world in which light achieves remarkable effects. This is partly achieved through the perimeter apses, which dilate the central void, drawing parts of the cavity from inside out. Light is used to counter this movement and presses in from outside. The light is caught by the mosaic surfaces and reflected in such a way that it seems as though the light emanates from inside. The walls are more radiant than the window openings (fig. 3.2).

In this architecture, where space and surface are conceived as receptacles of light, openings are small relative to surface and usually glazed with opaque and translucent materials such as thinly cut onyx. The result is a filtered and diffuse light that underplays the source in favour of reflection and the illumination of surface. According to Runciman (1975: 59) there is a direct correlation between Byzantine decoration and the subtle use of light: " The Byzantines were deeply interested in the study of geodesy, the measurement of surface and volume and of optics, *Katoptica*, the relation of seen objects with the eye. Geodesy and optics were combined to influence the decoration of curved surfaces. But this involved effects of lighting."

The Santa (Hagia) Sophia (AD 532-537, Anthemius of Tralles and Isidorus of Miletus) is a celebrated example of Romanesque-Byzantine light (fig. 3.3). It is comparable to the Pantheon in its architectural achievement but allows a greater level of understanding because the religion it was designed for still exists, and there are contemporary accounts available regarding the impression

it made on its first congregations. Although the dome is smaller than that of the Pantheon, the enclosed space is extended by the surrounding semi-domes and apses. Paulus Silentiarius (dates unknown), delivering the inaugural sermon described the dome hovering above its forty windows as seemingly suspended from heaven by a golden chain (Runciman, 1975: 56). Procopius of Caesarea, the historian, writing some twenty years later said of the space: "...the interior abounds exceedingly in sunlight and gleaming reflections. Indeed one might say that its interior is lit not by the sun from without but by radiance generated within, such is the abundance of light (Davey, 2000: 4). The impression it made on less sophisticated people was transfixing: "We knew not whether we were in heaven or on earth ... we only know that God dwells there among men...we cannot forget its beauty (The emissaries from Kiev as quoted from the Russian Primary Chronicle in Davey, 2000: 4). Davey's own description of the space refers to the deliberate organisation of the plan and integrated illumination of the space and its specific intent. An example of this was the intention of having the first rays of sunlight on Christmas Day shine down on the silver and gold iconostasis.

Runciman (1975: 59) concurs with this opinion and states that the windows of the Hagia Sophia were placed with "careful calculation", the windows around the base of the dome being especially effective and their clear glazing contrasting with the thin alabaster used elsewhere (Fig. 3.4). Ironically the Byzantine theory of light was derived from that of the leading Neoplatonist of the time Plotinus (Runciman 1975: 36-7). Obsessed with light he argued: "Beauty of colour derives from the conquest of darkness inborn in matter by the pouring in of light, the unembodied". The Byzantines held light, the first created element in supreme regard. Combined with the movement as an indication of life, space was animated through the considered manipulation of light and shadow. There is a conscious intention to make every mosaic and bas-relief shimmer with movement. This encouraged the spectator's glance to move through the space as well in a kinetic comprehension of the whole.

The importance of light as the first element, and sight as the first sense gave supremacy to pictorial art in the Byzantine period. Mosaic work overshadowed painting and fresco, as exemplified in the Hagia Sophia, because it could catch and reflect light as no other medium could (fig. 3.5). To enhance the effect and in an effort to animate the representation the tesserae were set at a slightly different angles and depths to allow light to shimmer and perceptibly move across the decorated surface (Runciman, 1975: 59, 104).

Although far removed from one another geographically and in terms of scale and grandeur, the two examples above are clearly linked regarding spatial conception and the supportive and conscious manipulation of light. Romanesque-Byzantine light deliberately dissolves interior space

through the illumination of surface, which in turn is created and decorated to receive and multiply light. Light is used to create tectonic illusion and to visually corrode structure. As in the example of the Pantheon, light becomes imbued with metaphysical meaning and acquires a divine dimension and meaning.

3.3.3 DIVINE SPACE: GOTHIC LIGHT

The influence of theological thinking on the concept of space in science and philosophy (and thus architecture), conceived during the Middle Ages (1140-1400), lasted until deep into the eighteenth century. According to Jammer (Van de Ven 1993: 21) the importance of theological arguments shaped physics and cosmological thought to the extent of assuming a direct association of God with space and place during this period. This resulted from the influence of Jewish cabalistic thought. Several Mediæval scholars draw parallels between the omnipresent God and the idea of space. As God is light both space and light were endowed with divine character.

The idea of space as the representation of light, which is the omnipresent God is a broad philosophical concept that has resulted in varied contemporary readings. There are two primary and opposing attitudes in this regard. The first is to link the spatial expression of the church directly to the scholastic or theological concepts of space at the time. The second proposes a morphological approach which claims that architectural form is autonomous and the development of the Gothic style can be understood entirely by looking at the built form without specific knowledge of scholastic theories. This attitude suggests that the mediæval master builder was foremost a craftsmen whose formal knowledge developed from an architectural and social tradition of building and the application of mathematics, and might only have been indirectly inspired by the theology of the time.

A proponent of this approach, Hans Jantzen, authors (according to Van de Ven, 1993: 21) one of the most stimulating optical analyses of the Gothic interior as a "diaphanous structure". Jantzen believes that the sensory experience of light and space is distinct from the intellectual concept of metaphysical light: "*Ecclesia materialis significant ecclesian spiritualem*[8]. This sentence epitomizes the attitude of the mediæval theologian. The cathedral architect though, did not speculate about its meaning."(1962: 169). In defense of this argument Jantzen refers to Villard de Honnecourt[9], the mediæval architect and writer, who in his notes and inscriptions referred to the church

[8] The material church signifies the spiritual church
[9] Villard de Honnecourt, a much travelled architect, was active between 1225 and 1250 and is strictly speaking the author of the only didactic manuscript of the High Middle Ages devoted to architecture (Kruft, 1994: 36-7).

as building and the art of the architect and not the significance of architectural form. What distinguishes Gothic architecture from previous attitudes though, is a new and clear symbolic conception of the Divine personality, which is linked with the aim of religious art to bring the believer all mystical truths of the faith in tangible, visible form. To this end the cathedral was the chosen theatre. The form in which Christ was represented changed from that of the Romanesque. Although there remains the divine aspect in the monumental symbolism of the church through the central position of Christ, both in composition and theme his human side emerges for the first time. In Gothic imagery the story of the Passion assumed greater importance than the image of Christ as Judge at the Last Judgement (Jantzen, 1962: 171), an aspect enforced by the use of light in the Gothic interior.

Jantzen (1962: 78) appropriated the phrase "diaphanous structure" with reference to the "dematerialized" quality of the nave wall and the manner in which it is placed in a transparent spatial setting, made possible through the invention of the flying buttress. This alone does not determine the particular quality of the cathedral interior. For this a further element of decisive importance must be considered: Gothic light (Jantzen 1962: 67).

The window openings of mediæval churches are largely (mis)judged by the amount of light they transmit. This overlooks the real significance of the church interior, which is concerned with light as spiritual power, capable of exerting an influence equal to architectural form. In contrast to the gloom of the vaulted Romanesque church interiors prior to the thirteenth century, and the brightly lit Renaissance interiors, the luminous Gothic interiors were "flooded" with coloured light. Jantzen in his analysis of Gothic light (1962: 68) argues against a reference to St Augustine's metaphysics of light, despite its importance to mediæval theology. His reasoning is that metaphysical light does not belong to the realm of the senses, but the mind, and that Gothic light is foremost sensual. The speculative conception of the idea of light refers to both a visual and intellectual reality, contained within the single term: "light".

In mediæval painting shade and shadow were omitted, raising visual light to a super-sensual state, a bridging of light of the senses and light of the mind. In mediæval thought, because of its theological basis, the view of a work of art as such, as art for art's sake and pictorially representational, is rejected. Art is only important as conveyor of the Evangelical message. This attitude applies equally to the light of the Gothic interior, which is both sensual and super-sensual. This, in part, indicates the precedence Gothic light takes over Gothic statuary. Platonic anti-sensualism was an influential factor in the Middle Ages, where the body was conceived as a source of sin. The Cisterian theologian Bernard of Clairveaux (dates unknown) considered sculptural represen-

tation as dangerous and distracting from theological contemplation (Jarzombek, undated: 37). The ethereal, non-representational quality of light became an acceptable substitute.

The particular character of light in mediæval places of worship was directly related to architectural form (Jantzen 1962: 69). Few examples of Gothic light in its original form remain, one exception being the cathedral of Chartres (1194-1260), allowing for a more accurate contemporary reading. What is apparent firstly is that Gothic light is not a natural light and that this "unnaturalness", when experienced in conjunction with the power of the architectural form, becomes a "supernatural" light (fig. 3.6):

> "The gothic interior is bathed in a dark, reddish violet light, which has a mysterious quality difficult to describe, and which, in particular, does not come from a single source, seeming to fluctuate in its brightness according to the weather of the natural world outside, now swelling, now receding, now filling the twilit colours with unimaginable incandescence. That this is no transparent light, but that the windows themselves are its source has been stressed by Wolfgang Shone, who describes the light of the windows as combining an artificial light of their own developed to the highest possible intensity with colour developed to the highest possible intensity – darkness, brilliance and depth" (Jantzen 1962:69).

In certain respects this light takes the place of architecture. The colours dissolve the tectonic lines of the architectural framework until it merges into a solid physical structure in which architecture and coloured light make the containing sides of the nave into a luminous wall. The coloured light acts as an essential element in the containment of space and an architectural expression of the illusion of complete escape from the everyday environment and material reality: "Gothic interiors are illuminated by sunlight transformed through stained glass into a myriad of mysterious prismatic colours. The interior masses and voids become activated and etherealised by the directional flow of light, and material and immaterial elements fuse into a flowing harmonious whole" (Fleming, 1985: 154).

The importance of light in the Gothic interior is not limited to its real and sensory nature but is extended through its confronting the viewer with rich pictorial imagery, its "silent power exercising enormous influence over mankind" (Jantzen, 1962: 70). Even more than Gothic statuary, the figures in the stained glass bring the feeling of transcendence into direct experience as immaterial creatures of light, set like "magically glowing symbols in the frontiers of space" (Jantzen 1962: 157). The allegorical influence of the stained glass exceeds that of the sculptures of the Gothic churches, which in comparison is confined, while the light from the windows effect every part of the space (fig. 3.7).

Conflicting arguments exist with reference to the question as to whether an overall iconographical programme was followed in the design and location of the windows and their relationship to the

space. Jantzen (1962:161) believes that an overall plan for the glass existed within the architectural scheme for the interior. As example the intentional scale and detail difference between figures used in the clerestory fenestration and that of the aisles is cited, a result of the practical problem of viewing distance. The composition of "iconographical unities" within the window design provides further proof of intent.

Grillo (1960: 139) identifies a confluence of both the mundane, i.e. reasons of orientation, and the symbolism in the scale, design and colour in the composition of the Chartres windows in support of an intentional plan:

> "more light in a building does not necessarily mean progress. Only the quality of light matters... On the north side, the window, in light diffusing blue tones, has a surface of almost twice as large as the west side rose, which is in dark red, light constricting hues. The west wall window is set instead of being cut by large openings, offers more blind surface than any other in the [Chartres] cathedral. At the hour of sunset, the small window gloriously lights up like a pure ruby set on a drape of pure velvet. The west façade is also the main entrance, always associated with the symbolism of the Last Judgment which precedes the access to heaven. It reminds one of the Narrow Gate of the scriptures, designed as a lock of darkness to prepare and enhance the mystic vision of heavenly light that follows as one enters the cathedral."

Fleming (1986: 154) supports this proposition, referring to the west-east gradation of light as a "gradual crescendo" starting from the blue and violet of the west rose through the brighter tones of the reds defining the nave to the red and orange lancets illuminating the altar.

In the same vein the Abbot Suger[10] in his essay on the importance of light does not relate this to the expression of architectural form but only to the material quality of the illuminated surface. He relates light primarily to the preciousness of gold, stone and glass, which is to matter. Light to Suger meant primarily brightness which had to impress, a metaphorical interpretation of the City of God as mentioned previously. Little reference is made to the spatial quality evoked by this new kind of luminosity. However this does not imply that the relationship between Gothic light and architectural form was not intentional or apparent at the time, as illustrated in the C13 theory of light contained in Witelo's *Perspectiva* (AD 1270). Witelo, contrary to Suger, stresses the autonomy of architectural appreciation from theological thinking and concentrates on the sensual perception of form as the basis of visual beauty. Witelo defines the purely atmospheric qualities of *diaphanitas, densitas, obscuritas* and *umbria*[11] as the spatial-visual effects associated with the Gothic interior and its expression through light (Van de Ven, 1978: 24).

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[10] Abbot Suger (1081-1151) of St Denis (1130-1150), the Gothic prototype, embodies a singular occasion in the Middle ages when theological ideas and architecture are unified. In 1151 he published a book on the building and decoration of the church.

[11] Transparency, density, obscurity and shadow.

In summary, both schools of thought, in defense of or against a theologically informed reading of light and the Gothic interior, recognise the importance of light in the poetics of mediæval spatial expression, the difference being in the allegorical or symbolic value and meaning attached to it. A defined, considered rationale is implicated in this process and the intrinsic role of light in Gothic space making is indisputable.

3.3.4 THE RENAISSANCE AND RATIONAL LIGHT.

The soberness of Renaissance light, compared to mystical Gothic or illusive Baroque light has inspired little in terms of architectural writing. Cursory reference is made to its rational quality but its meaning is ignored. To come to an understanding of Renaissance light it is necessary to understand the principles of Renaissance theory. To this end a brief interpretation thereof and its bearing on the poetics of light is presented.

