The poetics of light in architecture:

Light as architectural form

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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).

The poetics of light may be defined as this deliberate manipulation of light in the creative act of architecture. To the same extent that spatial concepts have conformed to specific paradigms throughout the history of architecture, light and its articulation have been encoded with meaning peculiar to a defined period. Light in architecture can be qualified and investigated as an artefact, a fundamental element of the language of architecture, subject to the same rationale that determines the other elements of that language.

From this argument it follows that the distinctive architectural periods, from Classical Antiquity to the Enlightenment, may be defined by equally definitive attitudes towards the expression of spatial constructs, which in turn are underscored by a particular employment of light enhancing this expression. This article explores the evolution of light in the poetics of architecture during these periods. The focus is on light and its relationship to interior space, or light as architectural form. Form in this sense refers to the physical manifestation and metaphysical significance light assumes within architectural space rather than to formalism or the formal language of architecture.

The term poetics

Poetics, derived from a Greek verb, *poiëma – poiësis – poieein*, "to make", has been used, from Plato (428-347 BC) to Gaston Bachelard (1887-1968), to imply the aesthetics of creation. Poetics evolve out of tradition, informed by experience or precedent, and transcend the mimetic towards a dynamic process of criticism and selection. Architecture belongs to such a complex category of poetics. The term *poetics* encompasses the multivalent dimensions of the act of making architecture – from the physical to the metaphysical – those acts that aim at the creation of works that address the diversity of human needs.

Light as architectural form

Light as architectural form is inseparable from the characteristics of architecture. Architecture is qualified as space within, as "space that can be lived in, in a dynamic way" (Zevi 1990:56). According to Van de Ven (1993:357), "architecture is the art of space and all architectural innovations arise from

Figure 1: Pantheon, Rome (AD 120-124). View of interior.

new concepts of space." The creation of space is the most basic act of civilisation, and the revelation of interior space in light is fundamental to architecture. Louis Kahn declared that architectural space could only exist where it is revealed in natural light (in Devillers 1992:151).

Light in the absence of creatively conceived space

When space is not creatively conceived, there is no need for light to qualify and enhance it. As an example, Zevi (1990:58) cites ancient Greece and the play of light on volumes, and not the light through and inside the volume, that is space.

A comparison may be drawn with Roman architecture in which a similar attitude is found, but with a further qualification: where inside space exists but is static and isolated and no relationship to exterior space is intentionally established, light remains an isolated entity.

The dismissal of Greek and Roman architecture with reference to light as architectural form might be contentious. It is, however, supported by the absence of any reference to the importance of light in Vitruvius's (84-10BC) *De architectura libri decem* (33-14BC), the only major text on architecture to have survived Classical Antiquity. Vitruvius[1] restricts his remarks on light to cursory references to its functional value.

The neglect of light as architectural form might lie in the importance afforded Plato's *Timaeus*[2] regarding architectural thought at that time. In summarising Platonic theory, Van de Ven (1993:9) draws attention to its preoccupation with the visible and the tangible as measures of existence. The definition of space relies on the creation of boundaries, and for this reason the tangible in architecture became the predominant concern with a resultant commitment to the articulation of surface and volume – an architecture of light rather than light as architectural form.

Although it belongs to the tradition of static and isolated space, the Pantheon in Rome (AD 120-124), is an extraordinary confluence of architectural form and light in Classical Antiquity. The dome of the Pantheon represents the curved canopy of heaven (Fletcher 1956:157). To reinforce this perception, the illumination of the Pantheon relied on a single aperture, the nine meter oculus at the zenith of the dome; according to Fletcher (1956:158),

> This method of lighting produces the most solemn and impressive effect, and this great eye may have had a symbolic meaning, the idea 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.

Davey (2000:4) 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 celebration of time, the weather and the seasons" (figure 1).

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. Campo Baeza (1994:88), in a 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".

