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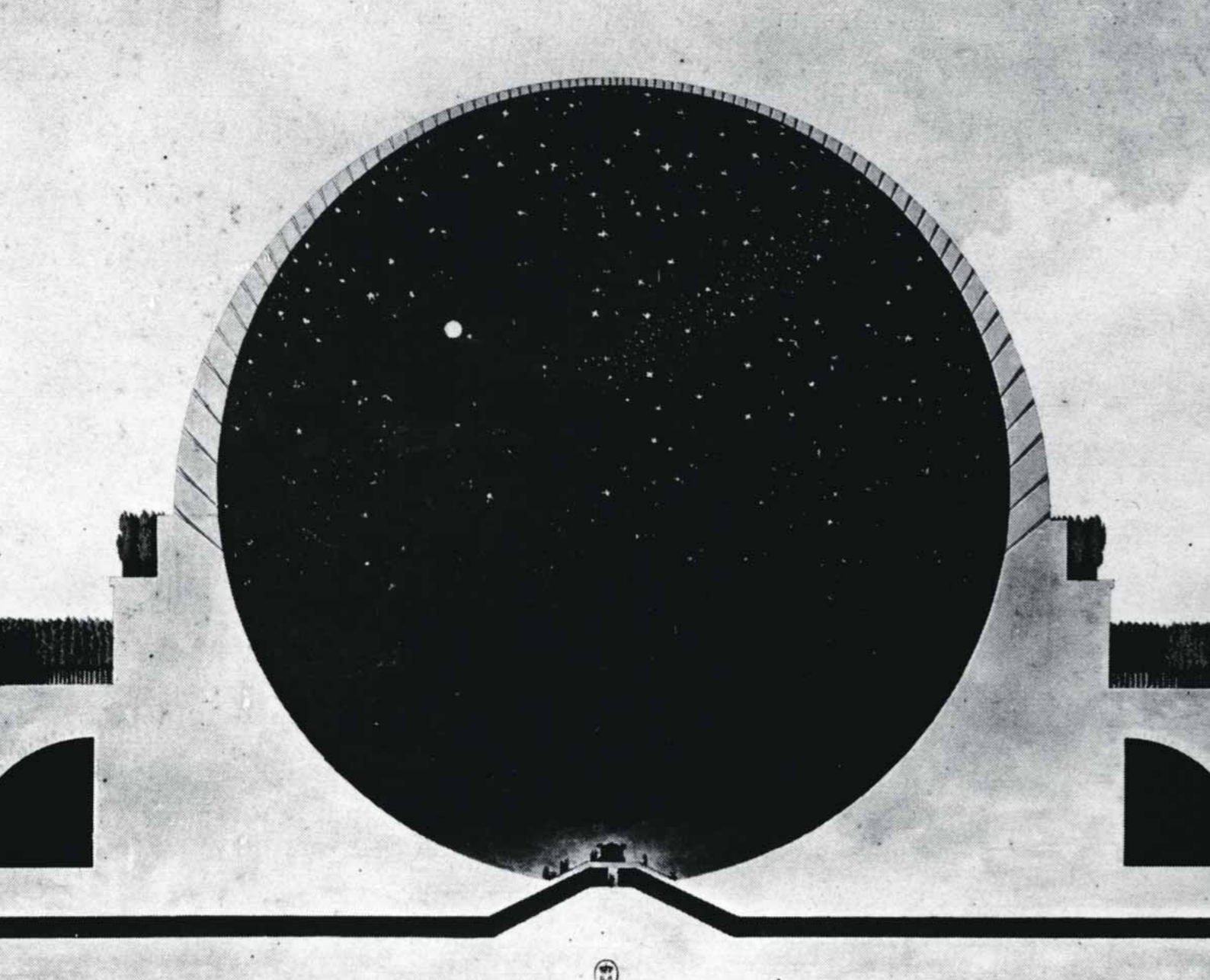
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## MANKIND AND ARCHITECTURE

Mankind as the focal point of architecture:  
interior views of a corresponding relationship.

