Light for art and culture
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Cover photos:
“Environmental Work”
Facade design of the
Kunsthaus Bregenz, in
Austria, by Keith Sonnier

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“Environmental Work”
Facade design of the
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Art creates identity. Art testifies to those values and levels of meaning that point beyond everyday life and its purposes. That is why buildings for art and culture have exceptional standing for public and private organisations. Both symbolically and factually. For they are an unmistakable expression of their time and its approach to the true treasures of civilisation. And they are, by definition, public. They are intended to be convincing, well-visited, highly prized mediators for the general public, for visitors, spectators and other users.

For that reason, the architecture of these buildings has to develop a strong sense of identity. The power which it radiates is able to put cities and regions on the cultural map. Its aesthetic and functional perfection is the key to the greatest experiences of art. It is for good reason that the architects who enter competitions for projects of this kind are of such high standing, since the winning entries often come to write a piece of architectural history.

Where the highest architectural requirements have to be fulfilled, there is a corresponding increase in the demands made on that element without which spatial impressions and the enjoyment of art are unthinkable: light – as a modulating, accentuating experiential factor.

That is what this brochure is all about. It presents exemplary lighting solutions for art and culture. In museums, galleries, cultural and congress centres, libraries and religious buildings. Innovative lighting solutions, often specifically developed for one particular project, not only reinforce the quality of the encounter with art and culture, but also help in other ways, both on the scene and behind the scenes; they create an atmosphere in areas for visitors, guarantee security and optimal working conditions in storerooms, workshops, studios or administration offices, and they are often an integral component of building control and monitoring networks.

It is precisely in the case of important buildings constructed for art and culture that property owners, architects and lighting designers today put their faith in our overall competence in developing a wide spectrum of project-oriented lighting solutions. Because the sum total of individual, user-specific implementations must finally lead to a highly functional whole. It is part of the nature of this common task that in order to reach this goal a step into unexplored country has to be taken time and time again – equipped with comprehensive technological know-how and based on experience derived from many successful collaborations. The fact that we have obtained such wide experience is due not least to the project partnerships documented here.

For that we would like to express our gratitude to all those authors, designers and institutions that are represented in this publication.
Yonel Lebovici, Paris
Neues Museum für Kunst und Design, Nuremberg
“Without light there is no space” – a fundamental dogma for designing the lighting system in a museum. And – one ought to add – without light there are no objects. Carlo Scarpa once said: “I want to see objects, there is nothing else I can rely on...” and created the interior design of important exhibitions and pioneering works of architecture. In a museum, illumination plays a decisive role, because the museum space serves as the stage of history, as the theatrium artium and seeks to display its actors – whether they be artworks, design objects or historical documents of various kinds – in a “right”, “appropriate” or even “new” light. The illumination in which the museum objects “make their appearance” (in the truest sense of the phrase) therefore plays an important part in a collection’s choreography, and in an ideal case – although this will probably go against the grain for every luminaire designer and every luminaire manufacturer – the source of this illumination should be as invisible as possible, since, after all, it is the exhibition object which is the focus of attention. And that is what matters. Although you might not believe it, even the most valuable and astounding piece of a collection can be robbed of its aura and, as it were – to use the jargon of museum people – killed by the wrong light. Of course, this can – if employed deliberately – sometimes also be useful.

People frequently like to claim that museums are today’s cathedrals. However that may be, we do not – in my opinion – need religious illumination there. If, as a museum director, I might state my personal preference – something that practically goes with the job – then it would be that the illumination of the building should be in interplay with the architecture, understated, predominantly natural, flexible, many-sided and functional – nothing more and nothing less. That is how simple it could look – the light.

Prof. Dr. Florian Hufnagel, principal director of the collections of the Neue Sammlung, Staatliches Museum für angewandte Kunst, Munich; director of the design department “Neues Museum für Kunst und Design”, Nuremberg. Since 1997 honorary professor at the Akademie der Bildenden Künste, Munich; 1998 chairman of the Directorial Conference of State Museums and Collections in Bavaria. He is at present preparing the presentation of the Neue Sammlung in the future Pinakothek der Moderne in Munich.
Embedded between the Baroque buildings designed by the great architect Fischer von Erlach, one of the largest museum complexes in Europe has been created in the middle of Vienna’s city centre. More than a dozen different cultural institutions are collected on the 60,000 square metres of the “Austrian Louvre”.

The Museum Quarter is an architectural intersection of urban “energy fields” and at all levels focuses on connections: between old and new, art and recreation, artists and spectators. Every volume that is integrated within the museum complex speaks a language of its own. What is presented inside also receives expression in the architecture of the volume. The complex requirements of an extraordinary cultural operation, as well as the spatial visions of the architects, formed the foundations for arriving at adequate lighting solutions.
Laurids Ortner, Ortner & Ortner, Vienna:

“The paths are always the same, but they have to be reinvented every time. Basically, it is all about the form of an objectivised lighting system. Which is to say that one does not illuminate the individual objects with spotlights or with special effects, rather they should be dipped in light in a general, large-scale and pleasant lighting situation. Strictly speaking, it is only a matter of shining the light uniformly from the ceiling onto the walls and of ensuring that this light covers the whole wall as uniformly as possible – regardless of what is hanging there. The wall should be an illuminated area with a lighting gradient from the top to the bottom as low as possible.

The daylight-dependant changes of light are important in museums, too, because they indicate that a museum is not a sterile zone. It would be important to give much more consideration to things which come from outside. However, we have had to take account of the fact that a broad front of museum specialists categorically reject daylight – because it cannot be controlled and it is not beneficial to the work of art.