De Bruyne's (1993:320-1) 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 space cut out of an infinite light source is applied with expressive force in the Pantheon. The space is integrated with the cosmos, while achieving a salient autonomy from the solid mass of the exterior. The gradations of light are concentrated within the space, and the interaction of space-mass and the natural effects of light expose symbolic values.

The illumination of the Pantheon not only presents an instance of the 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. Two universal concerns regarding light as architectural form are presented in the Pantheon: light is used to dematerialise mass and form, as a counterpoint to the effects of gravity on structure. At the same time, through the articulation of surface as a receptacle of

Figure 2: San Vitale, Ravenna, (AD 527-547). Interior view illustrating wall decoration and reflected light.

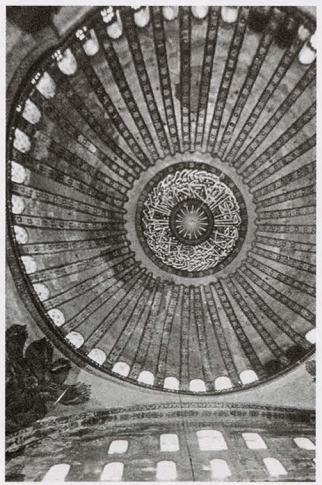

Figure 4: Hagia Sophia, Istanbul (AD 532-537). Illumination of the dome.

light, light is materialised to afford it tangible quality, which is associated with Platonic theory (Campo Baeza 1994:88).

Dynamic light

The most revealing examples of the poetics of light during the Romanesque and Byzantine periods are found in their ecclesiastic architecture. What distinguishes these periods from others with similar analogies of ecclesiastic architecture as an image of heaven as the City of God, is the predilection of the Romanesque to elucidate the cataclysmic events that will occur before entry to the New Jerusalem (Kostoff 1985: 331). This concept is translated into an introverted architecture where the relationship between internal space and the exterior is consciously avoided, the inner world of God's City cut off from the real world outside. This architecture departs from the comparable Classical example 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. It is at this moment that light becomes a protagonist in architecture.

In typical examples such as San Vitale in Ravenna (AD 527-548), the tectonic consistency of the space is dissolved – a result of the envelope being extensively covered by mosaics. Depth is sacrificed and walls become continuous surfaces, creating a seemingly weightless interior in which light achieves extraordinary effects. This is 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 as to seem as though it emanates from inside (figure 2).

In Byzantine architecture space and surface are conceived as receptacles of light. Openings are small relative to surface and are glazed with opaque and translucent materials. The result is a diffuse light, underplaying 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 use of light:

> The Byzantines were 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 Hagia Sophia (AD 532-537) is a celebrated example of Romanesque-Byzantine light (figure 3). Its architectural achievement is comparable to the Pantheon, but allows a greater level of understanding as the religion it was designed for is familiar, and contemporary accounts regarding the impression the building made on its first congregations exist. Paulus Silentiarius, delivering the inaugural sermon, described the dome hovering above its forty windows as seemingly "suspended from heaven by a golden chain" (Runciman 1975:56) (figure 4). The Byzantine historian, Procopius of Caesarea wrote 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).

Ironically, the Byzantine theory of light was derived from that of the leading Neo-platonist of the time, Plotinus. Being 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" (Runciman 1975:36). The Byzantines held light – the first created element – in supreme regard. Inspired by movement as an indication of life, space was animated through the considered manipulation of light and shadow. There is a deliberate intention to make every tessera and bas-relief shimmer with movement. This encouraged the spectator's glance to move through the space towards a dynamic comprehension of the whole.

Figure 3: Hagia Sophia, Istanbul (AD 532-537). Interior view illustrating light quality.

The importance of light as the first element, and sight as the primary sense, gave supremacy to pictorial art in the Byzantine period. Mosaic art overshadowed painting and fresco because it could catch and reflect light uniquely (figure 5). The inconsistency of depth and angle of the tesserae enhances the effect of light in motion and animates the representation, allowing light to shimmer and move across the decorated surface perceptibly (Runciman 1975:59,104).