# LIGHT AS A CULTURAL ASSET

*Above* Isaac Newton was one of the first scientists to explain the phenomena of the heavens and light without relating them to religion. In his grand plans for a Cenotaph for Newton, the revolutionary French architect Etienne-Louis Boullée attributed a god-like character to the British physicist in 1784. Hundreds of tiny openings in the sphere, which was to have a diameter of more than 150 metres, make it into a depiction of the heavens with the moon and constellations.

Text by Pablo Buonocore.  
Image selection and captions by D&A.

From the sun cults of the ancient Egyptians to the modern-day office workplace, our relationship with the sun, and consequently with daylight, has been a determining factor of human culture down the centuries. In his article, Pablo Buonocore discerns a periodical backward and forward shift in our attitude to daylight.

WE NEED DAYLIGHT as a framework on which to adjust our natural biorhythm. We need only to glance outside to pick up the pointers we need for the well-being of both body and soul. We unconsciously gather a wealth of information from factors we see as commonplace, such as mood, the position of the sun, the weather situation and the time of year – all of which are essential for the regulation of our bodily functions.

But each and every one of us is different, and our receptiveness to factors such as the brightness and tonality of a light atmosphere is individual on both a conscious and a subconscious level. People with a more rational disposition will tend to prefer bright, white light, while the more sentimentally minded err towards a more subdued, soft lighting effect with a slightly yellow tinge. This is complicated by personal experience gained in connection with light or dark places which bring out a whole series of moods and associations even before we have made a conscious assessment of a space. Perception is consequently not simply a question of the lighting mood of a space but also of the baggage of individual experiences we carry round with us. These are the factors which cause us to pick up the mood of any space or location subjectively.

But it is not only our own internal experiences that cause us to perceive light differently from our fellow humans. There are without doubt cultural differences to be found, originating from religious beliefs and their interpretation as to the significance of the sun, the light or the sun's rays. Even in the Christian culture, the significance of daylight as a metaphor for God has undergone a continuous transformation over the centuries. Conversely, in our daily lives the cultural significance of the sun has diminished rather than increased. When the sun was superseded by the clock and the calendar as a means of telling the date and time, there was a shift in the dependence of our daily rhythm on the rising and setting of the sun.

The influence of daylight on our lives is not simply cultural but also geographical. In southerly regions, ingenious methods have been devised to provide shelter from the hot rays of the sun. Wide overhanging roofs and shady hallways are among the preferred methods for preserving a pleasantly cool atmosphere away from the oppressive heat of the midday sun. Shady, darkened spots frequently have pleasant associations. Conversely, in Scandinavian countries there is an obses-

sion with “catching light”. Since the very beginnings of the Modernist era, architects in this part of the world have looked for ways of collecting the sparse Northern light using funnel or fan-shaped building structures and using it to maximum effect in building interiors.

Like the various epochs that have marked out the history of Europe, the different architectural styles that characterise them have also evolved their own individual position in relation to daylight. At times, during the Romanesque period for example, the light mood was deliberately engineered to be mystic and dim, while in periods such as the Renaissance, a bright and rational atmosphere was preferred. Over the course of centuries, the light mood and its cultural significance have swung regularly back and forth like a pendulum between the rational and the emotional. However, since the Post-Modernist period this pattern has changed, with varying parallel styles now remaining in vogue concurrently. Consequently, we are lucky enough to live in an era in which the architecture of daylight is tailored to the practicalities of the project in hand rather than being subject to the dictates of fashion.

## THE CULTURAL HISTORY OF DAYLIGHT

From the Christian perspective, the creation of light stems from the very concept of Genesis. But the special importance attached to light is not exclusive to the Old Testament. The mythology of many cultures equates the creation of light with the beginning of an ordered and living world, while in contrast the shadow and darkness are synonymous with death and chaos. This dualistic approach has served in many of the world's religions to embody good and evil. Since pre-historic times, mankind has venerated light-filled artefacts, and the sun and its light have been deified, particularly by early civilisations. Cult objects were often treated as a medium between mankind and the light. Translucent amber, for instance, was revered as a symbolic carrier of light. The light symbols favoured by ancient civilisations tell us a lot about the human craving for light-filled artefacts and their transcendental significance.