Van de Ven (1978: 9) draws attention to the resurgent importance of Plato's *Timaeus* in the formation of Western architectural theory during the Renaissance. Plato's proportional systems of the cosmos were translated into doctrines defining the proportions of buildings. Reference was previously made to Plato's prerequisite of tangibility and visibility in defining reality:

> "Now anything that has come to be must be corporeal, visible and tangible: but nothing can be visible without fire nor tangible without solidity and nothing can be solid without earth. So when God began to put together the body of the universe, he made it of fire and earth... so God placed water and air between fire and earth and made them so far as possible proportional to one another so air is to water as water is to earth and in this way He bound the world into a visible and tangible whole" (Plato in Van de Ven, 1978: 9).

The Renaissance architect saw architecture as the plastic embodiment of these universal proportions and attempted to transform the spatial cells of the interiors into similar mathematical systems.

Illumination became the vehicle through which these systems could be exposed and at the same time the immateriality of light could be concretised. Renaissance light was "transparent" in contrast to the "artificial" quality of Gothic light. Natural white light projects natural shades in various gradations of grey. The visual perception of physical form is made possible through these gradual variations in lightness and darkness. Renaissance material theorists like Leonardo da Vinci (1452-1519), in dealing with perception of form, viewed light as a scientific tool through which reality could be revealed (Van de Ven 1978: 26). To this end white translucent glazing was preferred. As opposed to the Gothic church, the Renaissance temple is filled with "natural" light (De Bruyne 1993: 321). Light sources are spread out regularly and with precise speculative intention. All architectural elements are illuminated with equal intensity. The space as a whole prevails, as

opposed to separate accentuation (fig. 3.8). This articulation of space and light without variation or hierarchy corresponds to the intellectual Renaissance movement of Humanism[11] and the promotion of equality, liberty and tolerance.

That proportion and regulation informed all aspects of Renaissance design is indisputable. Evans (1995: 248-9) draws attention to the perceived dichotomy in the Renaissance attitude where the preoccupation with classical proportion exists and concurrent to this the invention of perspective which distorts that proportion. The possibility of various proportional analyses of Renaissance buildings as those of Wolfflin's (1889) and Wittkower's (1949) of Alberti's Santa Maria Novella in Florence is another anomaly. Evans points to the fact that in practice, Renaissance artists were not trying to show proportion but to bury it in imitation of nature, where the perception of regulation exists without visual certainty. This brings into question whether lines and figures are remarked in objects because of the prejudiced attention the observer gives them or whether they are pre-existing. "Vision may be achieved through the intro-mission of light rays but certain kinds of visual understanding are achieved through intellectual extra-mission. This might explain why we still imagine vision as a projection from the eyes, although for centuries we have known it is the other way around" (Evans 1995: 250). This concept of dialogue between observer and object or in theoretical terms subject and object, has its philosophical roots in the classical theory of mimetics, based on Aristotle's (BC 384-322) theorem[12]. Wölfflin writes:" We animate the things around us. It's an ancient force of mankind" (Jarzombek, 1994: 31). Relying on this premise it may be argued that Renaissance illumination can be interpreted on a rational and physical level as an effort, through diffusion and reflection, to allude to and capture the "naturalness" of light, exposing the "naturalized" order buried in the spatial design. At the same time, as inevitable part of subjective perception, meaning is attributed to physical light, as a representation of metaphysical "light" that illuminates understanding.

In the ten books of *De re aedificatoria* (1450-72), Leoni Batista Alberti (1404-1472) [13] dedicates chapter XII of book 1 to the design of apertures. In his reference both the rational and the sensory qualities of Renaissance light are apparent:

> "Lastly from whatever side we take in the Light, we ought to make such an Opening for it, as may always give us a free Sight of Sky, and the top of that Opening ought never be too low, because we see light with our Eyes; not with our Heels;

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[11] Humanism originated in C14 Italy in reaction to the God-centred worldview of the Middle Ages. It allowed a revaluation of humankind and promoted those attitudes that brought into question existing authorities and initiated the scientific revolution of the C16.

[12] Aristotle, in questioning Platonic anti-sensualism, proposes that mankind learns through an innate mimetic compulsion that is an essential component of our ethical development.

[13] Alberti is considered to be the key author of theoretical works during the first half of fifteenth century (Kruft, 1994: 41).

> besides the inconvenience, that if man gets between nother and the Window, the Light is intercepted and all the rest of the room is darkn'd" (Alberti, 1965: 17).

He continues to advise against the use of round windows, the exception being "certain temples" and referring to Varro: "thus they preferred to give a round temple to the Sun and to that of father Bacchus: Jupiter, because he is at the origin of all things, requires a temple with a pierced roof" (Alberti, 1965: 137). This implies an ordinal perception of light - zenithal light, imbued with divine quality, being superior.

Teyssot (1990: 59) summarises the essence of Renaissance light: "Beyond the mythological references, light was soon explored in terms of vision and geometric representation, as though to illustrate the inseparability of an agent outside the eye (*lumen*), its psychic representation (*lux*), and the act of seeing.

3.3.5 BAROQUE: LIGHT AND ILLUSION.

Architectural theory during the Baroque period is essentially about dualisms. In abandoning the Greek organic analogy, resurrected during the Renaissance, for the new mechanistic one, theorists had to struggle with the more extreme fissures between mind and world, reason and sense, determinism and freedom and internal and external sources of form (Gelernter, 1995: 121). The premise is that the expression of light during the Baroque is an interpretation and fusion of these extremes. The intrigue in which the whole concept of light (in both a physical and metaphysical sense) was held in almost every sphere of intellectual life is one of the distinguishing features of the age. Painters as diverse as Michelangelo Merisi da Caravaggio (1573-1610) and Rembrandt van Rijn (1606-1669) to Jan Vermeer van Delft (1632-1675), and Nicolas Poussin (1594-1665) or Claude Lorrain (1600-1682), found the symbolism of light a consistent source of inspiration, and relied on light effects to animate their subject matter. This fascination with light extended to architectural space and the expression of a representative poetics of light extending from the emotive to the scientific.

The theatrical illusion generated by light in architecture as a visible manifestation of the supernatural often rivalled even that of the churches of the Middle Ages. In the Protestant north the imagination was inspired by clear, white light representing truth.

In literature the blind poet Milton's pursuit of a celestial light to compensate for his disability stood as a beacon for later generations of English poets, who drew further inspiration from the discoveries of scientists like Newton in the field of optics (Nicholson in Louw, 1994: 301).

In politics the imagery of the sun as the primary source of light on earth was adapted to fit the doctrine of Divine Hereditary Right, culminating in Louis XIV's (1643-1715) appropriation of the title 'Sun King'.

Light remained a favourite theme for seventeenth century religious writers and philosophers alike, and from that unique blend of spiritual and material enquiry of the era was born the new science of optics, i.e. the systematic study of the physical properties of light, in which most of the leading scientists of the day participated.

The middle decades of the seventeenth century presents the rational side of Baroque, emphasising the exclusive validity of rule and logic and the application of fixed precepts. Towards the end of the century architectural theory paralleled the contemporary shift in epistemology from Rationalism to Empiricism, and emphasised the priority of sensory appearance. Eventually it would become a celebration of the subjective and the idiosyncratic (Gelemter, 1995: 141). It is this period that defines the specificity of Baroque light.

As a powerful propaganda tool of the Counter Reformation, a Roman Catholic Church building provides an overtly expressive incidence of the poetics of light. What distinguishes Baroque from previous eras is a preoccupation with indirect light and the conscious effort to underplay the source. The intention is that of the Gothic, to imbue light with a divine quality but instead of making light seem artificial by colouration, it acquires a mystical dimension, as if generated within space (fig. 3.9). The passage of light is woven into the architectural concept to become an illusive and symbolic element (De Bruyne, 1993: 321).

In the Church of San Lorenzo (1667) in Turin by Guarino Guarini (1624-1683) the play of light emphasises the boldness of the dome construction and creates illusionary effects (fig. 3.10). The upper-part of the building becomes a "vision of light". As with the Romanesque church and opposed to the Gothic cathedral, reflected surface illumination takes precedence over light source, the latter intentionally obscured from view. The perforation and the concealed light source seem to detach the lantern from the dome. Zevi (1990:58) refers to the Baroque as a celebration of light. His interpretation of the illumination of spaces designed by both Guarini and Francesco Boromini (1599-1667) claims an unprecedented approach. According to Zevi light is not directed onto walls or objects but into architectural space which makes space the source and protagonist of the whole. The dematerialization of matter (architecture), the mystification of light, the fusion of reality and illusion are hallmarks of Baroque light (fig. 3.11).

A distinguishing feature of the period is the illusionary fusion of art - sculpture and painting - and architecture, and the appropriation of light as agent in this process. An example in this regard is the *Transparente* (1732) in the Toledo Cathedral by Narciso Tomé (fig. 3.12), but it is in the work of Gianlorenzo Bernini (1598-1680) that the extent of Baroque light may be best explored. Campo Baeza (1994: 88) refers to Bernini as the "light magician among all those".

In comparison to his contemporaries, Bernini did not solely rely on the sensuous, but valued a scientific approach to lighting design. To this end he devised his own tables for measuring light[14]. He knew light could be quantified and classified as all matter that is evaluated, and may be scientifically controlled. Bernini's approach was so specific that it was referred to as *Luce alla Bernini* (Campo Baeza, 1994: 89). Using various sources of light he first created a homogeneous environment with diffused light. Exploiting the shadow-less north light he illuminated the space to centre it geometrically. The even illumination would be broken by a defined beam of solid light, *Luce gettata,* animating the space (fig. 3.13). The contrast and counterpoint between both types of light resulted in a dynamic architectonic statement: "Solid light in visible movement dancing over an invisible diffused light in calm stillness" Campo Baeza, 1994: 89).

3.3.6 ENLIGHTENMENT AND THE LIGHT OF REASON

Bernini's approach to the poetics of light represents the opposites of the dualism of the time, referring to both the scientific and the emotive. The rational approach concerning light, associated with the scientific and positivist ideals of Enlightenment, finds expression in the secular architecture of the period. Louw (1994: 300-1) refers to the sash window as the "habinger of an age of progress and enlightenment."

What made the sash-window important is the significance that had come to be attached to light. During the seventeenth century there was a growing conception, amongst the people of northern Europe, of the emergence of a new, progressive age of light and reason. The increasing amount of daylight available inside buildings, the result of a sustained period of evolution of flat glass making and carpentry technology, revolutionised the attitude concerning interior design. The development was mostly confined to secular building. Well and uniformly illuminated spaces, extensively decorated with mirrors and painted stucco and wood ornamentation, became the aesthetic norm (fig. 3.14). The contrast with the architecture of preceding times came to symbolise the su-

[14] According to Campo Baeza (1994:90), Bernini's valued manuscript was lost during his visit to Paris in 1665, to be found, in part, in a second hand bookshop by Le Corbusier and contributing to his mastery of light.

periority of an era of light and knowledge over previous centuries which were considered to be times representing darkness and ignorance.

It is important to note that this attitude corresponds to that of the early twentieth century establishing a link between these periods and allows the second half of the eighteenth century to be seen as the advent of the period of the Modern. It is especially in the visionary illustrations of luminous (*la lumiére mysterieuse*) ever extending spaces of Etienne-Louis Boulleé (1728-1799), that the first intonation of the spatial expressions of the Modern may be found. Boulleé was intrigued by the sensory experience of form revealed in light and in his conceptual architecture it was possible to depict architectural space as dissolved by light into an endless perspective in a way glass architecture would make possible in the twentieth century (fig. 3.15).

3.4 SUMMARY

3.4.1 Light as architectural form is defined as the poetics of light in the illumination of interior architectural space.

3.4.2 The poetics of light is allied to that of architectural space. Light is essential in exposing architectural space to observation. Principles particular to an architectural period inform attitudes toward the use of light similar to the manner in which it guides the conceptualisation of architectural space and form within that period. Light amplifies these spatial intentions and may be regarded as an artefact equally representative of an architectural paradigm.

3.4.3 Light as architectural form can be encoded with meaning beyond physical reality. Light is used in architecture as a vehicle for expressing abstract concepts such as divinity and enlightenment. Light can represent metaphorical and allegorical narratives.

3.4.4 There is an apparent correlation between light in architecture and light in representational art.

3.4.5 A recurring theme in the poetics of light is the manipulation of illumination to dematerialise the physical form of architecture while architectural surface is articulated to receive and reflect light in a manner that materialises light.

CHAPTER 4

THE IDEA *MODERN* IN ARCHITECTURE

SUBPROBLEM 3

The clarification of the concept *Modern* with reference to a period in architecture.

HYPOTHESIS 3

A *Modern* period in architecture can be defined.

4.1 INTRODUCTION

The purpose of this chapter is to explore the ideas surrounding and informing the concept of *Modern* in architecture. Tracing the origin and use of the term, it is argued that *Modern* not only refers to that which is contemporary, but, in reference to architecture, indicates a distinctive period in which the ideals of architects differed radically from what they were before. This period can be defined in terms of a paradigm.

4.2 AN INTERPRETATION OF THE TERM PARADIGM

Fisher (1989: 31) defines the term *paradigm* as follows:

> "... a paradigm is the set of shared schemata which form the basis of the assumptions by which the phenomenological world is encountered." Tracing its origin to the Greek term *paradeigma,* meaning model, he argues a derived abstract and metaphorical contemporary usage, meaning *exemplar*: "The metaphorical usage suggests that the mind encodes experience into cohesive models in order that similar situations can be comprehended".

Kuhn (1970) used the term to designate the shared intellectual environment determining man's endeavour. In his particular instance, this endeavour refers to the context of science. Fisher (1989: 10) expands this application to include artistic endeavour:

> "Science is but one of man's activities and all man's common activities are directed by the shared schemata or paradigm. Hence not only science, but all man's communal undertakings are directed by the prevailing paradigm.
>
> Man encodes his artefacts with the ideas generated within the prevailing paradigm. His art reflects such patterns of encoding and this constitutes the "style" of the artefact. The prevailing paradigm therefore not only directs the scientific pursuit, but also the artistic endeavour. The style of artistic expression is thus a reflection of the prevailing paradigm."