That is probably also decisive for the museum specialists’ preference for artificial lighting, which has the potential to reveal or specially highlight certain aspects of the work of art, something which daylight alone would not allow. Nevertheless, I believe that one should not violate art with light. There is no need for lighting scenarios which project additional effects on art objects.
The work of art has to be perceptible in a benign, objectivised spatial situation. That is the condition for a museum and that is the condition for the lighting in a museum.

In the Kunsthalle hardly any daylight was used, rather illuminous ceilings with special focusable spotlights.

At the Leopold Museum, for instance, it is thanks to Professor Leopold himself that a great deal of daylight, including subsequently planned lateral light coming through the windows from outside, has been brought into the building. At the Museum of Modern Art, the lighting situation that has
been created attempts to produce an atmosphere of neutral artificial light, which summons up an objectivised form of lighting conditions. There we only installed the lighting slits, which allow a view outside, in order to create possibilities of orientation."

Laurids Ortner planned the new Vienna Museum Quarter together with his brother Manfred Ortner and Manfred Wehdorn. He was co-founder of the group of architects and artists Haus-Rucker-Co and manages the architectural studio of Ortner & Ortner Baukunst in Vienna and Düsseldorf. Since 1997, he has been Professor for Design at the Potsdam University of Applied Sciences. Among his most important projects are the head office of the office furniture manufacturer Bene in Waidhofen, the Landeszentralbank in Potsdam, the Regional Library of Saxony in Dresden, as well as the Kultur-und Werkzentrums Schiffbau in Zurich.

Large-scale backlit illuminous ceilings take the place of daylight in the lower storeys of the Leopold Museum.
Hannelore Kress-Adams and Günter M. Adams, Kress & Adams Atelier für Tages- und Kunstlichtplanung ("Studio for Daylight and Artificial Lighting Design"), Cologne: "The decisive aspect in representative spaces is the imminent atmosphere, the emotional grasp of the space, which in former times architects tried to achieve through their impressive skill in using daylight. Every modern luminaire which appears formally independent today disturbs this archaic spatial impression and no less the special function of an exhibition space. That is why restraint in both form and design were also called for in the luminaires of the new museum rooms. Light as an immaterial medium should be deliberately employed for design purposes. Its task is to support an emotional perception of architecture and the various spatial qualities, as well as the visual enjoyment of the exhibited art objects.

At the Leopold Museum, the external world is part of the exhibition.
The large-surface emission of light is emphasised even further by the fact that the patinated lighting areas are perfectly level with the adjacent ceiling soffit. That also applies to the vaulted areas. Thanks to the greatest possible reduction in details – expressed in the striving for renunciation and the minimisation of the profile at the edge – these lighting areas almost look as if they had been punched out of the ceiling. What emerges is the spatially dominant combination of very bright top-lit areas, supplied by zenith lighting, in the employment of which it was often necessary to resort to the tricks of lamp positioning. Through the proportional harmony of the lighting and the large volume, the rooms acquire a visual expansion which in places even becomes an almost monumental enhancement.

In the case of the accentuated lighting, too, there existed the strict requirement that it should be reflection-free, creating a quite special challenge both for the technology and for the integration of the design. From a common creative effort, a new concept was created: a combinatory recessed luminaire with a rectangular central lighting field and two laterally arranged spotlights. Wholly oriented to the specific demands of the Museum Quarter, the four laterally sunk spotlights are motor-operated and can be turned, swivelled, focused and dimmed, by remote control – the direction of the light is subject to virtually no limits whatsoever.

On account of the lighting concept that has been consistently implemented in all individual areas, most of the luminaires seem to derive from one single luminaire range – and that is also the desired effect. However, the luminaires did not exist before. Without doubt, 80 per cent of the luminaires used at the Museum Quarter were developed as purpose-built products on the basis of different rooms and the respectively defined functions.”

Hannelore Kress-Adams studied at the State Academy of Art and Design in Stuttgart, Günter M. Adams at the Academy of Fine Arts in Düsseldorf. In 1985, they founded a joint studio in Cologne. Among their most important projects are Haus 1 of the State Library in Bonn, the Museum of Modern Art on the Mönchsberg in Salzburg, the Kunsthaus in Graz, the Kultur- und Werkzentrum at the Schauspielhaus in Zurich/Schiffbau building, the Federal Ministry of Finance in Berlin, office buildings for the representatives of the Federal Republic of Germany in New York and the IKB Deutsche Industriebank AG in Düsseldorf.
Perfect lighting management
for the perfectionists of centuries past

Illuminous ceiling to the square: high light levels and coloured walls increase the effect of the pictures.
For one of the most precious collections of European painting, ranging from the Middle Ages to Impressionism, architect Oswalt Mathias Ungers has built a treasury in the middle of Cologne that follows a strict geometry: the new Wallraf-Richartz Museum. Throughout the two buildings runs the principle of a precise square grid which determines the room measurements, the facades and the floor and ceiling structures. Art is displayed on all exhibition levels in a precise brightness: electronically controlled daylight ceilings were installed.

Oswalt Mathias Ungers, architect, Cologne: “The collection of the Wallraf-Richartz Museum comprises three focal points, each of which is connected to an exhibition level: on the first level the Middle Ages, on the second level paintings of the Baroque and finally, on the top level, paintings of Impressionism. All levels are equipped with artificially lit ceilings, the floors are executed in dark oak parquet and the walls in fresco plastering. The spatial structure of the individual storeys, as well as the colouring of the fresco plastering were decided upon in accordance with the requirements of the individual focal points of the collection: for example, the Middle Ages department has been decorated in a terracotta tone and is organised around a cross-shaped central room, which provides the appropriate spatial framework for the collection’s magnificent altars. The exhibition rooms are restrained in their proportions and surfaces, connected by simple room sequences and related to the exhibited art works in an introverted way. Solely the rooms in the north-east corner have large panorama windows, which at various heights provide an almost immediate view of the city from which the collection derives.”