When light was brought into the home during the Stone Age in the form of fire, life underwent a drastic change. For the first time, mankind was able to wield an active influence

**"But the architects who design spaces today have lost their belief in natural light. By making themselves dependent upon the pressing of a switch, they are settling for the use of static light and forget the eternally changing properties of natural light that can transform one space into another at any second during the day."**

Louis I. Kahn (source unknown)

in the eternal battle between light and dark. The sun as the 'redeemer' of light after the darkness of the night was now no longer the only source of light available for use.

Human observation of the sun and the cultivation of sun-related myths go back as far as the Bronze Age. One example that illustrates this is Stonehenge, whose stone gateways are positioned to allow the rays of the sun at certain elevations to fall at precisely defined points in the centre of the circle. Many findings testify to the use of sun chariots and a variety of other sun-related motifs. Hans Sedlmayer explains: "We see the large, flat golden disk itself, which may be interpreted as an illustration rather than as a symbol of the sun. It is decorated by fine circular and spiral-shaped ornamentation whose primary motif is large annular rings and rows of smaller circles and spirals. Circles and spirals are without doubt used as vehicles of solar symbolism. The reference to the light is provided by the material, the reference to the sun is made by the circular shape." At Stonehenge, experts were also able to verify that the increasing radius of the stone circles is concurrent with increasing calendar precision – to the point at which the stone circles are indicative of the 13 lunar months. This is an indication that Stonehenge was used as a relatively precise instrument for the measurement of time.

It is almost impossible to deal with the subject of light and its significance for any civilisation without looking at the sun and death cult of the ancient Egyptians. While civilisation on the European continent lagged well behind in the deepest Stone Age, the Egyptians had already successfully taken the momentous step into the Bronze and Iron Age. We are fairly sure that the most significant of the Gods worshipped by the Egyptians was Ra. He embodied the sun itself and was worshipped with an unflinching intensity throughout all the dynasties. The picture of Ra, the Sun God, was linked to the conception of the daily path travelled by the sun. The disc of the sun represented his face or his eye. The Egyptians imagined that Ra was born again of the Goddess of the Heavens every day in the east, and then appeared over the horizon (his eye opening). As the lord of the heavens, he then traversed the water of the skies in his barque, depicted as a falcon, watching over the earth.

Findings indicate that the Egyptian pyramids were given

a polished finish which took away their dull stony surface, totally transforming their appearance. They turned into geometrically precisely calculated mirrors and thus became symbolic of the status of the deceased king, who was at one with Ra, the sun, the light and the universe. The tips of most pyramids were finished with a capstone called a pyramidion made of precious metal. The capstone was designed to catch the first and the last rays of daylight, and appeared as a light-filled torch beaming out over the earth.

BETWEEN MYTH AND RATIONALITY:  
FROM ANTIQUITY TO THE RENAISSANCE

Both the Greeks and the Romans attached a far less important role to light. It was the Greek civilisation that developed the geocentric view of the world, placing mankind on the earth in a world made up of light and shadow, moving into the realm of darkness in death. The Greeks set out not to negate nature as a force to be resisted, but to embrace it by accepting and researching its laws.

But still the Greek temples must be seen as a type of bridge between mankind and the immortal world of the gods. Their interiors were no longer enclosed by walls that would prevent the ingress of light, but by columns that thematised the transition between inside and outside. As most of the temples were oriented towards the east, we may imagine how the gilded statues of the gods were lit up by the rays of the low lying sun penetrating the columns at dawn, seeming to awaken them, like the temple statues in Ancient Egypt, to new life.