Laszlo, (1973: 227-9) describes *style* in art as the "functional analogue" of a paradigm in science. Much as the loss of validity in scientific hypotheses can lead to a paradigm change, stylistic change is initiated, when formally adequate aesthetic constructs lose their validity in the face of new patterns of experience supervening old ones.

It can therefore be argued that architecture and architectural style too follow paradigmatic constructs and is susceptible to paradigmatic change. Much as the discontinuities in man's scientific endeavour indicate a change in paradigm, do the discontinuities in the style of artistic endeavour reflect the same and synchronous changes. Rowe (1994: 11) cites the example of the legacy of Romanticism as stirring the architect's awareness of his/her art's connection to and dependence on the state of the community:

> "However, thanks to the whole heritage of Romanticism, by 1900 the architect could stipulate an intrinsic connection between the form of his buildings and the condition of society. Thus he became able to attribute what he had previously supposed to be his own deficiency to a cultural flaw; and, conversely, he could also imagine that the emergence of an authentic architecture would be dependent upon an unspecified cultural renewal."

It is on the premise that the *Modern* in architecture belongs to a identifiable paradigm that the following discussion is based.

4.3 THE ORIGIN OF THE TERM *MODERN*

Habernas (in Foster, 1985: 3-4) explores the origin of the term as follows:

> "The word 'modern' in its first Latin form 'modernus' was used for the first time in the late 5th century AD in order to distinguish the present, which had become officially Christian, from the Roman pagan past. With varying content, the term 'modern' again and again expresses the consciousness of an epoch that relates itself to the past antiquity, in order to view itself as the result of a transition from the old to the new.
>
> Some writers restrict this concept of 'modernity' to the Renaissance, but this is historically too narrow. People considered themselves modern during the period of Charles the Great in the 12th Century (sic), as well as in France of the late 17th Century at the time of the famous "Querrel des Anciens et des Modernes". That is to say, the term 'modern appeared and reappeared exactly during those periods in Europe when consciousness of a new epoch formed itself through a renewed relationship to the ancients – whenever, moreover, antiquity was considered a model to be recovered through some kind of imitation.
>
> The spell which the classics of the ancient world cast upon the spirit of later times was first dissolved with the ideals of the French Enlightenment. Specifically, the idea of being 'modern' by looking back to the ancients changed with the belief, inspired by modern science, in the infinite progress of knowledge and in the infinite advance towards social and moral betterment."

Williams (1983:208-9) undertakes the following discussion:

> "Modern came into English from moderne, (F), modernus, (L), From Modo, (L) – just now. Its earliest English senses were nearer our contemporary, in the sense of something existing now, just now. (Contemporary, or the equivalent – till the mid19th century – co-temporary, was mainly used, as it is still often used, to mean 'of the same period', including periods in the past, rather than 'of our own immediate time'.) a conventional contrast between ancient and modern was established before the Renaissance; a middle or MEDIEVAL period began to be defined from the 15th century. Modern in this comparative and historical sense was common from 16th century. Modernism, modernist and modernity followed, in the 17th century and the 18th century: The majority of pre-19th century uses were unfavourable, when the context was comparative. Modernise, from the18th century, had initial special reference to buildings (Walpole, 1748: "the rest of the house is all modernised"); spelling (Fielding, 1752: " I have taken the liberty to modernise the language"); and fashions in dress and behaviour (Richardson, 1753: "He scruples not to modernise a little"). We can see from these examples that there was still a clear sense of a kind of alteration that needed to be justified.
>
> The unfavourable sense of modern and its associates has persisted, but through 19th century and very markedly in 20th century there was a strong movement the other way, until modern became virtually equivalent to improved or satisfactory or efficient. Modernism and modernist have become more specialised, to particular tendencies, notably to the experimental art and writing of c. 1890 – c. 1940, which allows a subsequent distinction between the modernist and the (newly) modern. Modernise, which had become general by mid19th century (cf. Thackeray (1860): "gunpowder and printing tended to modernise the world), and modernisation (which in 18th century had been used mainly of buildings and spelling) have become increasingly common in 20th century argument. In relation to institutions or industry they are normally used to indicate something unquestionably favourable or desirable. As catchwords of particular types of change the term needs scrutiny. It is often possible to distinguish modernising and modernisation from modern, if only because (as in many such actual programs) the former terms imply some local alteration or improvement of what is still, basically, an old institution or system. Thus a modernised democracy would not necessarily be the same as a modern democracy."

It is the Enlightenment view of *Modern*: "a belief in the infinite progress of knowledge and the infinite advance towards social and moral betterment", which provides the most suitable definition of the term. As such, it indicates not only the contemporaneous period, but describes a period that is characteristically distinct from others: "The *Modern* period is the most recent period where there exists a discernible continuity of endeavour, a common cultural pattern and system of belief, in short a shared paradigm" (Fisher, 1989: 27).

4.4 THE MODERN PARADIGM

A paradigm has previously been explained as a common transient intellectual directive which informs and guides the whole of communal endeavour, and following a crisis period, can undergo change towards the formulation of a new paradigm. In defining a specific paradigm, it is therefore necessary to identify the character of an intellectual environment, which is only viable after the

fact. The identification of such a shared intellectual directive, as manifested in the artefacts of a specific period, indicates the identification of that particular paradigm.

The *Post Modern* is indicative of a paradigm change; it is therefore possible to distinguish the character of the *Modern* period and its paradigm.

The previously argued definition of *Modern* is Newtonian in character. It follows that if the character of Newtonian directives can be formulated, it will serve as the articulation of the Modern paradigm.

The Newtonian paradigm might best be explained in the context of a mechanistic world view, based on the quantification and rationalisation of natural phenomena: "Descartes had provided the basis and, hence, indicated the forthcoming triumph of rationality; he had forever emancipated humanity from the confines of theological sophistication, while, in addition to this, Newton had disclosed the spectacle of Divine Creation (or physical construct) grander and more solemn, more regular and more mechanical than any which had previously been available for inspection" (Rowe, 1994: 75).

Isaac Newton's (1642-1727) "Philosophiae Naturalis Principia Mathematica", published in 1687, reduced for the first time in human existence all observable phenomena of motion to one abstract formula. The appeal of translating complex phenomena to essentially simple formulae proved powerful enough to become the critical theme of the next two and a half centuries. (Rowe, 1994: 75) Newton's mechanical notion of the universe was transplanted, as a miniature of his vision of the heavens, to society, the rational society of the future.

In an attempt to build a complete natural science, René Descartes (1596-1650) extended his mechanistic view of matter to living organisms. Plants and animals were considered mere machines; human beings only distinguished from the animal machine by being inhabited by a rational soul (Capra, 1983: 46). Popular philosophy of the time, for example, Julien Offroy de la Mettrie's *L'Homme machine* (1752) entrenched the idea of man/society as a machine. (Rowe, 1995: 75). By the second half of the eighteenth century, the Age of Enlightenment, the world was being increasingly directed by what Rowe (1995: 105) refers to as the myth of *Social Newtonism*, the idea that the universe was a piece of clockwork, and that a logical society must follow this divine prescription. Both Descartes and Newton acknowledged the role and existence of a Divine Creator, finally deposed at the culmination of the Age of Reason, the French Revolution, when Robespierre symbolically enthroned the Goddess of Reason in God's vacant chair (Koestler, 1967: 256).

This act indicates the drastic change in the image of nature from organism to machine. This mechanical view of nature became the dominant paradigm of science, guiding all scientific observation and the formulation of all theories of natural phenomena. The mediæval idea of the earth as a living organism and nurturing mother, and the notion of an organic, living and spiritual universe was replaced by the *world-machine* as dominant metaphor. The mechanisation of science removed the existing cultural constraints of the *universe as organism* view. The Cartesian/ Newtonian view of the world as a mechanical system, sanctioned the manipulation and exploitation of nature, now typical of Western culture (Capra, 1983: 46).

The elaboration of mechanistic science from the seventeenth to the nineteenth century, including Newton's great synthesis, was only the development of the Cartesian idea. What makes Newton the keystone to this development is that his *Principia* introduced the successful integration of previously opposing trends in science; the empirical, inductive method presented by Francis Bacon (1561-1626) and the rational, deductive method proposed by Descartes (Capra, 1983: 50).

The eighteenth and nineteenth centuries used Newtonian mechanics with tremendous success. The Newtonian theory of the universe and the belief in the rational approach to human problems became the cornerstone of the Age of Enlightenment. Newtonian mechanics were transplanted to the newly created social sciences where its principles were applied to the study of human nature and human society. The dominant figure, greatly influencing eighteenth century thought, was the philosopher John Lock (1632-1704). Lock developed an atomistic view of society, describing it in terms of the human being as its basic building block, while describing the human mind in terms of his well known metaphor of the *tabula rasa* on which knowledge is imprinted through sensory experience. He advocated equality at birth, concluding that all development was entirely dependent on the specifics of the environment.

4.5 THE PRINCIPLES OF NEWTONIAN SCIENCE

Koestler (1967: 1) provides a conclusive summary of the doctrines upholding the Modern paradigm, in what he refers to as two of the principle doctrines upholding the orthodoxy of science:

> "that all organisms, including man, are essentially passive automata controlled by the environment, whose sole purpose in life is the reduction of tensions by adaptive responses";

and:

> "that the only scientific method worth the name is quantitative measurement; and, consequently, that complex phenomena must be reduced to simple elements accessible to such treatment".

From this we can expand the postulates of science to be:

Determinism: Events have causes determined by other circumstances;
Empiricism: Certain kinds of reliable knowledge can only originate in experience, and thus the tenability of a theory or hypothesis depends on the nature of empirical evidence in its support;
Parsimony: Phenomena should be explained in the most economical way;
Generality: The scientist observes the particular, but sets out to generalise his findings to the world at large (Cohen and Manion, 1984: 15-6).

If we accept these to be the basic principles of science within a Newtonian world view it follows that these are the principles of the Newtonian paradigm, which we conclude to be the paradigm of the *Modern* period, and as such would apply, as previously argued to the whole of the Modern community's endeavour, including architecture.

4.6 THE *MODERN* IN ARCHITECTURE

If the Modern in architecture relates to the Newtonian paradigm, as is argued, it follows that the principles of *Modern* architecture (not to be confused with Modernism) too originated in the mid-eighteenth century, as Collins (1965: 15) suggests:

> "...it can hardly be disputed that radical changes took place in the middle of the eighteenth century which so profoundly altered subsequent theories of architecture as to make the ideals of architects differ henceforth quite markedly from what they were before.
>
> From 1750 onwards, architects were motivated by a number of notions which had previously played little or no part in the formation of their ideal, and these notions did not simply succeed one another in an evolutionary sequence; they were to recur continually, in various combinations and with various expressions, during the whole of the following two centuries. The fondness of late eighteenth century architects for historical allusions, for analogical justifications, for asymmetrical landscaping, for brutal detailing, for oriental prototypes, and for pictorial techniques does not simply cut them off from the tradition of earlier centuries; it relates them intimately to the architects of today, and it is this which gives unity to the period 1750 – 1950, and allows us to treat it as a single architectural age".

Marc Antoine Laugier's (1713-1769) *Essai sur l'Architecture*, first published in 1753, allows as a document contemporary to the genesis of this architectural age, important insights to its guiding principles. His treatise advocates an architecture of reason, founded on Newtonian principle, and rejects the excesses of the Baroque:

> "It seems to me that in those arts which are not purely mechanical it is not sufficient to know how to work: it is above all important to learn to think. An artist should be able to explain to himself everything he does, and for this he needs firm principles to determine his judgements and justify his choice so that he can tell whether a thing is good or bad, not simply by instinct but by reasoning and as a man experienced in the way of beauty" (1971 [1753]: 1).

The same ideas of a rational and functional architecture are found in Jacques-François Blondel's (1705-1774) *Cours d'architecture* (1752) An essentially practical set of books it stressed the idea of convenience, the correct relationships of the numerous parts of a building which thereby would permit the occupants to pursue their activities in the most economical way. Those things which enhance everyday living are stressed, such as good orientation, exploitation of views, and proper drainage. Blondel attached great importance to *convenance* (fitness / suitability) as an aesthetic guide. The composition of forms and their decoration were to be related to function: "An edifice must at first glance announce what it is" (Blondel in De Zurko, 1957: 155).

Adhering less to the strict rationalism of Laugier, the more emotionally spirited writings of Claude-Nicolas Ledoux (1736-1806), a product of the Revolution, nonetheless continue the advocacy of a rationalist functionalism. His treatise, only published in 1804, embodied utilitarian principles and social ideals. Ledoux admired machines and engineering, seeing in them lessons for the architect: "Puisse surtout l'architecte se pénétrer du besoin de connaître les lois et les ressources de la mécanique et ne pas dédaigner les principes d'un art qui peut le servir aussi utilement. N'est-ce pas au mécanicien que nous devons ces machines animées, ces ponts suspendus... ces écluses... ces dômes qui semblent menacer le ciel?"[15]

4.7 RATIONALISM AS THE BASIS OF MODERN ARCHITECTURE

Architecture based on reasoned principles places it within the Rationalist School of thought. César Daly (dates unknown) was of the opinion that the self-imposed task of the Rationalist School, was to reconcile modern architecture with modern science and technology (Collins, 1965: 198). His definition of Rationalism, as paraphrased by Collins: "was the belief that architecture was ornamental or ornamented construction, but more specifically the belief that architectural forms required rational justification, but could only be so justified if they derived their laws from science".