Oswalt Mathias Ungers is one of the most important contemporary architects. For decades, he has consistently formulated his architectural language, which is characterised by its rationalistic principles, in opposition to the respective current stylistic tendencies and fashions. The design office which he founded in Cologne in 1950 has realised numerous projects, including the gatehouse and other buildings for the Exhibition Centre in Frankfurt am Main, the German Museum of Architecture in Frankfurt am Main, the Badische Landesbank in Karlsruhe, the extension of the Exhibition Centre in Berlin, the Residence of the German ambassador in Washington D.C., and the new Kunsthalle in Hamburg.
Andreas Lippl, Michael Schmidt, Clemens Tropp, Werning Tropp Schmidt Lichtplanungen, Feldafing: “Which kind of lighting for which kind of art? This is the basic question that arises at the start of the lighting design for a museum. Is it light-sensitive graphic work without much contrast that is to be exhibited, which should therefore be lightly illuminated and zoned? Or is it Andy Warhol with his huge striking formats and strong colours, requiring large bright rooms?

Precise square grids, as shown here in the exhibition room for 19th century art works, characterise the digitally controlled daylight ceilings.

The specific requirements of every object of art differ greatly as regards illumination, and to some extent are even quite contrary. Needs vary from 50 lux vertical illuminance for graphic art to 1,000 lux to serve as a daylight supplement, for example. Light distribution varies from being punctiform to being diffused over a large surface. Colour temperatures range from the 2,700 K of a warm-toned incandescent lamp to the 6,000 K of a cold daylight colour. The optimum colour rendition characteristics of
light sources and glazing are in diametrical opposition to the costs. Also relevant to the costs are the conservational aspects, for example UV protection.

An ever-recurring requirement is that of flexibility. Whether a spatial shell is constructed around a defined work of art, or whether there are temporary exhibitions from all areas of the fine arts. Similarly, there is also the question: ‘Which light for which room?’ Is it a building constructed for the permanent preservation of valuable exhibits, with a constant room temperature and protection against the rays of the sun? Or is it the transient staging of art, independent of time and space, possibly outdoors, illuminated by spotlights on masts? From the point of view of architecture and lighting design, good museum design has to take a whole range of aspects into account, and it is only from a dialogue with all those involved in the design that the building emerges.”

Werning Tropp Schmidt Lichtplanungen have been involved in lighting designs for numerous larger-scale architectural projects, among them at present the Galileo skyscraper in Frankfurt am Main, the new administrative building of Lufthansa AG at Frankfurt/M Airport, as well as the Main Station in Innsbruck.

**WALLRAF-RICHARTZ MUSEUM IN COLOGNE, GERMANY**

*Client:* The City of Cologne  
*Architect:* Oswalt Mathias Ungers, Cologne  
*Lighting design:* Andreas Lippl and Clemens Tropp for HL Technik AG, Düsseldorf  
*Lighting solutions:* Illuminous ceiling with ZX batten luminaires mounted on a trunking system, Dancer spotlights on tracks, Luxmate Professional lighting management system
New lighting for new media
Infotainment is the motto of the new crowd-pullers. A new type of museum has emerged, which packages things worth knowing in experiential worlds. The puzzles of the universe unfold at the Universum Science Center in Bremen. Mankind and nature become fascinating. Not rectangular, not straight, not orthogonally geometrical – architect Thomas Klumpp compares the architecture of the exhibition building, which from the outside reminds of a whale, with life, about the meaning and function of which questions should be asked inside.

The task of setting the stage for things surprising and bizarre, explanatory and entertaining lay in the hands of lighting designer Uwe Belzner, who in each of the experiential rooms has made sure that the lighting scenario specially matched the respective contents.

Within the giant silver whale, the secrets of the universe can be discovered; the Conference Center is visible in the background.
Body movements are illustrated using holograms.

Draft design of an exhibition situated within a tunnel. Visitors look at the exhibits through portholes.
These area modules with a format of 1 x 2 metres are more than just an assembly system. They visually relax the visibly complex installations of the ceiling area and conceal the points of bright light from the luminaires.

In order to give the visitors some orientation in an exhibition which at times almost resembles a labyrinth and in order to make it possible to experience from the inside the external form of the building reminding of a whale, the skin pulses in a subtle way. To do so the edges of the storey ceilings are fitted with two rows of free-standing batten luminaires, which are individually coloured and controlled. Coloured LED lighting strips are employed as a guiding system for the three exhibition areas ‘Mankind’, ‘The Earth’ and ‘Cosmos’, and also to set the scene of the central multi-functional area.

Uwe Belzner works as a lighting designer in the field of architecture and art. His Heidelberg design studio Architektur•Licht•Bühne creates lighting designs for buildings, exhibitions and stage designs, ranging from atmospheric external lighting, complex lighting solutions for interior designs (Side Hotel, Hamburg) to lighting scenarios for museums and trade fair appearances.
The exhibition becomes a light experience
Cities and metropoles are leaving the unforgettable marks of an active cultural policy by organising attractive large-scale exhibitions. Frequently, lighting is one of the challenging subjects of design in this context.

Berlin paid homage to the millennium with a fascinating exhibition in the Martin Gropius Building. Entitled “Sieben Hügel – Bilder und Zeichen des 21. Jahrhunderts” (Seven Hills – Pictures and Signs of the 21st Century), it was devoted to seven areas, including art and technology, science, faith, nature and civilisation. Seven artists designed the individual areas. The lighting of the area entitled “Core” was developed and realised by 007 film designer and Oscar-winner Ken Adam and lighting designer Michael Flegel, in collaboration with Zumtobel.