Right up until the height of the Middle Ages, the abstract concept of light continued to assume the role of mediator between God and the world, and was even used as a symbol for God himself. We are familiar with the use of light as the symbol of Christ's resurrection. His words "I am the light of the world" are still valid today in the Church. The materialisation of light became a spiritual phenomenon considered independently of the sun in Christianity. According to Genesis, on the first day of creation there was light – the sun and the stars were created only afterwards.

The Romanesque cathedrals (900-1250 A.D.) are the last buildings in Europe that were constructed not for people but

1. The meaning of the stone circle at Stonehenge, set up in the Bronze Age is still intensely debated today. However, it was most probably a site for sun worship and death cult. The reason for this assumption is that the circle is aligned with the sun for the summer and winter solstices.

2. The Sky Disc of Nebra, discovered in 1999 in Saxony-Anhalt, is an estimated 3,600 years old and is the oldest known depiction of the heavens in the world. It is agreed by experts that the sun, moon, 32 stars, a celestial barque and a horizontal arc are all portrayed on it.



PHOTO: DAE SASTORIV / WWW.LASTREFUGI.CO.UK



PHOTO: JURAJ LIPPAK / LDA SACHSEN-ANHALT



PHOTO: AIG-IMAGES / BIRCH LESSING

3. Obelisks were symbolic monuments in ancient Egyptian sun worship. They represent the petrified rays of the sun god and make the connection between this world and that of the gods. This obelisk in St. Peter's Square was brought to Rome under Caligula (12-41 A.D.).

4. This copper engraving by Christoph Scheiner (1575-1650) illustrates the scientific and secular approach to light phenomena in the Renaissance and Baroque. Scheiner was the first person to observe sun spots, independently of Galileo Galilei, with a telescope he constructed himself.

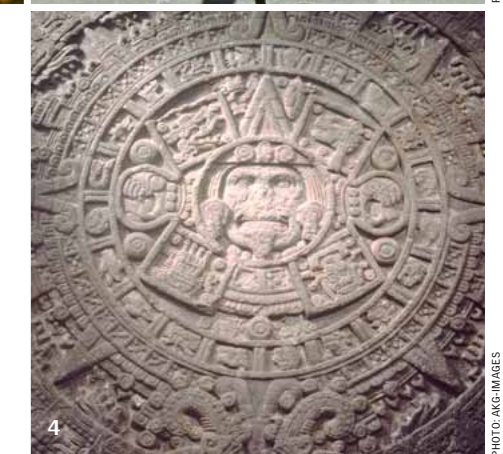
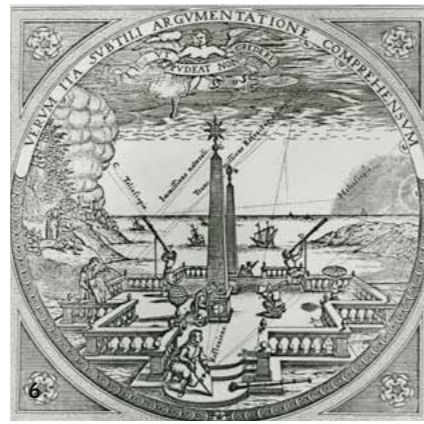


PHOTO: AIG-IMAGES



5. A compact, solid construction, like this at the Abbey of Montmajour near Arles, is typical of the Roman style of church architecture. Due to the kind of construction, there are only relatively small window openings through which light is barely able to penetrate. The church interior is usually only seen like this at twilight.

PHOTO: ACHIM BEDNORZ / BILDARCHIV MONHEIM



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PHOTO: ANG-IMAGES / WERNER FORMAN

for a godhead that performed visible miracles. Romanesque sacred buildings, solidly at one with the ground, are bastions of faith. They reflect the zeitgeist of the cluniastic reforms, which set out to counteract the influence of secular authority over ecclesiastical affairs. The architectural orientation was aligned here from the outside towards the inside. The exterior of the church sent out a clear message of God's omnipotence and greatness, while the incidence of daylight inside was reduced to create a dim and mystic atmosphere intended to inspire a shiver of respect and awe inside the house of God. In contrast to the cults of ancient civilisations, the church assumed the function of an assembly point and was no longer reserved for the exclusive use of only a small group of priests.