This definition clearly belongs to the Newtonian paradigm, or as Greene (1976: 177-84) refers to the tradition of Modern European thought, as the "Cartesian tradition":

> "The Cartesian separation of essential attributes has come to foster the visual neutrality favoured by many modern designers. Since emotional experience is derived from the private world of sensation, it is subjective. It cannot meet the requirement of being measured in a perfectly definite manner. Intrusions into design that seem emotional, spontaneous, or incongruous do not meet the Carte-

[15] "Then, above all the architect must impress himself with the need for understanding the laws and resources of mechanics and not disdain the principles of an art which serves little purpose beyond utility. Is it not to the mechanician that we owe machines, suspended bridges... dams... and the domes which seem to menace the sky?" (De Zurko, 1957: 165).

> sian requirements of rational thought; the same could be said of any experiential metaphor or any subjective projection of an emotion. But machines are considered products of rational forces, and designers have begun to feel secure in using forms based on their appearance and on models of their functions...
>
> The rational mind believes that it can construct functional models based on the operational and the instrumental and that it can coordinate them with the requirements of physical structure and the "engineering" of social behaviour. These beliefs have been transformed into design goals by the rationalist progressives. The visual forms that express these aims are thought to be universals, free of subjectivity".

Rowe (1994: 16) confirms this viewpoint in his critical definition of modern architecture:

> "However a definition of modern architecture simply in terms of Physique and visuals, possible though it might be, must be totally unacceptable – and for this simple reason: that modern architecture professed to despise mere physique and mere appearance. Classic, heroic, good 'old-fashioned' modern architecture rejected any obvious notions of visual seduction (the pride of the eye), and, instead, insisted on an appraisal in terms of its advertised ethical integrity. Modern architecture, it was persistently declared, was not a matter of externals. By themselves externals were illusion and deceit, and modern architecture it was believed, embodied a vital, inner impulse, an obligation to disclose and to reveal, without varnish and camouflage, the essentials and the fundamentals of the problem – and the social problem – to be solved."

4.8 CONCEPTS OF MODERN ARCHITECTURE

Referring to the Newtonian paradigm the essential concepts of Modern architecture can be summarised as:

4.8.1 Space: The conceptualisation of space as the dimension of architectural reality. This explains the Modern Movement abhorrence of decoration as interference in the direct experience of the surface of interaction between solid and void and interior and exterior. The formulation of the entity of architectural space is attributed to the German art historian August Schmarzow (Colquhoun, 1985: 105). Although all Schmarzow did was to categorise something that had always existed, it changed methods of interpreting architecture radically. Paradoxically the conceptualisation of space included the fusion of exterior and interior brought about by glass architecture.

4.8.2 Time: Although Modern architectural thought distanced itself from historicism it advocated a return to primary principles[16], an indication of awareness of historical time and the verification thereof. The awareness of time was not limited to an identification of evo-

[16] Laugier's primitive hut (1753) and Le Corbusier's Dom-ino frame (1914) are the two extreme examples of primary architectural form returning to its supposed origin.

lutionary and stylistic progression in architecture, but also referred to the spatial experience of time, allied to Einstein's (1879-1955) theory of relativity (1905-1916) and analytical Cubism (1907). The concept of space-time creates a fourth dimension for architecture, exemplified in Le Corbusier's *Promenade Architecturale*[18] and establishes movement as a precondition to spatial comprehension. Identifying the concept of *dürchdringung* or interpenetration as the basis of space-time Giedion (1947: 416) argues that Modern architecture, by example of the villa Savoie (1929), cannot be comprehended through a fixed view. It is only through the "almost insensible" movement through space that the complexity of spatial layering can be understood. He (1947:364) identifies the mathematician Hermann Minkowski (dates unknown) as the first proponent of the union between space and time. It is in his 1908 lectures before the *Naturforschenden Gesellschaft* that the space-time concept is proposed, contemporary to the establishment of Cubism. Immanuel Kant (1724-1804) had however already proposed such an inter-dependence in the *Critique of pure reason* (1781):"It is therefore ... indubitably certain that space and time are the necessary conditions of all experience" (1911: 283).

4.8.3 Materiality: The rationalisation of the design process recognised an understanding of inert material by identifying its constituents and quantifying its properties towards an optimal application. This exploitation imbued inert material with the creativity of the designer, adding value to the artefact, subscribing to the concept of poetics in architecture, and viewing the architect as the ultimate *Homo faber*[19]. This attitude explains the initial Modern obsession with craft revival and the organisation of architecture in guilds mimicking the mediæval example.

4.8.4 Determinism: Social responsibility translated into the concept of architectural determinism in which it was believed that architecture could determine and manipulate human behaviour. A belief in empirical cause and effect translated into the notion of humankind as *noble savages* to be shaped by culture and context forms the basis of architectural determinism. An early manifestation is found in Jeremy Bentham's (1748-1832) Panopticon or *Inspection House* (1778).

4.9 SUMMARY

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[18] Contemporary readings of the *Promenade Architecturale* tend to dispute its space-time dimension as identified by Gideon and others, viewing it as a purely temporal experience.
[19] The concept of *Homo faber* is defined by John Locke's (1632-1704) distinction between fabrication of artifice and labour as life sustenance.

4.9.1 Paradigm may be defined as the common intellectual model, directing all human endeavour during a given period.

4.9.2 The term *Modern* with reference to a period distinct from any other period, indicates the belief in "the infinite progress of knowledge, and the infinite advance towards social and moral betterment."

4.9.3 The Newtonian or Cartesian paradigm characterises the *Modern* period, informed by Rationalism as guiding principle. Phenomena encountered based on this principle must be the objective truth, be qualifiable and quantifiable.

4.9.4 The principles at the basis of Modern science, are accepted as the principles of the Modern paradigm.

4.9.5 The Modern period in architecture adheres to the principles of the Newtonian paradigm, is part of the Rational school of thought, and is distinguishable from other periods by a radical change in thought, occurring in the mid-eighteenth century, and continuing until the mid-twentieth century. At the basis of rational thought in architecture is the belief that beauty may be objectified through fitness and economy.
Function and utility inform architectural form and language, freeing it from subjectivity and stylistic constraints. The social obligation of architecture is to improve, like science, the human condition.

4.9.6 The essential concepts of Modern architecture based on these principles are space, time, materiality and determinism.

CHAPTER 5

GLASS ARCHITECTURE AS MODERN PHENOMENON

SUBPROBLEM 4

The study of glass architecture as a uniquely Modern phenomenon and the use and meaning of light.

HYPOTHESIS

Artefacts exist, providing evidence of glass architecture as Modern phenomenon.

5.1 INTRODUCTION

Modern as term was defined in the previous chapter, signifying a distinct period and related paradigm encompassing the eighteenth century Enlightenment and continuing up to the mid twentieth century. A radical change in the ideals directing architectural endeavour during this period was defined. These ideals are now explored with reference to the meaning and importance of glass architecture and the poetics of light associated with its production during this period. This investigation provides not only a link between the eighteenth century and the *Modern Movement* of the twentieth century , but establishes a continuous thread running through two centuries.

5.2 GLASS AND MODERN ARCHITECTURE

In his 1918 review of Paul Scheerbart's (1863-1915) *Glass Architecture* Adolf Behne's (1885-1948) states:

> "The idea of a glass architecture is perfectly simple and is to be understood just as Scheerbart presents it... in the light of gayest optimism. It is not the crazy caprice of a poet that glass architecture will bring a new culture.
>
> No material overcomes matter to such an extent as glass. Glass is a completely virgin material; to produce it, matter has been melted down and transformed. It has the most elementary effect of all the materials we possess. It reflects sky and sun, it is *transparent like water,* and it has a wealth of possibilities as regards colour, shape, and quality that are really inexhaustible and to which no one can remain indifferent. In comparison with glass all other materials seem to be derivative or trifling — merely man-made. Glass has an extra-human, super-human quality.
>
> Therefore, the European is right when he fears that glass architecture might become uncomfortable. Certainly, it will be so. And that is not its least advantage.

> For first of all the European must be wrenched out of his cosiness *[Gemütlichkeit].* Not without good reason the adjective *'gemutlich'* intensified becomes *'saugemütlich'* (swinishly comfortable). Away with comfort! Only where comfort ends, does humanity begin. Comfort is of no value. It is true that glass as a material is hardly suitable for an alcove in which to play cards or to sit down for the evening beer — unless one would abuse it by imitating the romanticism of bull's-eye panes. Yet such glass panels are not at all what we mean by glass architecture. Glass architecture rules out the dull vegetative state of jellyfish-like comfort in which all values become blunted and worn, and it substitutes a state of bright alertness, a daring activity, and the creation of ever fresher, ever more beautiful values.
>
> Its profoundest effect, however, will be that it breaks down the inflexibility and harshness of the European. The European is easy-going where he has no responsibility; where he has it, however, he is harsh. Underneath a jelly-like exterior he is dull and brutal. Glass will transform him. Glass is sheer and angular, yet in its hidden potential it is gentle and delicate. The new European will have these qualities too..." (Benton et al, 1975: 79-80).

In 1929, the architectural critic and academic, Arthur Korn (1891-1978) offered a tempered and pragmatic interpretation of Behne's view of a decade earlier. In *Glas im bau und als Gebrauchsgegenstand*, translated into English as *Glass in Modern Architecture* he states:

> "A new glass age has begun, which is equal in beauty to the old one of Gothic windows. Up to the present time glass has been a secondary building material, which remained subservient in spite of all its intrinsic ornamental strength, in spite of its crucial position in the interplay of structural forces, in spite of its underlining contrast with the masonry of the walls. The contribution of the present age is that it is now possible to have an independent wall of glass, a skin of glass around a building; no longer a solid wall with windows. Even though the window might be the dominant part - this window is the wall itself, or in other words, this wall is itself the window. And with this we have come to a turning point. It is something quite new compared to the achievements through the centuries ... it is the disappearance of the outside wall. The wall, which for thousands of years had to be made of solid materials such as stone or timber or clay products. But in the situation now, the outside wall is no longer the first impression one gets of a building. It is the interior, the spaces in depth and the structural frame which delineates them, that one begins to notice through the glass wall. This wall is barely visible, and can only be seen when there are reflected lights distortions or mirror effects.
>
> Thus the peculiar characteristic of glass as compared to all materials hitherto in use becomes apparent: glass is noticeable yet not quite visible. It is the great membrane, full of mystery, delicate yet tough. It can enclose and open up spaces in more than one direction. Its peculiar advantage is in the diversity of the impression it creates...
>
> Glass has an extraordinary quality which enables it to render an outside wall practically non-existent, when one compares such a wall to those made of other materials - stone, wood, metal or marble - all of which form solid barriers.
>
> Obviously, the opening up and perforation of a wall has been an aim and a problem for a considerable time and in some instances solutions were found which made the interior of a building visible from without, but never before did man suc-

> ceed in enclosing and dividing up space by a single membrane. It is this membrane which really encloses a building, but only with certain qualities of a solid wall, such as defence against temperature variation and noise, as well as the provision of safety. This is not a purely imaginary wall as it is in the case of the regular rhythm of columns around a classical temple.
>
> It is evident that a material of such qualities requires the building itself to be remodelled, conceived in a revolutionary way. The window as the structural element of the large glass surface has to be redesigned from the basic principles. This was done not only because of the general tendency to reconsider and redesign each of the few basic elements of the modern building, but also because the window is the most exposed element in an outside wall, and furthermore, because a window has to be movable with a frame as thin as possible. This is the reason why quite a number of new window constructions appeared on the market both casement and sliding windows.
>
> With the advance of glass as a building material its use for other purposes also increased ... it is being used for the sake of its intrinsic beauty, its hygienic, hard and protective surface..." (Benton et al, 1975: 170-1).

In the preceding chapter the concepts of space, time, materiality and determinism were defined as particular to Modern architecture. Measured against these concepts it is clear that the quotes, representative of the views informing the formative years of the Modern movement in architecture, refer directly, from both an emotive and a functional point of view, to these concepts. An alliance between glass architecture and these concepts may be concluded. Glass presented the ideal material in the translation of these concepts into Modern architectural form.

Although the manner in which glass and glass architecture may be interpreted in terms of these concepts are inter-linked and interdependent and are subsequently discussed, it is in particular the expression of light in glass architecture that is the focus. The ambivalent relationship between transparency and translucency, which is the material quality of glass and a condition of light, is investigated with reference to space, space-time and an underlying determinism and materiality.

5.3 TRANSPARENCY AS IDEAL

5.3.1 INTRODUCTION

It is proposed that transparency has been a fundamental issue in the architectural development of the *Modern* period: "'Simultaneity,' 'interpenetration,' 'superimposition,' 'ambivalence,' 'space-time,' 'transparency': in the literature of contemporary architecture these words, and others like them, are often used as synonyms. We are all familiar with the manifestations to which they are

applied — or assume ourselves to be so. These are, we believe, the specific formal characteristics of Modern architecture..." Rowe (with Slutzky, 1976: 160).

The origins of transparency as architectural quest can be traced to the social ideals presented by the Enlightenment, and which resulted in a metaphorical manifestation of transparency in architecture, while literal transparency was used as a vehicle for expressing industrial advancement and the pursuit of 'shadowless' light, on the one hand, as a realisation of the principles of the Picturesque, on the other. Transparency is inexorably allied to the idea of space and light in the architecture of the Modern period.

5.3.2 DEFINING TRANSPARENCY IN GLASS ARCHITECTURE.

Transparency can be described as the condition of being transparent, i.e. having the ability to transmit light and to render bodies lying beyond the medium in question completely visible. Such a definition conclusively integrates the notion of light, and its transmittance, with the principle of transparency. This is a literal interpretation, stating the quality of transparency as a material condition, for example transparency as a fundamental and associated property of clear glass. Then there is the implication of transparency as an intellectual imperative, indicating a desire for that which is easily detected and clearly evident. Used as a critical titular imbued with moral overtones, it signifies personality - the absence of guile, pretence or dissimulation. It is therefore a word laden with meaning and interpretation with reference to both the physical and the metaphysical in architecture.