**Michael Flegel, lighting designer, Berlin:** “The scene for the central area of the exhibition, also known as the ‘Core’, could only be set using lighting and media after the inner courtyard of the Martin Gropius Building had been completely darkened. Ken Adam, the designer of this area, wanted lighting which, on the one hand, made the glass roof visible as a spatial conclusion of the existing architecture of the inner courtyard and, on the other hand, created the impression of a space opening behind and disappearing into the depth, similar to the ‘sfumanto’ technique. The desired effect was produced using a fluorescent-lamp continuous-row lighting system running around the glass roof, blue lighting foil and an arrangement of darkening foils. The illumination of the ‘Core’ was created using four basic elements: the globe as a self-illuminating focal point, the illumination of the load-bearing structure, the architecture of the inner courtyard and the exhibits themselves.

The central element in terms of space and design was the globe, which as the luminous centre point illuminated and brightened up the whole area. This could not really be done by using the globe as an actual luminaire – also taking into consideration the media – so the task for the lighting design consisted in building up concentric layers of lighting throughout the whole area, in order to create the impression of an illuminated focal point. The innermost

![Light experience and the projection of light in the darkened inner courtyard of the Martin Gropius Building.](image)

![Special luminaire with a waveguide from the Orea luminaire for uniform illumination of three-dimensional exhibits and flat paper exhibits in a showcase structure in the “Knowledge” area.](image)
shining white core of the globe, which slowly turned on its own axis, was lit up by dimmable TC-L fluorescent lamps. In addition, Starflex light engines were also installed here, which supplied light in various red tones by means of side-radiating fibres – in order to represent the magma canals leading from the earth's interior to the surface.

In order to achieve a differentiated exhibition design with all its numerous projection surfaces, the entry of diffuse daylight from adjacent rooms bare, fluorescent-lamps or large, uniformly illuminated areas had to be avoided. The lighting solution lay in the interplay of a number of smaller areas with accent lighting. Spirit and Solartron accent spotlights were used. For illumination of the architectural areas, spotlights with soft-edge lenses were used, as were shutter blades for light guidance and glare reduction. The exhibits on the walls of the inner courtyard’s circular passage were illuminated with Xeno framing spotlights, so that the wall area lighting could be kept to a minimum, yet the exhibits became clearly visible despite the fact that only low levels of illuminance were allowed.

Because of the necessity of having to co-ordinate the four lighting elements with one another and the media areas, only luminaires and spotlights which could be dimmed individually or in groups were considered. Furthermore, the dimming capacity of the accent spotlights made it possible to set them quickly and maintain precisely those levels of illuminance required for conservational purposes on exhibits sensitive to light.”
Side-radiating fibres and red light from Starflex engines made glowing red magma flow through the globe.

Showcase structures in the “Knowledge” area (design Edouard Bannwart); past, reality and vision are fused to form an artistic unity.

Topkapi Palace is an unusual complex of buildings, set in a magnificent location above the Bosphorus and extending across one of the seven hills of Istanbul.

The architect Caglayan Tugal has shown a great deal of sensitivity in renovating the Treasury of Topkapi Palace, which was opened in July 2001. As a result of his intensive study of Ottoman history and that of the Palaces, the Ottoman art treasures and valuable jewels can today be presented to the public in an atmosphere that is stylish while still remaining true to the original.
Caglayan Tugal, T Mimarlik, Istanbul:

“There are only a few people in this world who really love their jobs and accord them the necessary importance. I find my work quite marvellous. And when I take on a project, then investigation and research are part of my approach to the work. Some time ago I was asked to take over the restoration of the Treasury of the Topkapi Museum. The research work and the time spent in preparation took eight months alone. At the end I presented those responsible with a report on its feasibility, which was as detailed as a book on the subject itself. For example, by studying old drawings I was able to determine that the wooden floors in use at the time were not the originals. This emerged from studies of old drawings. Before I begin a new project, I devote myself to these investigations. This period is always also a time of learning. If you view your life like a book or like school, then you wake up and are ready to learn something new every day. You open your eyes and discover that there are a great many new things to learn. If you begin every day like that then the rest comes as a matter of course.”

Caglayan Tugal is the director and owner of the renowned Istanbul architectural studio T Mimarlik; the team comprises eleven architects and interior designers. For the restoration of the Treasury of Topkapi Palace he studied Ottoman history, and in particular the history of the Palaces. His most outstanding work also includes a national TV station in Istanbul, a shopping mall and several boutiques and showrooms in Istanbul.

Situated at the entrance to the Bosphorus, Topkapi Palace forms part of the spectacular skyline of Istanbul.
The lighting design was realised in a process of close co-operation between the architect and the lighting designer. «After intensive discussions we decided in favour of an ambient lighting system with an illuminance of 80–100 lux, in order to create a contrast to the accentuated treasures displayed in the showcases in the four different rooms. Considering that the rooms were between 10 and 17 metres high, we decided in favour of an indirect lighting solution using Spheros wall-mounted uplights. This emphasises the elegant ceilings to an even greater extent», explains lighting designer Coskun Insel. Particular attention has also been paid to the illumi-
Several of the exhibits, like this ornate throne, are so large that they need to be housed in individual cabinets. The Starflex fibre optic system, with delicate, adjustable light heads, really makes the valuable art treasures sparkle. This lighting solution allows both effective accentuation and a diffuse lighting ambience.