During the Gothic period, churches became a gathering place for ever greater communities. By the middle of the 13th to the end of the 15th century, this tendency led to the construction of enormous buildings with 'divine' dimensions that appeared to defy the laws of gravity. Since the very first Christian churches were built, every conceivable means had been used to represent and build a structure symbolic of 'rising light'. These endeavours reached their peak during the Gothic era. Ribbed vaults and flying buttresses satisfied the demand for resolution of the enclosing wall. The sense of perpendicularity favoured by Gothic architecture was supported by pointing arches whose ribs formed a continuation of the rising columns, drawing them together and sending them upwards into infinity. The cathedral in Chartres is a good example of the use of ever larger translucent membranes in coloured glass. The Gothic window is an opening only as defined by the construction. The impression it creates inside the building is more that of a disembodied wall illuminated ethereally from behind. The opacity of the glass surfaces creates the impression that the walls, of which the glass area form a part, are glowing. The rose window in particular may be interpreted as an effigy of the sun, and the structural embodiment of the equation "light equals God and the sun equals the image of God". To be touched by the light was to be touched, according to popular belief at the time, by the hand of God.

The demythologisation of light began at the end of the 13th century, with the first attempts to explain nature. In the same way that architecture was rendered rational and tangi-

ble by proportions and the rules of physics, an attempt was made to rationalise the concept of light. The perception of light changed during the Renaissance period between 1420 and 1660 from the religious to the representative and aesthetic, causing the symbolic concept of light to lose much of its significance. The function of light was now simply one of illumination. Brightness and transparency became associated with progressive building; the mystic twilight of the Middle Ages was now synonymous with a barbaric and backward age. For the first time, large windows permitted transparency from both the inside and the outside of building. Light from above was welcomed as a new symbol of quality, architects such as Bramante and Michelangelo began, for the first time, to consider the use of roof lights. Churches were divided into areas of differently designed lighting effects: the nave as the (laterally lit) passage through the building, the cupola as the (top lit) centre and the choir stalls as the (neutrally lit) end. This concept is clearly demonstrated by the Andrea Palladio church II Redentore in Venice. Here, the significance of light is reduced to its functionality. It illuminates every angle of the nave precisely, reflecting an austere, demystified prayer room. The architectural lighting themes used in the Renaissance are often viewed as reinventions of the Modernist period. In fact, they represent rather a re-interpretation that was to be manifested predominantly in profane architecture.

EXTRATERRESTRIAL LIGHT AND RATIONAL BRIGHTNESS:  
FROM THE BAROQUE TO THE ENLIGHTENMENT

Between 1560 and 1760, the pendulum denoting the perception of light swung back towards the sentimentality that characterised the Baroque period. A more intense relationship with light was in evidence; the way we experienced the sun was perceived in a more sensual perspective. Once again, the search was on for a diffuse, unreal experience of light avoiding the formation of hard shadows. The most striking achievements of the light architects of the time lay in the creation of a ring of lights above which a cupola appeared to float, its curves illuminated so as to appear totally dematerialised. This effect is encountered with particular poignancy when the sun is low in the sky in the Chapel of the Holy Shroud in the Cathedral

6. In many early civilisations, the sun was considered to be the highest divinity. On the Aztec sun or calendar stone, the face of the sun god Tonatiuh can be seen at the centre. He is framed by four pictures that represent the four previous suns (worlds) in Aztec mythology.

7. During the course of his research, Sir Isaac Newton, mathematician and physicist, refracted light through a prism and ascertained that seven colours of the spectrum could be produced from "white" sunlight. In doing so, he discovered one of the fundamental principles of modern optics, and religion no longer had the exclusive rights to the interpretation of light phenomena.