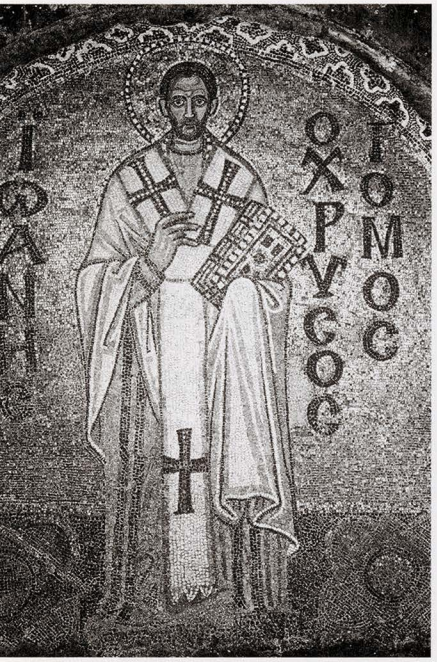

Figure 5: Hagia Sophia, Istanbul (AD 532-537, Anthemius of Tralles and Isidorus of Miletus). Detail of mosaic decoration and reflected light.

Romanesque-Byzantine light deliberately dissolves interior space through the illumination of continuous surface, which in turn is articulated and decorated to receive and multiply light. Light is used to create tectonic illusion and visually corrode structure. Light acquires metaphysical meaning and a divine dimension, alluding to the post-apocalyptic New Jerusalem.

Divine light

According to Jammer (in Van de Ven 1993:21), theological arguments conceived during the Middle Ages (1140-1400) shaped physics and cosmological thought to the extent of implying a direct association between God and space and place. Mediæval scholars drew direct parallels between the omnipresent God and the idea of space. As God is perceived as light, both space and light were endowed with divine character.

Gothic architecture may be distinguished from previous attitudes by a new symbolic conception of the divine personality of God. Although the divine aspect remained in the monumental symbolism of the church through the central position of Christ, both in composition and theme, his human side now emerged. This aspect was enforced by the use of light in the Gothic interior (Jantzen 1962:171). The particular quality of the church interior as "diaphanous structure" with reference to the "dematerialised" quality of the nave wall and the manner in which it is placed in a transparent spatial setting, resulted from the invention of the flying buttress and an element of "decisive importance", namely Gothic light (Jantzen 1962:78).

The illumination of space in Gothic architecture is concerned with light as spiritual power, capable of exerting an influence equal to architectural form. The luminous Gothic interiors were flooded with coloured light. Jantzen (1962:68) argues against an analogy with St Augustine's metaphysics of light, despite its importance to mediæval theology. Jantzen reasons that metaphysical light does not belong to the realm of the senses, but to the mind, and that Gothic light is a sensual light. 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. This attitude applies equally to the light of the Gothic interior, which is both sensual and super-sensual. This explains the precedence Gothic stained glass (light) takes over sculpture. Platonic anti-sensualism became an increasingly influential ideology, conceiving of the body as a source of sin.[3] The ethereal, non-representational quality of light became an acceptable substitute for sculptural representation.

Few examples of Gothic light in its original form remain, the one exception being the cathedral of Chartres (1194-1260) (figure 6). What is first apparent 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. According to Jantzen (1962: 69),

> 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.

This is not transparent, natural light. The windows themselves are its source, combining this artificial light developed to the highest possible intensity with colour developed to the highest possible intensity of darkness, brilliance and depth (figure 7).