TREASURY, TOPKAPI PALACE
Client: Turkish Ministry of Culture
Architect: Caglayan Tugal
Lighting design: Lumina/Coskun Insel
Lighting engineering: Lumina, Istanbul
Lighting solutions: Spheros wall-mounted uplights, Starflex fibre optic system
Lighting management: Luxmate professional

Coskun Insel (born 1962), attended the Austrian School of St. Georg in Istanbul. After studying electrical engineering at the Technical University in Istanbul he worked for AEG for three years. In 1993 he founded the Lumina Lighting Company with partners and now represents Zumtobel, as well as other lighting manufacturers. Coskun Insel has already worked together with Zumtobel in the planning of numerous projects in Turkey.
Aedes Architecture Gallery
East Berlin/Germany
Client: Galerie Aedes, Kristin Feireiss, Berlin
Architects: Ben van Berkel, Van Berkel & Bos, Amsterdam
Lighting design: Zumtobel
Lighting solutions: Luxmate controlled lighting boxes with REW indirect luminaires for ceiling illumination and overall lighting. Optos NV directed spotlight and point outlets for accentuated lighting of objects. Downlight with 150 W HIT for high zonal horizontal lighting.

Art-Kite Museum,
Detmold/Germany
Architects: Gerkan, Marg + Partner, Hamburg
Lighting design: Zumtobel
Lighting solutions: Mellow Light, zone lighting divided into lighting fields, spotlights, Luxmate lighting management system.

Centre PasquArt, Biel/CH
Client: Stiftung Centre PasquArt, Biel
Architects: Diener & Diener Architects, Basle
Lighting design: Piazza Beratende Ing. AG, Biel
Lighting solutions: 55 W TC-L special luminaires
Gana Art Gallery, Seoul/ROK
Client: Gana Art Gallery, Seoul
Architect: Jean Michel Wilmotte, Paris
Lighting consultation: Itework, Hwang-duck Engineering (technical office), Seoul
Lighting solutions: Canal lighting system, Spirit spotlight system

Getty Center, Los Angeles/USA
Client: J. Paul Getty Trust, Los Angeles
Architects: Richard Meier + Partner, New York
Lighting design: Fisher Marantz Renfro Stone, Inc., New York
Lighting solutions: Special recessed louvre luminaire in the foyer, exhibition and office areas

Kunsthaus Bregenz/Austria
Client: Land Vorarlberg
Architect: Peter Zumthor, Chur
Lighting design: Peter Zumthor in collaboration with Zumtobel
Lighting solutions: Object-specific pendant luminaires, tracks and recessed downlights, interior facade lighting based on FZ moisture-proof luminaires, KXA explosion-proof luminaires, object-specific emergency luminaires, Luxmate Professional lighting management system
**Kunstmuseum Liechtenstein, Vaduz/FL**
Client: SEK Foundation for the Construction of an Art Museum in Vaduz
Architects: Arbeitsgemeinschaft Morger, Degelo and Kerez, Basle
Lighting design: Arbeitsgemeinschaft EAG/OAPIL, Basle, London
Lighting solutions: ZX continuous-row lighting system, ZXR, special downlights, special luminaire with track and supply/extract air system, Luxmate lighting management system

**Kunstmuseum Winterthur/CH**
Client: Federal Office for Building and Logistics, Berne
Architects: Gigon + Guyer, Zurich
Lighting design: Bühler and Scherler, Chur
Lighting solutions: TC-I special luminaires

**Le Grand Louvre, Paris/F**
Client: EPGL (Etablissement Public du Grand Louvre), Paris
Architect: Ieoh Ming Pei, Pei Cobb Freed & Partners, New York
Lighting design: Panavision M. Rain, in collaboration with Zumtobel
Lighting solutions: REW and ZX special recessed luminaires, DL 4000 recessed downlights, wallwasher recessed downlights, Luxmate Professional lighting management system
Museo di Scienze Naturali – Zoologia, Turin/I
Client: T.I.G. Coop Arl, Turin
Architects: Studio Andrea Bruno, Turin
Lighting design: Agenzia Alberti Bruno, Turin
Lighting solutions: ZX, Active light, Xeno spotlights

Austrian Gallery, Belvedere Palace, Vienna/Austria
Client: Republic of Austria, represented by the Burghauptmannschaft (Castle Authorities) of Vienna
Architect: Sepp Frank, Vienna
Lighting design: Sepp Frank, in collaboration with Zumtobel
Lighting solutions: X structure with integrated 3-phase track, high-pressure mercury-vapour lamp system, LV halogen spotlights and lamps, batten luminaires, TCL fluorescent lamp, Dancer spotlights

Russian Museum, St. Petersburg/RUS
Client: Russian State Museum
Architects: Antonio Rinaldi, Karl Rossi
Lighting solutions: Arcade with Luxmate, tracks, various spotlights (Xeno, Dancer...)
Salomon R. Guggenheim Museum, New York/USA

Client: Salomon R. Guggenheim Foundation, New York
Architects: Gwathmey Siegel & Assoc., New York
Lighting design: Light and Space Associates Ltd., New York
Lighting solutions: Special continuous-row luminaires and RCE recessed luminaire Mellow Light

Essl Collection, Klosterneuburg/Austria

Client: Agnes and Karlheinz Essl, Klosterneuburg
Architect: Heinz Tesar, Vienna
Lighting design: Charles Keller, St. Gallen
Lighting solutions: ZX system, RTX surface-mounted and pendant luminaire, FD 2000 recessed downlight, Dancer spotlight

Sensation Science Centre, Dundee, Scotland/GB

Client: Dundee Science Centre Charity Foundation, Scotland
Architects: Merrylees + Robertson, Edinburgh, Scotland
Lighting design: Merrylees + Robertson, in collaboration with Irons Foulner
Lighting solutions: Chiaro with blue and orange lamps, Arcade with coloured casing, curved special design with Spirit spotlights in special colours, ZX/XDO, Sicuro emergency luminaires
State Hermitage Museum, St. Petersburg/RUS
Client: State Hermitage Museum
Architect: Bartolomeo Rastrelli
Lighting solutions: Orion lighting tube, Teledancer