5.3.3 ORIGINS OF TRANSPARENCY, THE CRYSTAL METAPHOR AND THE SOCIAL IDEAL

The premise is that the ideal of a transparent architecture in the twentieth century, has its origin in the Enlightenment. Jean Jacques Rousseau (1712-1778), the French philosopher best known for his political theory outlined in *Du Contract Social* (the Social Contract, 1762), and leading figure in the Romantic movement, believed crystal to be the only innocent stone (Kahn, 1991: 97-98). It can be deduced that Rousseau saw in the clarity and transparency of crystal the embodiment of an idealised open society. His wish for transparency stemmed from a desire to reveal his true self. Paradoxically, extreme transparency would imply invisibility, and to Rousseau this suggested omnipotence, but in a positive sense. Referring to the myth of the ring of Gyges, which afforded its wearer invisibility, Rousseau stated: "Had I been invisible and powerful like God, I would also have been good and benevolent..." (Kahn, 1991: 98).

These ideas are antecedent to the ideal of transparency in architecture as an expression of a democratised society, offered in the early twentieth century, and in particular in the example of the German Expressionist movement of the post First World War period. Throughout his *Expressionist Architecture*, Wofgang Pehnt (1973) implicates the crystalline imagery as a characteristic of the movement but obscures the meaning by referring to its use in a "vague ecstatic sense" (1973:37-41). Noted for the free and frenetic forms it favoured, German Expressionism brought a non-objective approach to architecture. Because of this and its seemingly intuitive and emotive expression, the movement is often disregarded as far as its influence on mainstream Modern architecture is concerned.

Banham, in his 1959 essay *The glass paradise*, establishes an indisputable link between the visionaries of Expressionism and the respectable glass architecture of the Modern Movement. The architectural historian Rosemarie Haag Bletter (1981: 20-43) demonstrates how the utopian "glass dream" that inspired both the intuitive and rational investigation of glass architecture has roots beyond the Enlightenment and Rousseau, traceable to the biblical accounts of King Solomon's temple having reflective floors made of gold (1981: 23). The glass metaphor was sustained through the Judaic and Arabic cultures, principally in literary form, but it also found built expression in small metaphorical structures such as garden pavilions. "Because an actual glass or crystal palace was not technically feasible, the semblance of such a building was attained through allusion: water and light were used to suggest a dissolution of solid materials into a fleeting vision of disembodied, mobile architecture" (1981: 25). The crystalline *muqarnas* decoration of tectonic form can be viewed as the opaque translation of this ideal in the Islamic tradition.

In the Gothic period, the glass dream found greater expression in built form, churches with expansive walls of coloured glass, as well as in literary sources, particularly the legends of the Holy Grail. In Wolfram von Eschenbach's *Parzjfal,* the sought-for Grail is symbolised by a glowing crystal hidden in a cave (Bletter 1981: 26). Evolving into the alchemist's *lapis* and the associated symbolism of transmutation the Grail became the *Philosopher's Stone* and by way of the ritualism of the Rosicrucian movement and Freemasonary found its way to the eighteenth century. The associated egocentric mysticism had obvious appeal to Romantic sensibilities.

By the early twentieth century the crystal symbolism of transmutation, transcendence and metamorphosis had itself undergone a transformation by returning to an architectural format in the Romantically inspired work of the Expressionists, turning away from an introspective view to a search for social identity and community. Though this metaphor was often an ambiguous symbol, it could become such a persisting mythologem precisely because it could be appropriated from a religious to a personal and a social context. "Reviewing the iconography of glass, one can no

longer insist that Expressionist architecture constitutes mere idiosyncratic self-expression. Those very aspects of Expressionist design that appear on first glance to be its most revolutionary ones — transparency, instability, and flexibility — on closer examination turn out to be its most richly traditional features" (Bletter 1981:43).

Inspired by this tradition, Paul Scheerbart (1863-1915) the German pre-war visionary writer and poet declared: "...a person who daily sets his eyes on the splendours of glass cannot do wicked deeds" (Kahn, 1991: 96-7). In his *Glass Manifesto* of 1914 he called for the replacement of brick and masonry architecture, stating that:

> "We live for the most part in closed rooms. These form the environment from which our culture grows. Our culture is to a certain extent the product of our architecture. If we want our culture to rise to a higher level, we are obliged, for better or for worse, to change our architecture. And this only becomes possible, if we take away the closed character from the rooms in which we live. We can only do that by introducing glass architecture, which lets in the light of the sun, moon, and the stars, not merely through a few windows, but through every possible wall, which will be made entirely of glass – of coloured glass. The new environment which we thus create must bring us a new culture"
> (Curtis, 1996 [1982]: 106).

Scheerbart became the inspiration behind the *Gläserne Kette* (Glass Chain), the secret group of Expressionist architects assembled around Bruno Taut (1880-1938) and which included Walter Gropius (1883-1969), Adolf Behne (1885-1948), Lyonel Feininger (dates unknown), Hermann Finsterlin (1878-1973), and Hans Scharoun (1893-1972). The economic chaos and political polarisation characterising Germany after the First World War, formed the ideal breeding ground for the utopian ideas generated by the group. As the likelihood of actual construction diminished because of the deepening economic turmoil, these architects reverted to the creation of paper projects in which they proclaimed a forthcoming new society. The vehicle for achieving this new society would be an architecture of glass, moving Adolf Behne to state in 1918: "...glass architecture will bring a new culture. It is a fact" (Curtis, 1996 [1982]: 185). Behne's unwavering belief in the architectural determinism is clearly expressed in his opinion that "you can kill a man with a building just as easily as with an axe" (Gelernter, 1995: 251).

Taut's collection of water colours titled *Alpine Architektur* (1919) portrayed collective buildings of glass facets. Rising crystal-like from glaciers and mountain peaks, they were meant to symbolise an apolitical socialism, an ideal realm for the brotherhood of man, in which national boundaries and individual greed would dissolve, and in which a "natural society undisturbed by inherited class divisions would emerge" (Curtis, 1996 [1982]: 183). As the leading architect of the *Glass Chain* it is ironic that Taut was able to only construct a single building as an expression of their ideals, the *Glass House* (1914) for the *Werkbund* Exhibition in Cologne (fig. 5.1 and 5.2). Behne, a friend of Taut, comprehended the mystical intention behind the Glass House when he wrote:

> "The longing for purity and clarity, for glowing lightness, crystalline exactness, for immaterial lightness, and infinite liveliness found in glass a means of its fulfilment in this most bodiless, most elementary, most flexible, material, richest in meaning and inspiration, which like no other fuses with the world. It is the least fixed of materials transformed with every change of the atmosphere, infinitely rich in relations, mirroring the "below" in the "above," animated, full of spirit and alive! The thought of the beautiful cupola room which was vaulted like a sparkling skull, of the unreal, ethereal stair, which one descended as if walking through pearling water, moves me and produces happy memories" (Bletter, 1981: 34).

Although the *Glass House* was one of the earliest executed Expressionist buildings, to the degree that it stood for a "sparkling skull," it also referred to the Romantic-Symbolist tradition in which the crystalline *lapis* was identified with the self or brain. Another indication of the hermetic nature of this building was provided by couplets composed by Scheerbart for the Glass House, such as "Light seeks to penetrate the whole cosmos / And is alive in crystal" or "Coloured Glass / Destroys Hatred" (Bletter 1981: 34). These were inscribed on the 14-sided concrete band under the dome. The *Glass House* and the *Werkbund* Exposition were closed prematurely in August of 1914 because of the outbreak of World War One. Paul Scheerbart died in 1915. His ideas were transmitted to the post-war generation of young architects by Taut. Because architectural commissions were few during and immediately after the war, Taut turned to the publication of books and pictorial treatises about glass architecture as the ideal of a utopian, generally anarchist society. Of these *Frühlicht* (Early light or dawn) published between 1920 and 1922 had the most persistent influence and included works by Mies van der Rohe (1886-1969) and Gropius.

Of the group, Gropius's work remained the most sober, ascribing rather to Functionalism than Utopianism. He nonetheless saw in glass the representation of a collective purity, believing too that transparency, symbolised both political and moral liberation. Less apparent in his built work, although the Fagus factory (1911-1912), the *Werkbund* Pavilion (Cologne, 1914) and the later Bauhaus building (1926) displayed transparent features, this ideology and the metaphorical reference to crystal, is clear in the Bauhaus opening manifesto, drafted in 1919. Here he advocated a return to architecture as a craft, the architect as craftsmen rather than self-conscious designer: "Let us conceive, consider and create together the new building of the future that will bring all into one simple integrated creation: architecture, painting and sculpture rising to heaven out of the hands of a million craftsmen, the crystal symbol of a new faith of the future" (Curtis, 1996 [1982]: 184). Enforcing the crystal symbolism, was Feininger's woodcut illustration to the manifesto. "The Cathedral of Socialism" in its jagged crystal-like form clearly related to Taut's visionary Expressionism, rather than the sobriety of the Functionalists (fig. 5.3).

Mies van der Rohe's early alliance to the visionary attitudes of the Expressionists, too, is expressed in his work of this period. The competition entry for the Friedrichstrasse Skyskraper

(1921), and the project for a skyscraper (1922) are as much Rationalist expressions of a building stripped to its essential structure, wrapped in glass, and a reference to Taut's utopian sentiments. The jagged forms of the Friedrichstrasse project and the play of transparency and reflection suggest as much a cathedral as it does an office building, allying it to Le Corbusier's images of floating transparent towers above the parks of the *Ville Contemporaine* of 1922 (fig. 5.4).

Although the importance of this group was effectively dismissed by the more radical Functionalists of the Modern Movement, De Zurko (1957: 7-8) stresses the importance of social responsibility as part of the ideology of Functionalist theory. Accordingly even the most radical of Functionalists ascribed to what Rowe, albeit in a derogatory sense, refers to as the "notion of the architect as Messiah figure and the notion of architecture as the vehicle of the millennium" (1994: 46). This implied a belief among architects that architecture could play a proactive role in transforming and shaping a new society. The extensive use of glass in building during the first decades of this century was thus not only a utilitarian expression or spatial device, but an obvious reference to the metaphorical meaning of transparency in relation to society.

5.3.4 TRANSPARENCY AND PANOPTICISM – DETERMINISM AND GLASS ARCHITECTURE

Commenting on the glass ideal of the Expressionists, Curtis observes: "It is a sad irony of ensuing history that the pure glass prism should have started off as the symbol of a new faith and ended up as the banal formula for the housing of big business bureaucracy" (1996 [1982]: 190). The even greater irony might be the malevolent origin of the idea of transparency as a tool of social engineering.

Michel Foucault (1926-1964) identifies with the eighteenth century the development of a reflection on architecture as a function of the aims of the governing of societies, that is to say architecture as a technique of government. The most obvious expression of this phenomenon is to be found in the propositions of Jeremy Bentham (1748-1832), who is generally referred to as the father of English Utilitarianism (Rowe, 1994: 78). Of his 1791 design for a Panopticon – the all seeing eye - or Inspection House, Bentham declared: "Morals reformed – health preserved – industry invigorated – instruction diffused – public burdens lightened – economy seated, as it were, upon a rock – the Gordian knot of the Poor Laws not cut, but untied – all by a simple idea in Architecture!" (Baird, 1995: 167). This was a seminal design in institutionalising and instrumentalising labour conceived for the express purpose of what became known as "behaviour modification". Based on a centralised plan with cubicles or cells forming the perimeter, the centre was to be occupied by a single inspector, who could survey the behaviour of all occupants at the same time. The inspection point was designed in such a way as to afford constant surveillance while the inspector re-

mained screened, in a manner which Bentham described as 'to see without being seen" (Baird, 1995: 174).

Robin Evans (in Kahn, 1991: 99) refers to the generating idea behind Panopticon, stating that: "Lucid transparency was very much to his [Bentham] taste, as evident from his recollection of a French Fairy Tale in which the heroine had been imprisoned in a palace of solid glass: 'of this archetype the Panopticon was as near a similitude as the limited power of human art could admit". The expression of this transparency in the Panopticon was concealed within its solid and opaque masonry structure.

Although the contemporary view of Panopticism is tainted by its association with the extremes of behaviour control and modification, the concept of transparency as a means of determining social conduct and as a metaphor of open and accessible governance endured up to the twentieth century. This benevolent version of transparency as a tool of architectural determinism finds expression even in recent examples of civic architecture such as the Bundestag building (1991) in Bonn by Behnisch and Partners where literal transparency and inverted observation is equated with approachable and democratic rule.

5.3.5 TRANSPARENCY AND SPACE

Collins (1965: 26) states that a new theory of space developed during the late eighteenth century, emerging as part of Rococo, and which can be related to the spatial theories of the twentieth century.

The change concerned the idea of parallax and new methods of achieving its effects. In architecture parallax implies the perceptual experience of space and its elements through movement. As one moves through or past a colonnade, the columns not only appear to change position relative to one another, but also appear to change position relative to whatever is perceived through or behind them.

The multiplication of the effects of parallax, though only illusionary, became possible in the middle of the eighteenth century through the use of mirrors, which in turn resulted in a sudden and new interest in the aesthetic implications of the phenomenon. The use of large mirrors placed opposite one another on the walls of rooms allowed for the reflected perspective to adapt to the movements of the observer. Wherever the observer moved he saw, not enclosing walls, but a series of open arcades through which architectural spaces extended in an infinite parallactic sequence beyond the confines of the room, an endless three-dimensional *enfilade*.

Due to the constructional limitations of the time, the real effects of parallax, relying on material transparency, proved difficult to achieve in habitable buildings, and could only be experienced truly in ruined structures, or hinted at in the visionary architectural interiors of Boullée, which suggested the possibility of a transparent architecture by alluding to continuous space beyond the pictorial plane. Robert Wood describing the ruins of Palmyra in 1751, remarked: "...so a great number of columns, mixed with so little wall or solid building afforded a most romantic variety of prospect" (Collins, 1965: 27).