In this instance, 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 transform the containing sides of the nave into a luminous wall. The coloured light acts as an essential element in the containment of space. It also acts as an expression of a sense of complete escape from the everyday environment and 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 sensory nature, but extends to the pictorial imagery, its "silent power exercising enormous influence over mankind"

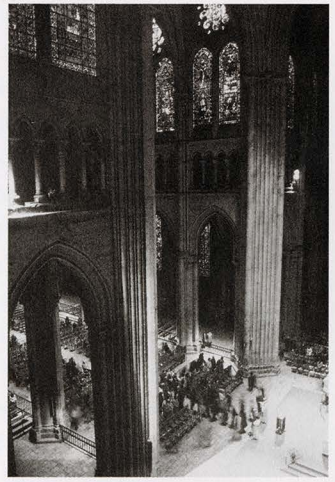

Figure 6: Chartres Cathedral (1194-1260). View of nave.
Figure 7: Chartres Cathedral (1194-1260). Detail of window design.

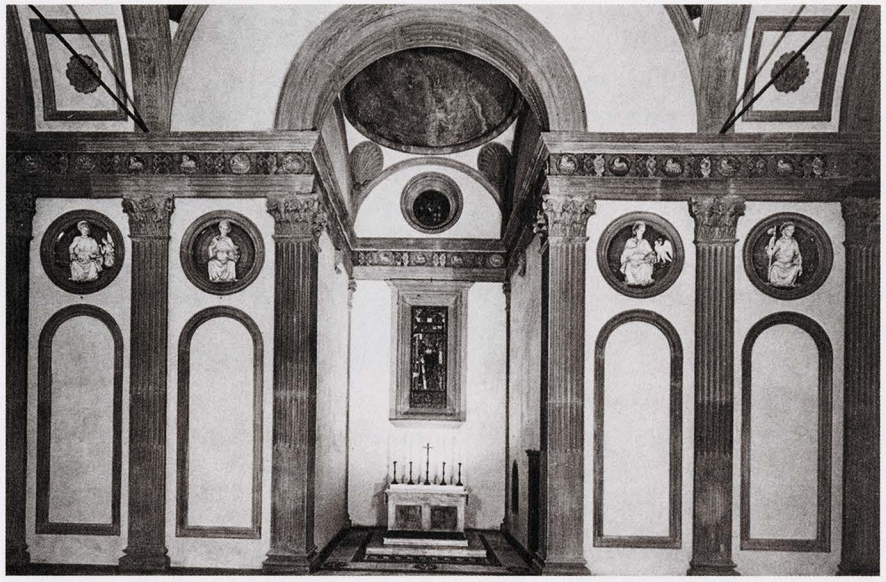

Figure 8: Pazzi Chapel, Florence (1429-1433, Fillipo Brunelleschi [1377-1446]). Interior view illustrating diffuse lighting.

(Jantzen 1962:70). The figures in the stained glass bring the feeling of transcendence into direct experience through the "immaterial creatures of light set like magically glowing symbols in the frontiers of space" (Jantzen 1962:157). The allegorical influence of the iconography of the stained glass exceeds that of the sculptures of the Gothic church, which in comparison are confined, while the light affects every part of the space.

The Abbot Suger (1081-1151),[4] in his essay on the importance of light, refers only to the material and iconographic quality of illuminated surface. Light to Suger primarily meant brightness, which had to impress as a metaphorical interpretation of the City of God. Although Suger ignored the spatial quality evoked by this new kind of luminosity, it does not imply that the relationship between Gothic light and architectural form was not intentional or apparent at the time, as illustrated in the thirteenth century theory of light contained in Witelo's *Perspectiva* (AD 1270). Witelo stresses the autonomy of architectural appreciation from theological thinking, and concentrates on the sensual perception of form as the basis of visual beauty. He defines the purely atmospheric qualities of *diaphanitas*, *densitas*, *obscuritas* and *umbria*[5] as the spatial-visual effects associated with the Gothic interior and its expression through light (Van de Ven 1978:24).

Rational light

Renaissance light, in comparison to the mystically artificial Gothic light, is defined by its transparent sobriety and is directly related to the principles of Renaissance architectural theory. Van de Ven (1978:9) draws attention to the resurgent importance of Plato's *Timaeus* in the formation of Western architectural theory during that period. Plato's proportional systems of the cosmos were translated into doctrines defining the proportions of buildings. The Renaissance architect saw architecture as the plastic embodiment of Platonic proportions and transformed the spatial cells of the interiors into similar mathematical systems.