State Museum of Art, Copenhagen/Denmark
Client: National Gallery, Copenhagen
Architect: Anna Maria Indrio/C.F. Møller and Partners, Architects, Århus
Lighting design: Anna Maria Indrio/C.F. Møller and Partners, Architects, Århus
Per Jansen/Ing. Bureau Carli Bro
Lighting planning: Bjarno Rask, Louis Poulsen & Co
Lighting solutions: DL 3000, Starlight, FD 2000, DL 4000, Solartron, Arcade

Weser Renaissance Museum, Lemgo/Germany
Client: Lippe Regional Association, Brake Castle, Lemgo
Architects: Lippe Regional Association, Brake Castle, Lemgo
Lighting design: Zumtobel
Lighting solutions: Xeno and Spirit spotlights on tracks, Arcade wallwashers, light coves with ZE batten luminaires, gimbal elements, lighting of the information stands by Paso recessed floor luminaire, Chiaro moisture-proof diffuser luminaire – partly with blue fluorescent lamps controlled by Luxmate sequencers
“Isambard Kingdom Brunel” exhibition, Design Museum, London/GB
Client: The Design Museum, London
Architects: Nicholas Grimshaw & Partners, London
Lighting design: Nicholas Grimshaw & Partners, James Langford, London
Lighting solutions: Special luminaires with fluorescent lamp technology with reflectors and fibre-optic systems for showcases, wallwashers with fluorescent lamp technology for wall paintings, Vito QR 111 luminaires for unobtrusive lighting along the circulatory areas

“Daniel Libeskind, Beyond the Wall 26.36”, exhibition, Dutch Institute of Architecture, Rotterdam/NL
Client: Nederlands Architectuur Instituut/Rotterdam
Artistic concept: Daniel Libeskind, Berlin
Curator: Kirstin Feireiss, Rotterdam
Lighting design: Zumtobel
Lighting solutions: Dancer spotlights on tracks; no further general lighting system

“Theatrum Naturae et Artis”, exhibition, Martin Gropius Building, Berlin/Germany
Client: Humboldt University, Berlin
Exhibition concept: Horst Bredenkamp, Humboldt University, Berlin
Lighting design: Michael Flegel Lichtgestaltung, Berlin
Lighting solutions: Luminaire sky with Copa high-bay luminaires for the inner courtyard, accent lighting spotlights, Luxmate lighting management system
EXHIBITIONS, PRESENTATIONS

“Environmental work 1968–99”, art installation and exhibition, Kunsthaus Bregenz/Austria
Client: Kunsthaus Bregenz
Artistic concept: Keith Sonnier, USA
Curator: Edelbert Köb, Bregenz
Lighting design of the facade installation: Zumtobel
Lighting solutions: Fluorescent lamps, Luxmate lighting management system

“Pavillon”, art installation, Hanover/Germany
Client: Kunstverein Hannover
Artistic concept: Gerhard Merz, Berlin
Curator: Eckhard Schneider, Hanover, now Bregenz
Lighting design: Gerhard Merz, in collaboration with Zumtobel
Lighting solutions: Over 7,000 batten luminaires fitted with lumilux lamps in daylight colour

Vesuna Tower, Amberg/Germany
Client: Wilhelm Koch, Amberg
Artistic concept and lighting design: Wilhelm Koch, Amberg
Lighting solutions: Over 100 FZ 1/36 W moisture-proof luminaires
Light to see
is, at the same time, light to hear
Dynamic lighting for art and culture

Lucerne’s Cultural and Congress Centre, designed by Paris-based architect Jean Nouvel, is regarded as the city’s new landmark. Situated directly on the lakeside of the Vierwaldstätter See, the three separate parts of the building, which contrast with one another in character and are separated by water conduits, form a fascinating ensemble. A concert hall, the multifunctional Lucerne Hall, and the Congress House, with the Art Museum that lies above it, are gathered together under a protruding roof that extends many metres over the lake. The reflection of waves and boats produces a fascinating interplay of light and shadow.

Jean Nouvel, Architectures Jean Nouvel, Paris: “The huge roof of the building in Lucerne absorbs and reflects the pulsation of the city and the wave movements of the constantly changing lake. The landscape images, which are captured by the deliberate positioning of the windows, produce excitement and allow the visitor to see the beauty of the city and the captivating landscape from a new perspective. The city and the building enter into a dialogue in the form of reciprocally reflecting surfaces, lights, colours and materials.

The intention is to reproduce the uniqueness of the city in a unique architectural vision. In the constant effort to meet this challenge, the project gradually achieved a form of its own: an individual character, an individual layout, individual materials and colours and individual lighting solutions.
It was our idea to arouse a series of emotions within the visitors while they are passing through the various rooms with their particular arrangement. The special atmosphere of each room and its surprise effects arise through the interplay of various elements, including the light. The lighting itself should consequently not be regarded as an independent element, but should follow the architectural vision. Daylight and artificial lighting are employed in interplay with shadows, without which light cannot take on form. That is why a separate lighting concept was provided for each project and even for every place in the buildings. Very dark areas, followed by very brightly lit ones, contrasts, reflections and the interplay of light and shadow, are all part of the scenario. It does not involve any uniformity whatsoever.

**The Dangers of standardisation**

Emotions and poetry do not necessarily conform to ‘standards’, yet we still have to do justice to the latter. Often enough great visions are shattered when they are confronted by economic, technical or functional requirements. Aesthetics, poetry and playfulness are replaced by comfort, which, in its turn, is also standardised. Technology, functionality and economy are the only recognised truths of the modern world.