PHOTO: ANG-IMAGES / ERCHLESSING

at Turin. The complete illumination which floods the zenith of the cupola is achieved by a bank of windows at the cupola tip that is out of view to the observer from the inside.

Profane baroque architecture, on the other hand, linked light with the concepts of reason, liberty and power. An example of this is Ludwig XIV's Hall of Mirrors at Versailles. The splendid mirrored wall along one side of the hall intensifies the incidence of light by additional mirrored surfaces on the opposite side, thus multiplying the efficient use of light and allowing the elaborately painted barrel vault to be admired in all its splendour by visitors. From this time on, admiration for the marvels of architectural beauty was no longer the exclusive province of the churches.

During the Enlightenment, a fundamental shift took place in our metaphysical attitude to light. The concept of a spiritual overworld bathed in eternal light slowly receded, making way for a new and rational way of thinking. The underlying reason for this process of illumination, "whose epistemological title was 'Research' and whose political program title was 'Enlightenment'" (Peter Sloterdijk), is to be found in the new belief in humankind and its ability to construct the world itself. Light was transformed from a medium into an instrument. Once architects and builders had made every conceivable use of the sunlight by the end of the 17th century, mainly in the service of church building, the use of lighting began to assume a slightly less spiritual aspect. In Classicist buildings, the rational use of light to achieve brightness and metaphors of Cartesian reason were dominating themes.

The dawning of industrialisation saw the perception of light become finally and irrevocably demystified. From here onwards, light also served the purpose of illuminating buildings as profane as greenhouses and factory halls. The newly germinated 'appetite for light' was manifested in architectural terms in such projects as the Great Exhibition in 1851, in particular in Joseph Paxton's famous Crystal Palace. Visitors admiring the colossal steel and glass construction realised that the rules conventionally used to judge architecture no longer applied. The significance of Crystal Palace lies not only in the solution it presented in answer to major problems of statics, and not even in the innovative pre-fabrication methods and technical deliberations invested in the project,

but in the new relationship that evolved between the technical means and the purpose of representation embodied by the building. Meanwhile, light-filled rooms with glazed facades were accepted initially only in publicly used rooms. Housing construction, for example during the Biedermeier era (1815 – 1848), still favoured the same dim half-light. Living areas were dominated by dark, light-swallowing materials. Bourgeois architecture throughout the 19th century was characterised by a strict separation of the outside from the inside.

SUN, LIGHT, AIR AND SPACE:  
DAYLIGHT IN THE MODERNIST AGE

The advent of a new sense of practicality now saw daylight making its entrance into the home environment. Brightness illuminating every nook and cranny now became synonymous with 'liberated living'. Plain glass, in undivided panes where possible, turned the home into an appendage of the outdoor world. The light concept reached its zenith with the complete dissolution of form, culminating finally in a house made purely of glass. Bruno Taut designed a Crystal House for the 1914 Werkbund Exhibition in Cologne. The walls and the elaborately formed domed roof were made of multiple glass panes. The impression of anyone inside was that of standing surrounded by pure light. Glass was used as a building material to depict joie de vivre and power. The overnight success of the new perception of light was aided by new sociological thinking and changing attitudes towards living hygiene. The Weissenhof housing complex, constructed in Stuttgart in 1927, provided exemplary proof that the theoretical concept of liberated living was capable of being implemented in practice. The foundation stone for the Modernist age had been laid.

New industrial processes and serial manufacture opened up the scope of young architects to develop new forms for contemporary architecture. "Sun, light, air and space" was the order of the day. Le Corbusier's manifesto "Five points towards a new architecture" advocated detachment of the facade from the supporting construction, which from then on permitted free positioning of openings around the building facade. Horizontal windows were introduced, and with them the possibility to impart complete, even illumination of rooms. The first

**8. The Pantheon was built between 118 and 125 A.D. as a place of congregation in Rome. The most predominant feature is a 9 metre wide opening at the top of the dome, which symbolises the sun in its firmament. When the air is damp or misty, the sunlight is concentrated into a visible ray of light that makes it obvious how our most important star moves across the heavens.**

room-height glass walls were created, and the 'brise soleil', or sunbreaker, developed as an answer to overheating in summer. From now on, there were no holds barred to free composition using light. Under continual development were new glass types, sun filters, control and deflection devices that permitted natural light to be modulated at will and modified the sun's rays to fulfil their intended purpose.