Illumination became the vehicle through which these systems could be exposed. Renaissance material theorists, in dealing with perception of form, viewed light as a scientific tool through which reality could be revealed (Van de Ven 1978: 26). The premise was that visual perception of physical form is made possible through gradual variations in lightness and darkness – a function of clear translucent glazing, allowing natural white light to project natural shades in gradations of grey. As a result, the Renaissance temple was conceived as a vessel to be filled with natural light (De Bruyne 1993:321). Light sources are formally spaced with precise intention, and all planar architectural elements are illuminated with equal intensity. The space as a whole prevails, as opposed to the separate accentuation of parts. This articulation of space and light – without variation or hierarchy – corresponds to the intellectual Renaissance movement of Humanism[6] and the promotion of equality, liberty and tolerance (figure 8).

Proportion and regulation informed all aspects of Renaissance design. Evans (1995:248-249) draws attention to the Renaissance dichotomy wherein the preoccupation with proportion existed concurrently with the invention of perspective, which distorted that proportion. The various possible proportional analyses of Renaissance buildings are another anomaly, such as Wölfflin's (1889) and Wittkower's (1949) analyses of Leoni Battista Alberti's (1404-1472) Santa Maria Novella in Florence. Renaissance architects were not trying to show proportion but to bury it in imitation of nature, where the perception of regulation exists without visual certainty: "Vision may be achieved through the intro-mission of light rays but certain kinds of visual understanding are achieved through intellectual extra-mission" (Evans 1995:250). With this as premise it may be argued that Renaissance illumination can be interpreted, through rational and physical principles, as an effort, through diffusion and reflection, to allude to and capture the naturalness of light, exposing the naturalised order buried in the spatial design. At the same time, as an inevitable part of subjective perception, meaning is attributed to physical light, as a representation of metaphysical light illuminating understanding (Teyssot 1990:59).

Light and illusion

Architectural theory during the Baroque period is essentially concerned with dualisms. In abandoning the Greek organic analogy of the Renaissance for a new mechanistic one, theorists struggled with the extreme fissures between mind and world, reason and sense, determinism and freedom, and internal and external sources of form (Gelernter 1995:121). The expression of light during the Baroque is an interpretation and fusion of these extremes. The intrigue in which the whole concept of light was held in every sphere of intellectual life is a distinguishing feature of the age. Painters as divergent as Caravaggio (1573-1610), Rembrandt (1606-1669), Poussin (1594-1665) and Lorrain (1600-1682) found a consistent

Figure 9: Vierzehnheiligen (1743-1772, Balthasar Neumann). Light integrated into architectural concept.

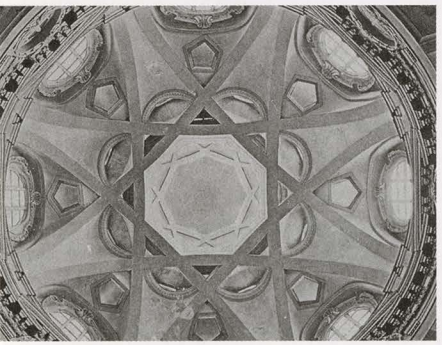

Figure 10: San Lorenzo, Turin (1667, Guarini). Illusionary lighting of the dome.

source of inspiration in the symbolism of light. This fascination with light extended to architectural space and to the expression of a representative poetics of light.