It is not always easy, in the case of a project of this size, with its numerous different requirements and various stipulations, to progress from the dream to reality. We follow norms and customs, which are regulated and promoted in the names of technology and standardised comfort, and we sacrifice poetry and emotionality for that. For that reason we had to find, together with all our partners, a synthesis of the various parameters and take into account both the necessary requirements and other needs and norms. We constantly had to guarantee functionality, without
losing sight of our vision of the project, or reducing the project’s aura.

The water is conducted to Europaplatz and from there flows along the conduits between the three main buildings. These are roofed over with a huge horizontal surface, the completely smooth underside of which reflects the wave movements of the water and the lights of the city. Here, in this interplay between water, city and building, light plays the leading role. The reflective surfaces of the roof and the facades catch the daylight and reflect it. When the sun slowly goes down, the exactly positioned artificial lighting underlines and replaces the rays and reflective effects of the sun.

The building concept contains four volumes, all displaying a unique architectural signature in accordance with their respective functions. Each of the four buildings has been provided with an independent lighting concept.

At night, the Cultural and Congress Centre is primarily illuminated by means of the lighting modules and its own ‘interior life’. The luminaires in the foyer of the concert hall illuminate Europlatz with little stars, and the interior life of the hall is projected to the outside. During the night, the facade grid lighting of the museum building sheds an urban flair on the Bahnhofsplatz. The interior illumination is reduced, in order not to obstruct the lighting spectacle and the view of the lakeside landscape around the Vierwaldstätter See. The intention was to retain the magical aura of the natural surroundings and to enhance this effect through the illumination of the building."

Jean Nouvel is regarded as the most important representative of contemporary French architecture; his position in design, oriented to technical innovation and spatial experience of media, is expressed not only in buildings which themselves set standards, but also in interior design and furniture design.

The projects realised by his studio in Paris, Architectures Jean Nouvel, include the Institut du Monde Arabe in Paris, the Congress Hall in Tours, the Fondation Cartier in Paris, hotels in Lucerne, Bouliac and Dax, the Galeries Lafayette department store in Berlin, the residential and office complex Le Triangle des Gares in Lille, the Interunfall office building in Bregenz and the Mediaparkturm skyscraper in Cologne.

The enjoyment of art has priority, everything else is framework – albeit of a perfect nature.
A warehouse becomes a cultural storeroom

Straightness is convincing: with their first-placed entry in an international architectural competition, Brückner & Brückner bring light and life inside the old walls.
Hustle and bustle, hectic noise, chugging tugs, squeaking wagons – the building on the Main tells a story of days gone by. Now the intention is to turn the former warehouse into a place that is open for new things, receptive and giving. “Also into a place which does not forget its history but continues to relate it”, as cultural scientist Winfried Helm puts it. The opening of the Kulturspeicher (“Cultural Storehouse”), designed by Brückner & Brückner, is planned for the beginning of 2002.

Klaus-Peter Brückner, Peter Brückner and Christian Brückner, architects, Tirschenreuth: “From the very beginning it was very important to us not to change the impressive and unique character of the place: the old timber construction which supports the new glass roof and allows the sunlight to shine in far below; the 140-metre-long wall displaying the wounds of time it has received and an unmistakable surface. In this situation, the new fits in quite naturally with the old. A few other materials have also been added: shimmering green glass, precisely worked steel, smooth concrete and soft light. New rooms are arising alongside the old ones. One of them is almost 160 metres long and 12 metres high. A room which defies description, yet one which can already be sensed today. Light and shadow, views outside and inside and from one side to another, conveying the feeling of being able to get the point. In the other rooms the architecture, the past and even the materials are more restrained, thus creating space for new experiences and new images.”

A valuable basis for art and culture: the historical grain warehouse on Würzburg’s old quayside.

Side views and cross-sections from the architects’ pen.
An eye-catcher with a view: the new facade made of stone, steel and glass.
Open yet closed.

A cross-section of the Kulturspeicher:
an impressive symbiosis of old and new.
The light of the Kultur-speicher (an approach):

“The sun shines, an interplay of light and shadow on the roughly cut sandstone. The windows reflect. Through the glass one senses the concrete constructions inside. The new end pieces made from stone – the joints reflecting like glass.

It is night-time. The building is not lit from outside. It is glowing from within. Its power lies in the modesty of the light. The concrete constructions inside are lit up from below. The light climbs up the walls and becomes more and more subdued. The windows are not dead, but conceal a secret.

An intensification. The break of the main entrance and the foyer. More light, one senses depth and height. The roof shines matt. A sign. The new end pieces. Light flows from the joints. The building seems to dissolve.

New and old are fused. Character is retained. Pendant luminaires between the timber construction illuminate important areas such as the ticket office area, the bookshop, the showcases... The luminaires are reminiscent of the original storage character of the building. Artificial lighting shines from the openings of the new concrete wall. Beneath the galleries, the visitor is accompanied by square luminaires. Warm light.

The exhibition rooms are characterised by pure artificial lighting. Four rows of illuminated glass are suspended under the roof. Direct and indirect lighting allow the room and the pictures to shine in a homogenous way. No shadows. No changing qualities of the light. Light is simply there. Art dominates space.”

Klaus-Peter Brückner, Peter Brückner and Christian Brückner display great sensitivity for buildings specially designed for art and culture, both in their architectural projects and in publications such as “Bausteine – Architektur als Prozess” (Building Bricks – Architecture as a Process) and “Neues Leben in alten Gebäuden” (New Life in Old Buildings). In addition to the Würzburg Kulturspeicher, they have attracted attention for their successful entries in design competitions for the Peissenberg Bürgerhaus, the Burgweinting ecclesiastical centre, the extension to the Donauscheningen Town Hall, and at present for the Bavarian Forest Granite Museum in Hauzenberg.
The new synagogue in Styria’s capital is rising out of the ruins of the old synagogue. Built on the old foundations, it keeps alive the memory of its destruction and at the same time expresses confidence and hope by having been built anew. Sections of the outer walls were built with bricks preserved from the Graz synagogue that was destroyed in 1938.