The use of multiple free standing columns inside and outside buildings, and in fact Laugier's suggestion in his Essay, that "all intercolumniations should be fully glazed" (De Zurko, 1957: 159), not only indicates a desire for structural clarity, but also the desire to express spatial continuity. Jacques-Germain Soufflot (1713-80) aimed at this in the design of St Geneviéve (1757), describing the desired effect poetically: "the spectator, as he advances and moves away, distinguishes in the distance a thousand objects, at one moment found, at another lost again, offering him delightful spectacles", while in a more sober tone Wolfgang Hermann remarked: "while the visitor moves forward, the cluster of columns seem to move too, opening up constantly changing views" (Collins, 1965: 28).

5.3.6 TRANSPARENCY AND THE CONCEPT OF SPACE-TIME.

The development of skeletal structures in steel and concrete, and the advances in glass production during the nineteenth century and up to the twentieth century, made the development of the spatial construct of parallax to its ultimate expression in materially transparent architecture possible. The Crystal Palace, designed for the great Exhibition, London 1851, by Joseph Paxton (1801-1865), occupies the space exactly in the middle of the period spanning what has been defined in chapter 4 as the Modern, and can be considered the first example of literally transparent architecture.

Contemporaries were quick to realise that, "the Crystal Palace is a revolution in architecture from which a new style will date", (Gideon, 1947 [1941]: 187). Lothar Buchner noted that, "In contemplating the first great building which was not of solid masonry construction, spectators were not slow to realise that here the standards by which architecture had hitherto been judged no longer held good" (Gideon, 1947: 188), adding that the impact of its "romantic beauty' was such, that reproductions of it were "soon hanging on the cottage walls of remote German villages".

Sigfried Gideon considered the Crystal Palace to be "the realisation of a new conception of building, one for which there was no precedent", and saw in it the unrivalled expression of the "possibilities of modern industrialised civilisation" (1947: 186). Henry-Russell Hitchcock described it as "a direct ancestor to modern architecture... often hailed with pardonable exaggeration as the first Modern building" (Kahn, 1991: 92).

The impact of the spatial quality of the building, resulting from its absolute transparency is equally important to note: "If we let our gaze travel downward it encounters the blue-painted lattice girders. At first these occur at wide intervals; then they range closer and closer together until they are interrupted by a dazzling band of light – the transept – which dissolves into a distant background where all materiality is blended into atmosphere" (Buchner in Gideon, 1947 [1941]: 189). The impact of this on architectural space was profound. By shedding all remnants of an opaque building skin, it did not "obscure, obstruct, or enclose in a typical architectural sense" (Kahn, 1991: 87). By developing the concept of parallax into its ultimate expression of infinite or boundary-less space, compounded by the simultaneous experience of its filigree structure, the Crystal Palace introduced the idea of simultaneity, which would culminate in the development of the concept of *space-time*.

Gideon defined this concept in relation to Cubism:

> "Space in modern physics is conceived of as relative to a moving point of reference, not as the absolute and static entity of the Baroque system of Newton. And in modern art, for the first time since Renaissance, a new conception of space leads to a self-conscious enlargement of our ways of perceiving space. It is in Cubism that this was most fully achieved.
>
> The Cubists did not seek to reproduce the appearance of objects from one vantage-point; they went round them, tried to lay hold of their internal constitution. They sought to extend the scale of feeling, just as contemporary science extends its descriptions to cover new levels of phenomena.
>
> Cubism breaks with Renaissance perspective. It views objects relatively: that is from several points of view, no one which has exclusive authority. And in so dissecting objects it sees them simultaneously from all sides – from above and below, from inside and outside. It goes around and into objects. Thus to the three dimensions of the Renaissance which have held good as constituent facts throughout so many centuries there is added a fourth one – time" (1947 [1941]: 357).

Walter Gropius elaborated on this idea in his search for an objective science of space (Van de Ven, 1978: 227). Defining the space concept of "our" time as that of the space-time continuum of philosophers and scientists, he translated it in artistic terms, as that of the fourth dimension of time, which the Cubist and Futurist painters had introduced. Like Lazlo Moholy-Nagy (1895-1946), he saw the architectural equivalent as our physical motion in space, or "vision in motion".

In Gropius's terms, vision in motion implied the use of large areas of glass, evoking transparency, stimulating in our perception the illusion of a floating continuity of space.
Gideon (1947 [1941]: 401-2) exalted Gropius' Bauhaus building as the direct manifestation of this concept (fig. 5.5):

> "The glass curtain is not the limited and marked off transparent area... It flows smoothly around the building, the corners showing no vertical support and binding members. Two major endeavours of modern architecture are fulfilled here, not as unconscious outgrowths of advances in engineering but as the conscious realisation of an artists intent; there is the hovering, vertical grouping of planes which satisfies our feeling for relational space, there is the extensive transparency that permits interior and exterior to be seen simultaneously, *en face* and *en profile*, like Picasso's "L'Arlésienne" of 1911-2: variety of levels of reference, or of points of reference, and simultaneity – the conception of space-time in short".

5.3.7 TIDAL SPACE AND THE PROGRAMMATIC VIEW OF TRANSPARENCY

Allied to the idea of the space-time experience as a function of transparency, is the idea of the inter-penetration of inside and outside space. Inverting, in a sense, the space-time concept, Banham (1978 [1962]: 56) refers to space as tidally moving from the fixed observer, into the building when he is outside, and outwards when he is inside. The observer becomes, axiomatically, the source of spatial experience. Banham cites Mies van der Rohe's Farnsworth House (1946-51) as the epitome of this type of space. Relinquishing all opacity in the vertical plane, space is only defined by the horizontal planes of the floor and ceiling. As a result the interior space is almost, visually speaking, in total communication with the infinite outside space.

Mies took a programmatic view of Modern transparency. In a prospectus written for the Union of German Plate Glass Manufacturers in 1933, he stressed the symbiotic impact of glass on modern construction, and thus Modern tectonic form and the resultant spatial quality (Frampton, 1996: 175):

> "What would concrete be, what steel without plate glass? The ability of both to transform space would be limited, even lost altogether, it will remain only a vague promise. Only a glass skin and glass wall can reveal the simple structural form of the skeletal frame and ensure its architectonic possibilities. And this is true not only of large utilitarian buildings. To be sure, it was with them that a line of development based on function and necessity began that needs no further justification; it will not end there, however, but will find its fulfilment in the realm of residential building.
>
> Only here in a field offering greater freedom, one not so bound by narrower objectives, can the architectural potential of these technological methods be fully realised. These are truly architectural elements forming the new art of building. They permit us a degree of freedom in the creation of space that we will no longer deny ourselves. Only now can we give shape to space, open it up, and link it to the landscape. It now becomes clear once more just what walls and

> openings are, and floors and ceilings. Simplicity of construction, clarity of tectonic means, and purity of materials have about them the glow of pristine beauty".

5.3.8 THE SUBLIME AND PICTURESQUE IN TRANSPARENCY

It is clear that Mies did not only view the possibilities of glass architecture in functional or formalistic terms, but saw in glass the possibility of poetic spatial expression which can be related to Picturesque sensibilities.

The preoccupation with the sublime and its adjunct, the picturesque, was a result of a renewed affinity with nature and a belief in the importance of sensory experience, germinating in the late eighteenth century. Edmund Burke (1729-1797) in his *Philosophical inquiry into our ideas of the sublime and the beautiful* (1756) says about the sublime that the first passion it arouses is "astonishment with a degree of horror", and "hence arises the great power of the sublime... it anticipates our reasonings and hurries them on by an irresistible force". He ads that the inferior effects are "admiration, reverence and respect", while sensations associated with the sublime are "terror, obscurity, power, privation, vastness, infinity, succession, uniformity, magnitude, difficulty, magnificence, light, and pain" (Rowe, 1994: 111)

Rowe (1994: 112) distinguishes between two types of the sublime. The first is the political sublime, depicting the power of nature as the ultimate expression of freedom, and secondly the cosmological sublimity, that of an astronomical scale as revealed by the operations of science. Related to this concept of the sublime are the twin sensibilities at play in the picturesque. According to Steven Daniels (Kahn, 1991: 90-91) these are: one articulating a critique of social and economic issues, the other using landscape to obscure these very issues. Manfredo Tafuri (1976: 82) refers to the same contradiction when he quotes from G.C. Argan: "It may be that [the English Garden] reproduces some wild aspects of the landscape: but it is an illusion, totally similar to the illuministic illusion of the 'noble savage'. It is not an image of uncorrupted barbarity, but of cultured civilisation. It is a re-acquired spontaneity and happiness, a paradise regained, after having lost it in the social affectations. In fact this garden is not made of values but of things". Expanding on this concept Tafuri (1976: 86) argues that the picturesque landscape is a microcosm not reflecting the cosmos, but rather human experience. Nature is no longer the reflection of the divine idea but a structure shared by man and which can merge with the history of the entire human species. The rational course of civilisation is natural because it moves from the realm of the senses to that of the intellect.

Andrea Kahn (1991: 85-106) sees in the ambiguous transparency of the Crystal Palace the expression of this subversion of nature allied with the idea of the Picturesque. Reflecting its park

surroundings, the structure obscured the division between nature and design. Integrating the mechanistic quality of the *orangery* with the commercial program of the shopping arcade, it superimposed nature and trade. Enclosed plants became mere speciality items displayed alongside industrial products.

Clear glass is at first glance neutral, but closer examination reveals its ambiguous, confusing nature. Transparency and reflection are intermingled in an ever-changing spectacle. Similarly the Crystal Palace obscured as it revealed. The act of 'seeing through' the glass structure out towards the park, concealed a simultaneous act of 'seeing past' industry's transformation of nature into a marketing tool (fig. 5.6).

At the basis of the Picturesque is a design strategy to make the act of design invisible, to imitate nature and its spectacle. Its aesthetic qualities include irregularity, roughness and complexity. Because of its association with emotive appeal, formal eclecticism and artifice, the influence of the Picturesque on Modern architecture is repressed. This is also true of the relationship between building and landscape in the Modern Movement. The first two of Le Corbusier's five points on architecture dispute this perception and confirm a conscious regard for this relationship. The elevation of the building on piloti and the replacement of the occupied landscape on top of the structure as in the shape of the solarium or roof garden indicate an unacknowledged reverence for the landscape often overshadowed by a formalistic reading of the architecture.

The transparency of glass architecture extends this argument and obscures the boundary between architecture and landscape. Glass becomes the architectural equivalent of the ha-ha that sought to dissolve the distinction between garden and landscape. According to Constant (1990: 46) Mies's Barcelona Pavilion (1929) is not only indebted to the Picturesque for as he (Mies) put it "erasing the barrier between the work of art and the living community", or the visual extension of space, but extends to the conceptual boundaries of the discipline.

Constant argues for an interpretation of the Barcelona Pavilion as a landscape garden. As with the Picturesque garden the building is perceived not as a thing in itself, but as a series of relationships that are gradually revealed to the moving spectator. The articulation of the plan and its conception as a three dimensional spatial experience relies on an explicit Picturesque device. In the original design each of the three major viewing axis is terminated in a statue as focal point, a sequence analogous to the C18 pictorial circuit. Reducing the number of statues to one in the final realisation, Mies rejected the pictorial means and overcame the Picturesque tendency of focusing on the object rather than the whole. The continuity of sequence is amplified and there is one relative point of stasis in the composition of the pavilion. It focuses not on the statue but the

opacity of the *onyx dorée* wall. Endowed with iconic value the solidity of this wall contrasts with the transparency of the enclosure and the translucency of the other internal divisions.
The horizontal seam bisecting this wall at eye level disrupts the implied equilibrium. It implies a horizon, reinforcing the reading of the pavilion as a landscape and evokes a passage Mies had underlined in his copy of Spengler's *Decline of the West*: "In analogising the horizon with the future, our age identifies itself with the third dimension of experienced space" (Constant, 1990: 50). Evans (1997: 233-272) too points to the significance of this horizon in his reading of a sectional or horizontal symmetry in the Barcelona pavilion.

Critics tend to view the onyx wall as the symbolic centre of the composition. There has been limited mention of an equally important constituent, the inaccessible luminous volume at the geometric centre of the pavilion. This void enclosed in etched glass is the only element conforming to the paving grid. Realised as a volume of light, it represents the embodiment of nature. Its light seemingly emanates from within, comparable to the autonomous light source of a cubist painting. Nature is presented as light within an architectural frame of glass and steel, a "garden" represented as light in a machine. It alludes to the spiritual difference and distance between nature and architecture and its objectification within the architectural realm in comparison to the naïve union with nature associated with Modern Movement. Architecture and the material quality of glass is employed as a mechanism through which nature might reveal itself to humankind. In this sense the building becomes both a physical and metaphysical manifestation of the Claude Glass.

5.3.9 LITERAL AND PHENOMENAL TRANSPARENCY

Literal transparency is an obvious physical and material property of glass. The interpretation of transparency with reference to glass architecture includes but also transcends such a literal reading and extends to a number of abstractions apparent from the preceding analyses. It may be argued that literal transparency becomes a vehicle for phenomenal or perceptual transparency.

Referring to Kepes's interpretation of transparency in the Cubist tradition and citing Pablo Picasso's (1881-1973) *L'Arlésienne* (1908) as example, Rowe (with Slutzky, 1976: 167) disputes Gideon's comparison between this painting and the Bauhaus building. Rowe refers to the fluctuating, equivocal nature of the painting and the limitless possibilities regarding interpretation. This he defines as being the essence of phenomenal transparency. Literal transparency is a function of material attributes, to be distinguished from phenomenal transparency perceived through spatial organisation. The former has the physical quality of being perfectly clear while the latter is clearly ambiguous.