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

As a powerful propaganda tool of the Counter Reformation, the Roman Catholic church is an expressive vehicle of the poetics of light. What distinguishes the Baroque from previous eras is a preoccupation with indirect light and the deliberate effort to obscure or underplay the source. The intention is similar to that of the Gothic – to imbue light with a divine quality. Instead of making light artificial through colour, it is deliberately manipulated in a manner allowing it to acquire a mystical dimension, as if generated within space (figure 9). The passage of light is woven into the architectural concept of complex spatial geometries 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 amplifies its illusionary effects (figure 10). The upper part of the building becomes a 'vision of light'. Reflected surface illumination takes precedence over the source of light, the latter intentionally obscured from view. The perforation and the concealed light source seem to detach the lantern from the dome. Zevi (1990:58) has it that this represents architecture as a celebration of light. His interpretation of the illumination of spaces designed by Guarini and Francesco Boromini (1599-1667) claims an unprecedented approach. Light is not so much directed onto walls or objects but into architectural space, making space the source and protagonist of the whole (figure 11). The dematerialisation of tectonic matter, the mystification of light, and the fusion of reality and illusion epitomise Baroque light.

Allied to these concepts is the illusionary fusion of art and architecture and the appropriation of light as an agent in this process. A prime example is the *Transparente* (1732) in the Toledo Cathedral by Narciso Tomé (figure 12), but it is in the work of the architect-sculptor Gianlorenzo Bernini (1598-1680) that Baroque light finds its ultimate expression. In comparison with his contemporaries, Bernini did not only rely on the sensuous, but valued a scientific approach to lighting design. To this end he devised his own tables for

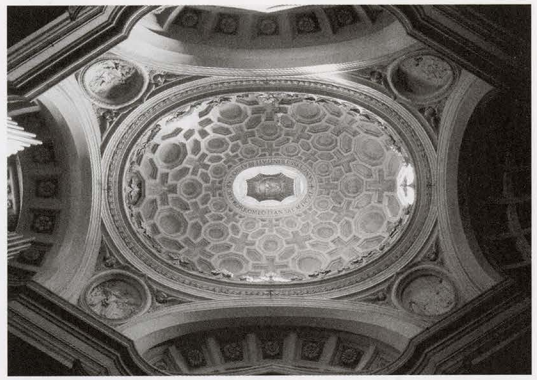

Figure 11: San Carlo alle Quattro Fontane, Rome (1638, Boromini). Light directed at space.

Figure 12: Transparente, Toledo Cathedral (1732, Narciso Tomé).

Figure 13: San Andrea al Quirinale, Rome (1658-1670, Bernini). Example of Luce alla Bernini.

measuring light.[7] He believed light could be scientifically quantified and controlled. This approach to illumination was so unique that it was referred to as *Luce alla Bernini* (figure 13). By employing various sources of diffused light, a homogeneous environment was created. This shadowless light was used to illuminate the depth of space and to anchor it geometrically. A defined, dynamic beam of solid light, *Luce gettata*, which animated the space, broke the even, static illumination. The contrast and counterpoint between both types of light resulted in a vivid architectonic statement: "Solid light in visible movement dancing over an invisible diffused light in calm stillness" (Campo Baeza 1994:89).

Light in the age of reason

Bernini's approach to the poetics of light represents a synthesis of the dualism of the time, integrating the scientific with the emotive. The rational approach concerning light, associated with the scientific and Newtonian ideals of Enlightenment, is primarily expressed in the secular architecture of the period. Louw (1994:300-1) refers to the sash window as the "harbinger of an age of progress and enlightenment."

What made the sash window important is the special significance that had come to be attached to light. Beginning in the seventeenth century and culminating in the eighteenth century, there was a growing conception – especially 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 progress in flat glass manufacture and carpentry technology – revolutionised attitudes toward interior design. Spaces that were well-lit in a uniform manner that were decorated with mirrors, painted stucco and wood ornamentation, became the aesthetic norm. The acute contrast with the architecture of preceding times came to symbolise the superiority of an era of light and knowledge over previous centuries that were considered to represent darkness and ignorance (figure 14).

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 precursor 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 intimation 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 made possible by glass architecture in the twentieth century (figure 15).