But even among progressive architects, Le Corbusier's five-point program was not greeted with unanimous recognition. Louis Kahn's rejection of the concept of separation of facade and skeletal structure clearly sets his work apart from the transparency of the Modernist movement. Kahn's issue was the emphasis of mass through structure, a theme taken up by many of his contemporaries, such as Paul Rudolph. Kahn's work sought to create the mystique of a space and bring it to life by using the energy of natural light. He worked with graduations and transitions from the public to the private and from the outside to the inside in order to modulate daylight. He also used light to support floor plan concepts that embodied his notion of spaces serving and spaces served.

The period from the Modernist to the Late Modernist age is characterised by the endeavours of architects to portray incident light situations with exemplary, and occasionally exaggerated, design solutions. Technical progress now opened up the possibility of implementing almost any architectural design concept calling for free placement of openings in the building facade. However, these new aspects were not without their problems in terms of statics, energy and climate technology. The process of finding solutions to these problems frequently lagged behind the inventive creativity of the architects. The all-glass house was acknowledged not to be the most sensible of solutions for a wide variety of reasons. Ways of ideally metering the daylight consequently became one of the most hotly debated issues in the world of architecture during the 20th century.

From today's perspective, the formative years of Kahn and Le Corbusier demonstrated that what is needed is not so much an intellectual approach as individual custom-tailored solutions to create optimum lighting atmospheres. The different ways of emphasising daylight according to specific architectural styles during past epochs have given way to a search

for building-specific solutions to the problem of illumination using daylight. There is now a widespread realisation that the heterogeneous building requirements of our age cannot be met by a standardised 'one-fits-all' solution engendered by a single architectural approach. At the same time, problem situations arising in practice have resulted in a situation where similar daylight-related solutions have evolved to address related building assignments. This pragmatic approach is naturally subject to the vagaries of fashion. In recent years, for instance, a new interpretation has been lent to glass facades as the expression of corporate philosophy – in defiance of the resulting overheating problems. Although it is possible, by highly complex technical means, to actually implement an all-glass building that complies with the fundamental rules of design, in these times even stronger ideological foundations are called for in order to justify the construction of a highly mechanised glass structure. Today, we know that the daylight yield achieved in buildings through a glazed area comprising just 50% of the facade is fully adequate to illuminate even the deepest room.

In an oversaturated consumer market, daylight, as an issue of architectural importance, is becoming ever more exaggerated in a bid to grab attention. This tendency is driving architects constantly to push back the boundaries of the technically feasible. In most new developments, once planners are confronted with the currently applicable standards and comfort values, they quickly come to realise that purely conceptual architectural approaches are no longer sufficient as a basis for the achievement of flawlessly functioning light architecture. Constructional physics-related problems and the complexity of home technology, as well as continuous advances in the field of glass technology, call for the technical expertise of specialists. Consequently, architects are being increasingly forced into a position of having daylight planning performed by a team of specialists.



PHOTO: IDOUR DESIGN GROUP

**Pablo Buonocore** graduated in architecture in 2000 from Zurich University of Applied Sciences. He then went on to work for several years in a number of architectural firms, including Antonio Sanches Griñan, Alicante, and Antonakakis Dimitris, visiting Professor M.I.T., Athens. Together with Michael A. Critchley, he wrote the book "Tageslicht in der Architektur" (Daylight in Architecture), which was published by Niggli in 2001. From 2001 to 2004, he managed his own architectural studio in Winterthur. Since 2005, he has worked as a building client representative and building trustee. He is also engaged on a post-graduate course in Business Management for Architects and Engineers (eMBA) at the Zürich University of Applied Sciences.