To Rowe there is a complete absence of such ambiguity in the literally transparent glass curtain wall of the Bauhaus. Clear glass is on first sight neutral and dismissive. Closer scrutiny, however, discloses its ambiguity and reveals its potential to obscure, allowing space enclosed in glass to recede and fluctuate in a continuous activity. The result is simultaneous perception of different spatial locations, an imperative of phenomenal transparency.

In defence of his argument Rowe draws a comparison between the literally transparent architecture of the Bauhaus and the opacity of much of Le Corbusier's work (1976: 167-175). In the Villa at Garches and the League of Nations project he identifies the stratification by means of which space becomes "constructed, substantial and articulate", essential attributes of phenomenal transparency. In reality the "now you see it now you do not" quality of glass as observed by Korn in the opening quote embodies a continuous dialectic between fact and implication, allowing glass a greater degree of ambiguity compared to opaque materials. With glass the building surface is qualified no longer by patterns of shadow on an opaque material, but by the reflections and refractions of light by glass. Through transparency the building form and space are conceived not in terms *of* separate, articulated masses, but as complex volumes that do not permit to be read as emanating from a formal logic.

It is a space or volume intractable to decoding by an analysis of what is temporally apparent. The glass curtain wall — alternately transparent, reflective, or refractive depending on light conditions and viewing positions — constantly absorbs, mirrors, or distorts the immediate, through changing images of the context. The surfaces are perceptually contorted by the invasion of circumstantial images. These surface distortions accompany and accentuate the formal inscrutability of the volumetric configuration. It is impossible to reduce the whole to a number of discernible parts. Comprehension and meaning is dependent on the sense of surface and volume that the building or space assumes in a particular time and place, in a contextually qualified moment, continuous with and contingent on the context in which the viewer moves.

This ambivalence empowers literally transparent glass architecture to be equally relevant in the spatial expression of phenomenal transparency.

5.4 THE POETICS OF LIGHT AND GLASS ARCHITECTURE

In Chapter 3 the role of light in the poetics of architecture was explored to conclude a direct relationship between the architectural form of a period and the expression of light within that period. In reference to glass architecture, the poetics of Modern light has been investigated indirectly as a function of transparency.

The poetics of light in glass architecture is, however, not limited to its physical necessity or metaphorical meaning in the expression of transparency. In conclusion the poetics of light pertinent to the glass architecture of the Modern is explored:

5.4.1 SHADOWLESS LIGHT

The obvious result of a literally transparent architecture is an abundance of light. Ludwig Hilberheimer (1885-1967), proponent of the Functionalist school of thought in Modern architecture, saw in glass and steel architecture the realisation of the ideal to create *shadowless* light: "It obliterated the old opposition between light and shadow, which had formed the propositions of past architecture. It made space of evenly distributed brightness; it created a room of shadowless light" (Riley, 1995:9-10). Bell (1987: 73) supposes the same inspiration, the creation of "uniform lighting", in the glass skyscraper projects (1920 to 1922) of Mies van der Rohe. Gropius defined the opposition between the past and the new architecture in terms of light: "...organic (functionalist) architecture whose new logic will be radiant and naked unencumbered by lying facings and trickery we want an architecture adapted to our world of machines, radios and fast cars ...with increasing strength of the new materials – steel, concrete and glass – and with the new audacity of engineering, the ponderousness of old methods of building is giving way to a new lightness and airiness" (Curtis, 1982: 126).

This Functionalist approach to clear, uniform light has its precedent in the diffusely lit interiors of Adolf Loos (1870-1933). Loos's windows were conspicuously translucent rather than transparent, a feature known among the early Modern movement architects and which he defended to Le Corbusier: " A cultivated man does not look out of a window, his window is made of ground glass ; it is there only to let in light" (Colomina, 1992: 69). Loos saw architecture primarily as the arrangement of spaces, consolidated in his theory of the *Raumplan*: " The great revolution in architecture is the solution of the plan in space" (Kruft, 1994: 365). In Loos's interiors light is employed in the manner of the Renaissance to illuminate the essence of the space without the interference of emotion – evenly distributed and clear light. The same reasoning informs the Modern glass interior, in which it was thought that the viewer should be able to grasp the physical and mental space, the antecedent logic, capable of deciphering the relationships between the parts and connecting every part to a coherent formal whole. For this to occur, the space had to be revealed in clear uninterrupted light. As Kepes (1964: 14) remarked: "To grasp spatial relationships and orient oneself in the metropolis of today...requires a new way of seeing". As vision is a function of illumination, a "new light" was required to facilitate the new way seeing.

5.4.2 SPACE-TIME AND LIGHT

As was true for previous epochs, the foundation of a poetics of light during the Modern was not only a function of new technologies or functional requirements. It may be assumed that an influence similar to the association between the architectural expression of space-time and its counterpart in Cubist painting may exist in the disposition of light.

In representational art, light and shadow effects imply an abstraction of reality. They are from a fixed point of view and they indicate the arresting of the position of the spectator, the light-source and the position of the object. Light and shadow relationships are in reality transitory, accidental and illusionary. The representation of an object under fixed illumination means its arrest in time and is consequently a limited representation of spatial events. It was therefore imperative to the Cubist painters during the analytical phase, in the expression of space-time, to overcome this contradiction. According to Kepes (1964: 146-7) they realised that the total disappearance of illumination, or the perfectly even illumination of the surfaces of an object, would free the representation of a temporal reading. It would however make that object inarticulate at the same time. The discretional control of light and shadow though, can explain the object without fixing it in time. A graphic method was devised of fusing the foreground and background by means of a discrete extension of light and shade. By subtly graded and consciously controlled values, planes are made to tilt forward or backward without defining the volume, so that the forms appear to dissolve in the background space. These shadow-facets guide the eye to all possible extensions in space. In synthetic Cubism this method was abandoned in favour of even illumination and the physical layering of planes through collage – a limited expression of what was ideally attainable in architecture.

Inspired, but not limited, by the temporal quality of representation and fixed-point observation in painting, architects achieved an expression of space-time sought by Cubist painters by both the even illumination glass architecture implied and the subtle grading which is integral to natural, diurnal and seasonal light. The ideal of achieving autonomous light, sought by the Cubists, finds expression in the illumination of glass architecture.

5.4.3 PHOTOGRAPHY AND LIGHT

As painters were working toward the fracturing of representational modelling by shading, photography reached an unprecedented perfection in the interpretation of visible forms through light and shadow.
Photographic representation brought into focus things and events in their actual appearances. For the first time, humankind was able to freeze the animated processes of nature into light and shadow patterns. What the eye was not able to do, the optics of the camera and the photosensitive emulsion could. It could record objectively and precisely the infinite variety of brightness differences reflected from surfaces.

Although architecture could not mimic this mechanistic representation of observation, it may be assumed from the emergence of architectural photography and its vital role in promoting universal acceptance in the genesis of Modern architecture, that the manipulation of light in space, or the intentional lack thereof was influenced by this new means of recording images. The clear, intense and pervasive light of glass architecture was indicative of an effort to reveal truthfully, as the camera would do. At the same time it was a simple question of pragmatism. For spaces to be photographically recorded, they had to be revealed in light. The best photographers succeeded in attaining a pliant and plastic treatment of light and shadow within such spaces, allowing the two dimensional representation of space to portray the complexity of three dimensional experience.

5.4.4 THE INVERSION OF LIGHT

In his pseudo science fiction narrative of 1914 Paul Scheerbart describes the creation of the [architect] protagonist of the novel:

> "Around midday, when the sun became visible outside, there was some commotion in the exhibition hall. The splendour of the coloured glass ornament was so enhanced by the sun that one was at a loss for words to praise this wonder of colour. Many visitors shouted repeatedly, "Delightful! Wonderful! Great! Incomparable!" While the exclamations were repeated over and over, better-educated visitors found these and similar words quite distasteful. Fortunately, the exclamations stopped as soon as the sun crept back behind the clouds and there remained nothing left of it to see" (Scheerbart, 2001: 3).

Until the twentieth century most of architectural space[19], with reference to light as architectural form, was conceived as being illuminated from an exterior source, the light of the sun. Towards the end of the eighteenth century and in particular in the luminous drawings of Boulleé there ap-

[19] Byzantine space is an exception in which the glimmer of light on the intentionally imperfect mosaic decoration was enhanced as much by sunlight as flickering candlelight (Runciman, 1975: 59).

pears the first suggestion of a radiant architecture, the building as the source of light. The same technological advances around the turn of the nineteenth century that initiated the foundation of glass architecture, allowed such a possibility to be considered. Architecture could now be freed from the subjectivity of illumination by the sun and could itself be the source of light. This may be defined as a profoundly important moment in the history of light as architectural form:

> "I have frequently said double glass walls are there not merely to maintain the temperature of the room, but to accommodate the lighting elements. I must ask to be forgiven for repetition but I want to stress and underline it. With this type of lighting the whole glass house becomes a big lantern which, on peaceful summer and winter nights, shines like fireflies and glow-worms. One could easily become poetic. But lighting can also be installed inside the room. This interior lighting also illuminates the walls — if not so strongly as the light between the double walls... The reader might gain the impression that glass architecture is rather cold, but in warm weather, coolness is not unpleasant. Anyhow, let me make it clear that colours in glass can produce a most glowing effect, shedding perhaps a new warmth...The beauty of the earth, when glass architecture is everywhere! The face of the earth would be much altered if brick architecture were ousted everywhere by glass architecture. It would be as if the earth were adorned with sparkling jewels and enamels. Such glory is unimaginable. All over the world it would be as splendid as in the gardens of the Arabian Nights. We should then have a paradise on earth, and not need to watch in longing expectation for the paradise in heaven." (Scheerbart in Benton et al, 1975: 73).

One of the early editions of *Frühlicht*[20], the principal document of Expressionist thought, contains an illustrated text by Taut entitled *Haus des Himmels* — a combination of the symbolism of mystical numbers, the symbolism of glass and pure aesthetics it contains passages supporting Scheerbart's vision of a radiant architecture (fig. 5.7): "A house should be nothing other than beautiful. It should fulfil no other purpose than to be empty, as Master Eckhart, the medieval mystic, put it...The visitor will be filled with the joy of architecture, which will drain all human elements from his soul and make it a receptacle for the divine. Building is the reflection and the greeting of the stars: its plan is stelliform, the holy numbers 3 and 7 combine in it to form a unity...The illumination comes from between the interior and exterior glass shell...If one flies to the house at night in an aeroplane, it shines from afar like a star. And it rings like a bell" (Kruft, 1994: 374).

The "artistic lightness" with which Taut sought to replace the "perpetual depressing clichés of monumentalism"(Kruft, 1994: 373), find metaphorical expression in the glowing images of his illustrations of *Die Stadtkröne* (1919) and *Alpine Architektur* (1919). This pervading symbol of the radiant crystal characterises Expressionist imagery, including Lyonel Feininger's cover illustration for the first Bauhaus manifesto (1919). It found its way into reality through the more realistic representations of delineators like Hugh Ferris (1889-), whose images of luminous skyscrapers and

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[20] Ironically *Frühlicht* marks the end of the visionary, Expressionist phase of Taut's work. After 1922 he believed that the new age had begun and devoted himself to the creation of social housing types, their bright colouration the only remains of the crystal metaphor.

shade too influenced the conception of light in Modern architectural space. Modern Light concludes with the inversion of illumination and the invention of artificial light allowing space to become a radiant light source instead of a receptacle for the sun's light.

CHAPTER 6

RECAPITULATION, CONCLUSIONS AND RECOMMENDATIONS

6.1 RECAPITULATION

This dissertation investigates the role and importance of light in the poetics of architecture, uncovering the origin and meaning of glass architecture and the glass metaphor and its manifestation as a Modern phenomenon.

In Chapter two the term "poetics", with reference to architecture, was clarified based on the hypothesis that a poetics of architecture exists. The origin of the term and its appropriation regarding architecture was investigated. Different types of poetics were identified and the contemplative and inclusivist category recognised as appropriate to the complexity of architectural production. "Poetics" in architecture was defined as the wilful, conscious and demanding act of creation in making architecture.

In Chapter 3 the role of light in the poetics of architecture was explored. The hypothesis was that light plays a definitive role in the poetics of architecture. Space and its articulation were identified as the primary determinants in the poetics of architecture. It was argued that light allows space to be revealed and is employed to amplify the spatial intentions of the creator. Light as architectural form was defined as the poetic illumination of interior space. Examples of light as architectural form were investigated from Classical antiquity to the advent of the Modern in the eighteenth century. It was concluded that light is employed poetically in architecture as physical matter but also to transcend reality, encoded with abstract meaning alluding to the metaphysical concerns of a period.

The hypothesis, that a Modern period in architecture can be defined, was investigated in Chapter 4. The advent of the Modern was identified as occurring in the mid-eighteenth century. This period was defined as being singular in the development of unique ideals informing the production of architectural theory and artefacts for the next two centuries. It was argued that this period conformed to the Newtonian paradigm and founded architecture on the principles of Rationalism. Concepts peculiar to Modern architecture were identified and elaborated.

In Chapter 5 glass architecture was investigated as a Modern phenomenon. The manner in which glass was employed as a tectonic material and an optical medium in articulating form and space, with reference to the concepts of Modern architecture, was explored. The particular importance of

literal and super-sensual transparency, a function of light, was noted and the origins of the crystal (glass) metaphor established. An evaluation of the evolution of light as architectural form in the Modern, supporting the existence of a poetics of light in Modern architecture, concluded the argument.

6.2 CONCLUSION

The investigation of artefactual evidence and theoretical and architectural history sources verify light to be a fundamental element in the poetics of architecture. The manipulation of light in architectural space, or light as architectural form, is a wilful, conscious and demanding act of creation in making architecture, equal to and supportive of the articulation of space and form during a distinctive architectural period. This may be termed the poetics of light in architecture. This premise suggests an approach for deriving meaning from and an understanding of architectural production by examining the poetics of light as evidenced in the artefactual and factual material pertaining to a period.