Conclusion

Light as architectural form is defined as the poetics of light in the illumination of interior architectural space. The poetics of light is allied to the poetics of architectural space. Light is essential in exposing architectural form to perception, and space to observation. Principles particular to an architectural period inform attitudes toward the use of light identical to the manner in which it guides the conceptualisation of architectural space and form within that period. Light exposes and amplifies spatial intentions and is an artefact equally representative of an architectural paradigm.

Light as architectural form is encoded with meaning that transcends physical reality. The sensual perception of light is used

Figure 14 (far right): Nymphenburg, Munich (1734-1739, Franscois Cuvillies).

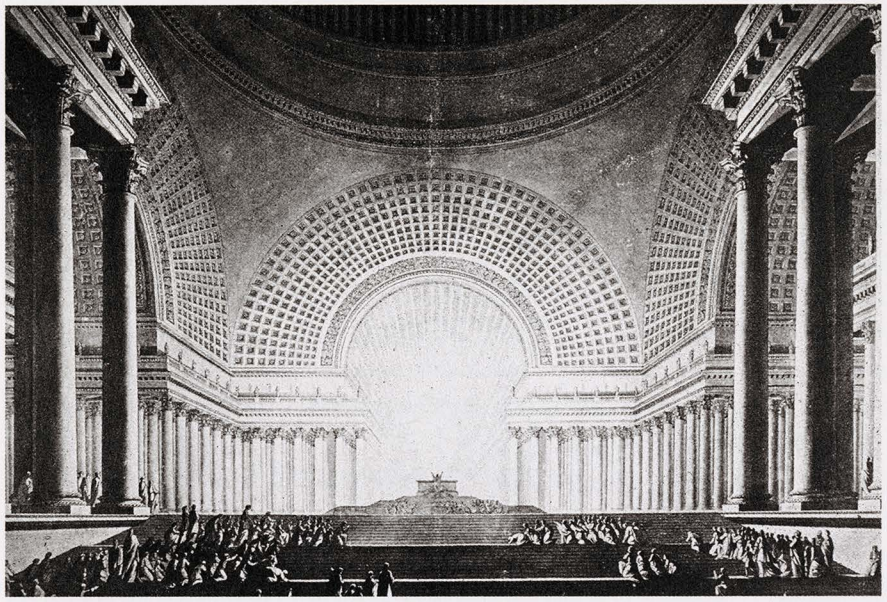

Figure 15: Métropole (1780-1790, Boullée). La lumiére mysterieuse.

in architecture as a vehicle for the super-sensual expression of abstract concepts such as divinity and enlightenment. Light is used to communicate metaphorical and allegorical narratives, fusing the divide between architecture and representational art. The representation of light in art often corresponds to the physical and metaphysical manifestation of light in the architecture of the same period.

A recurring theme in the poetics of light in architecture is the manipulation of illumination to undermine tectonic form. At the same time surface, volume and space are articulated to receive, reflect and amplify light in a manner allowing the immaterial quality of light to find physical expression towards a discernible sensory perception of light and space.

Endnotes

1 The only mention of openings to be found is in Book III, which refers to the decorative design of Temple doorways. In Chapter III of Book VI on the proportions of rooms in private houses, a typical observation refers to the articulation of a roof opening to allow for the illumination of the principle rooms (Vitruvius 1960:177).

2 The *Timaeus* presents the defence 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 et al 1990:223).

3 The Cisterian theologian, Bernard of Clairveaux (dates unknown), considered sculptural representation dangerous because it distracted from theological contemplation (Jarzombek 1994:37).

4 Abbot Suger of St Denis (1130-1150), the Gothic prototype, embodies a singular occasion in the Middle Ages when theological ideas and architecture are unified. His book on the building and decoration of the church of St Denis was published in 1151.

5 Transparency, density, obscurity, and shadow.

6 Humanism originated in fourteenth century 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 sixteenth century.

7 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 thus contributing to the latter's mastery of light.

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15 Wyss, 1987: 121.