The approach assumes knowledge and an understanding of the primary facts and principles informing a particular architectural paradigm. It is therefore aimed at the informed scholar. Light and space in architecture assumes physical and sensual experience towards an accurate reading. For this reason artefactual analysis assumes precedence over factual and pictorial investigation.

The study tests this approach by exploring the emergence and evolution of glass architecture as Modern phenomenon. It concludes that concepts of space and form in Modern architecture may be explained in relation to both the physical and metaphysical attributes of light and illumination resulting from the use of glass as architectonic and architectural material. It is apparent that the light of the Modern equally concerns quantified illumination and its sensual and super-sensual qualities.

The association of glass architecture with the glass or crystal metaphor establishes a link between Modern architecture and architectural ideals originating in Biblical texts depicting crystal architecture. This disputes the conception of Modern architecture as distinctly independent from previous architectural periods. It re-establishes the disregarded importance of German Expressionism in the development of the Modern Movement, acknowledging not only the direct link through the personalities of Gropius and Mies van der Rohe, but a similarity of ideals contained in different formal expressions.

There is evidence of a common genealogy in the glass metaphor between Western architecture and that of Islam, as suggested in corresponding references found in Biblical descriptions and the Holy Qur'an. This suggests a possible reading of light in architecture, transcending cultural divides and indicating a possible communality of ideals informing disparate architectural traditions.

6.3 CONTRIBUTION

The considered contribution of this study is:

6.3.1 the definition and description of the term "poetics" applied to the discipline of architecture;

6.3.2 the elaboration and synthesis of the concept of light as architectural form through the investigation of written sources and artefactual evidence from the distinctive periods of the Classical antiquity to the Modern. This process resulted in the integration of disparate sources into a single substantive text. Contemporary architectural education relies, for the most part, on a scientific approach of measure and quantification regarding the role of light in architecture. This text indicates that the sensual importance of light deserves equal academic consideration and may be used to augment existing syllabi, including theory and history, regarding the subject;

6.3.3 the articulation of the origins and evolution of the essential concepts informing the period of the Modern regarding architecture. This articulation extends the interpretation of Modern architecture beyond the popular and simplistic definition of the period in Functionalist and Rationalist terms. The discussion does however not extend to a critique of the Modern;

6.3.4 the uncovering of the origins of glass architecture as Modern expression and its relevant application in translating Modern concepts into architectural form. This allows an unconventional reading of Modern architecture and establishes a genealogy linking it to other cultural and temporal architectural traditions;

6.3.5 the proposition of an approach for interpreting architectural production through an investigation of light as architectural form, i.e. the poetics of light in interior space;

6.3.6 The identification of sources relevant to the study of light in architecture

6.4 RECOMMENDATIONS

The concise approach followed in this study limits the exploration of the poetics of light to specific architectural paradigms within the Western tradition. It is recommended that this research be extended:

6.4.1 on a level which parallels this study, to explore the role of light in the poetics of architecture outside the Western tradition towards the formulation of an ecology of common concepts;

6.4.2 to the articulation of the poetics of light in architectural periods excluded in this investigation and especially the Post Modern paradigm which will allow for a theoretically substantive comparison with the Modern as episodes linked to a common paradigmatic change;

6.4.3 on a level exceeding this study, to investigate the relationship between the poetics of light in architecture and that in other visual arts within the same paradigm;

6.4.4 on a level exceeding the depth of this study comprehensively investigate the poetics of light in architecture within any of the particular periods included in the study.

6.4.5 on a level exceeding this study, to investigate the relationship between the poetic, poetics and architecture and the dialectic relationship between production, the act of making and experience in architecture.

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APPENDIX A

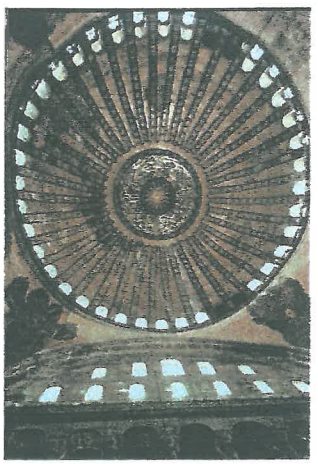
ILLUSTRATIONS

ILLUSTRATIONS TO CHAPTER 3

3.1 Pantheon, Rome (AD 120-124). View of interior (Department of Architecture, University of Pretoria, slide collection).

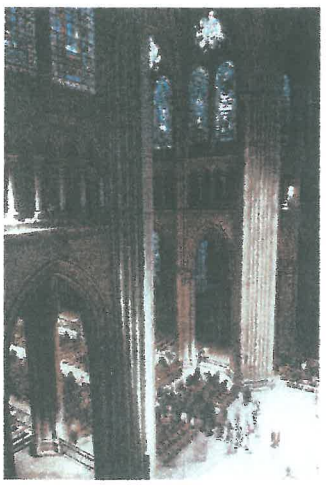
3.2 San Vitale, Ravenna, (AD 527-547). Interior view illustrating wall decoration and reflected light, (Van Rensburg, R.J., personal slide collection)

3.3 Hagia Sophia, Istanbul (AD 532-537, Anthemius of Tralles and Isidorus of Miletus). Illumination of the dome, (Department of Architecture, University of Pretoria, slide collection).

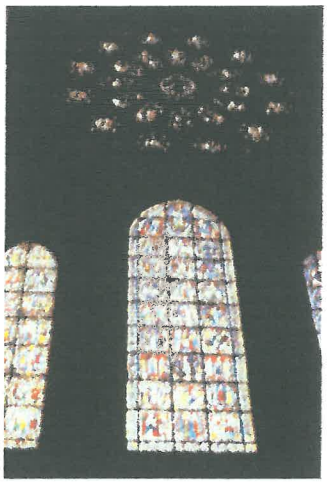


3.4 Hagia Sophia, Istanbul (AD 532-537, Anthemius of Tralles and Isidorus of Miletus). Illumination of the dome, (Department of Architecture, University of Pretoria, slide collection).

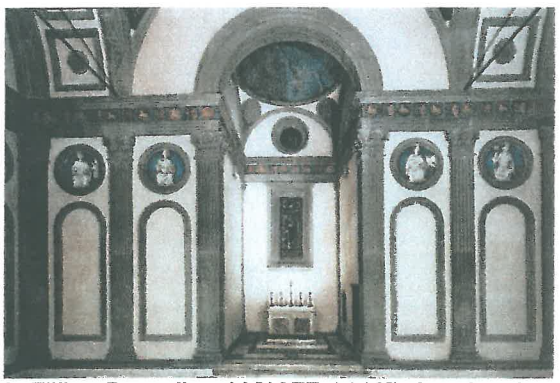
3.5 Hagia Sophia, Istanbul (AD 532-537, Anthemius of Tralles and Isidorus of Miletus). Detail of mosaic decoration and reflected light, (Department of Architecture, University of Pretoria, slide collection).



3.6 Chartres Cathedral (1194-1260). View of nave, (Van Rensburg, R.J. , personal slide collection)

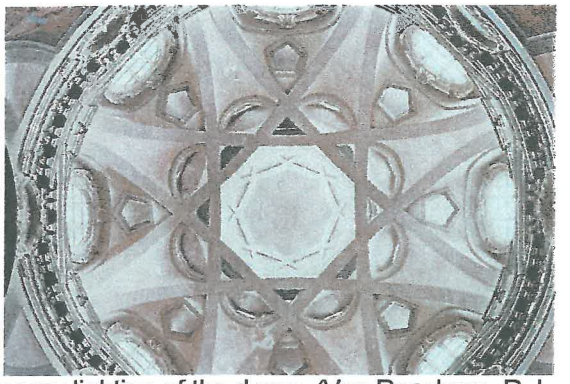


3.7 Chartres Cathedral (1194-1260). Detail of window design, (Van Rensburg, R.J., personal slide collection).

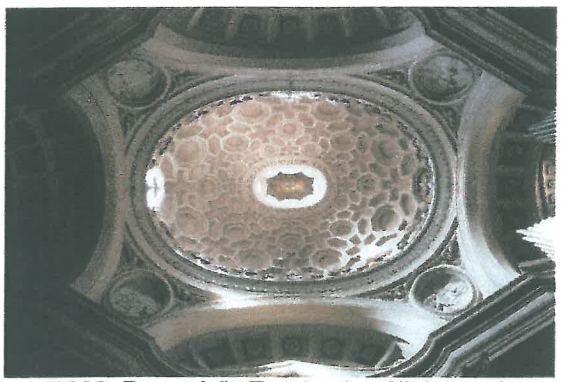


3.8 Pazzi Chapel, Florence (1429-1433, Fillipo Brunelleschi [1377-1446]). Interior view illustrating diffuse lighting, (Van Rensburg, R.J., personal slide collection).

3.9 *Vierzehnheiligen* (1743-1772, Balthasar Neumann). Light integrated into architectural concept, (Department of Architecture, University of Pretoria, slide collection).



3.10 San Lorenzo, Turin (1667, Guarini). Illusionary lighting of the dome, (Van Rensburg, R.J., personal slide collection).

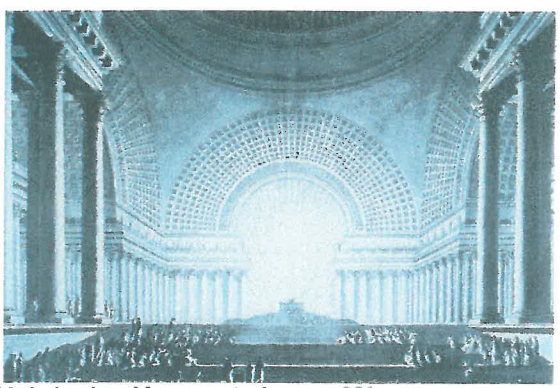


3.11 San Carlo alle Quattro Fontane, Rome (1638, Boromini). Emphasis of light on dome construction, (Department of Architecture, University of Pretoria, slide collection).

3.12 *Transparente*, Toledo Cathedral (1732, Narciso Tomé), (Department of Architecture, University of Pretoria, slide collection).

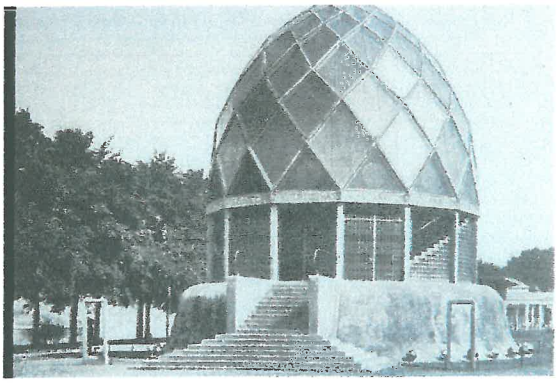
3.13 San Andrea al Quirinale, Rome (1658-1670, Bernini). Example of *Luce alla Bernini,* (Department of Architecture, University of Pretoria, slide collection).

3.14 Nymphenburg, Munich (1734-1739, Franscois Cuvillies), (Van Rensburg, R.J., personal slide collection).

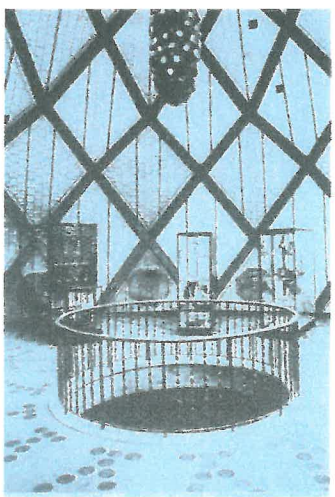


3.15 Métropole (1780-1790, Boullée). La lumiére mysterieuse, (**Wyss,** 1987: 121).

ILLUSTRATIONS TO CHAPTER 5

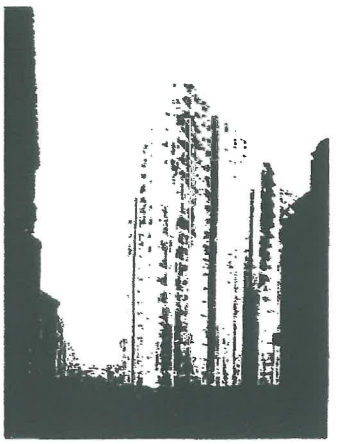


5.1 The Glass House, Cologne (1914, Bruno Taut). Exterior view, (Riley, 1995: 26).



5.2 The Glass House, Cologne (1914, Bruno Taut). Interior view, (Pehnt, 1973: 77).

5.3 The *Cathedral of Socialism*, woodcut (1919, Lyonel Feininger). Frontispiece, Bauhaus manifesto, (Bletter, 1981: 36).

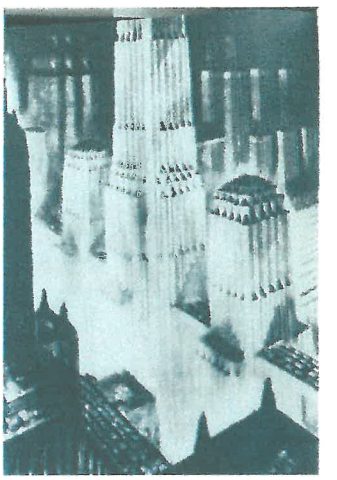


5.4 Project for Friedrichstrasse skyscraper (1921, L. Mies van der Rohe). Charcoal and pencil drawing, (Pehnt, 1973: 41).

5.5 *Bauhaus*, Dessau, (1925-1926, Walter Gropius). View of Machine Shop, (Gideon, 1947: 403).

5.6 Barcelona pavilion (1929 [1986], L Mies van der Rohe). Ambiguous transparency, (Van Rensburg, R.J., personal slide collection).

5.7 *Haus des Himmels* (c.1920, Bruno Taut) Illustration in *Frülicht* , (Bletter, 1981: 37).



5.8 *Crowding towers* (1929, Hugh Ferriss) Illustration from *Metropolis of tomorrow.* (Ferriss, 1980: 45)