The architects Jörg and Ingrid Mayr, a husband-and-wife team, have fulfilled with great sensitivity the brief given to them by the city of Graz and the Jewish religious community to create an appropriate new building which should not be a reconstruction of the destroyed synagogue, even though references to the destroyed building were quite acceptable and even desirable.
The new synagogue rises from the ruins of the old one. In this way, the memory of the destruction remains alive, but at the same time confidence and hope are expressed by the new building.

The new building is intended to remind of the previous building, so that the dimensions of the old synagogue also played a decisive role. In particular, the building should fulfil liturgical requirements and promote the life of the Jewish community through providing appropriate space.

The foundations of the external walls which had been excavated in 1988 were partly rebuilt, using bricks that had been preserved from the old synagogue. The basic geometrical forms of cube and sphere describe a central room and determine not only the exterior appearance, but also the interior of the new synagogue.

The 12 pillars are united in a Star of David at the centre of the dome.
Modesty and modern architecture create space for religious experience.

Almost a quarter of all the bricks used are relics of the Graz synagogue that was destroyed in 1938.
The load-bearing construction of the glazed dome consists of 12 steel pillars. The 12 pillars (the Twelve Tribes of Israel) are connected in pairs by arches and united in a Star of David in the dome. The glass panels of the dome are printed with Hebrew texts from the Old Testament. The design gives particular importance to the Almemor (Bima) and the Holy Drawer, the two most important elements of a synagogue. The Almemor, upon which verses from the Torah are read, occupies the middle of the central space. The congregation gathers around this centre. The glazed Almemor has been set up above the memorial stone dating from the year 1988 and is accentuated by the light that enters from the glass dome. The Holy Drawer, which houses the Torah rolls, stands in a niche in the east wall; the niche is as high as the room, but separated from the rest of the room by two steps up. The lectern, which can be used from two sides, is placed in the central axis between the Almemor and the Holy Drawer. The rows of benches with folding seats for a hundred people are arranged on three sides of the Almemor.

In the south, west and north, the main room is surrounded by a gallery seating 45 people intended for the female members of the community. Protruding extensions make the gallery more spacious, the room gains additional lighting and the external appearance becomes sculpturally richer.*

As a husband-and-wife team of architects, Jörg Mayr and Ingrid Mayr have constantly displayed great sensitivity and perceptiveness. Unobtrusive accents characterise their work, examples of which include the Graz City Museum, the school building in St. Nikolai im Sausal, the Hall of Ceremonies at the Jewish Cemetery, the restoration of Leech Church and the renovation of the seminary chapel.
**Congress Centre of the European Forum Alpbach/Austria**
**Client:** Alpbach Tourismus GmbH, Alpbach
**Architects:** din a4 Architekten-team, Innsbruck
**Lighting design:** Teleconsult, Artur Oberbichler, in collaboration with Zumtobel
**Lighting solutions:** Canal lighting system, various lighting modules, Luxmate lighting management system

**Casa Marchini Carrozza, Fiesole/Italy**
**Client:** Fiesole Municipal Council, Florence
**Architects:** Studio Gurrieri – De Vita – Gurrieri, Florence
**Lighting design:** Maurizio De Vita, Florence
**Lighting solutions:** Canal lighting system, Arcade spotlights

**Goethe Institute, Toronto/CAN**
**Client:** Goethe Institute, Munich
**Architects:** Shore, Tilbe, Irwin & Partners, Thomas Tampold, Toronto
**Lighting design:** Zumtobel
**Lighting solutions:** RTX continuous-row lighting system, track system with halogen spotlights, Optos downlights with Auriga glass
Alexandria Library/Egypt
Client: Snohetta AS, Oslo
Architect: Christoph Kapeller
Lighting solutions: More than 1,000 specially designed recessed luminaires

Waterfront Hall, Belfast/Ireland
Client: Belfast City Council
Architects: Robert & McIlwaine
Lighting design: Mott MacDonald
Lighting solutions: Downlights
Light for art and culture
Oostende Library/Belgium
Client: City of Oostende
Architects: Felix Glorieux/Maes-Debusschere, Oostende
Lighting design: Studieburo Vandenberghe, Oostende
Lighting solutions: Canal lighting system as special solution, Optos downlights, Aero waveguide luminaires, Luxmate Professional lighting management system

Phoenix Public Library, Arizona/USA
Architect: Will Bruder, Phoenix, Arizona
Lighting design: Roger Smith, Phoenix, Arizona
Lighting solutions: Technos, special design based on the RTX louvre luminaire

Benedictine Monastery, Admont/Austria
Client: Benedictine Monastery of Admont
Architect: Manfred Wehdorn, Vienna
Lighting design: Lighting Design Austria, Eichgraben
Lighting solutions: Filigrano, ZX systems, ID-SW, OCS, Starflex
**Johanneskirche, Magdeburg/Germany**

**Client:** Regional Capital of Magdeburg

**Architect:** Walter Brezinski, Magdeburg

**Lighting design:** Ulf Schmidt, Magdeburg

**Lighting solutions:** Specially designed chandeliers, Canal lighting system, Kava, Spirit spotlight system, Dancer, Arcade, DL 3000 lighting tubes

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**Church on Hohenzollernplatz, Berlin/Germany**

**Client:** Evangelical parish on Hohenzollernplatz

**Architects:** Gerhard Schlotter, Berlin; Eva-Maria Kreuz, Stuttgart; Liane Kaven, Berlin

**Lighting design:** Zumtobel

**Lighting solutions:** Construction floodlights, HST spotlights, spotlights with soft-edge lenses and honeycomb meshes, HIT spotlights, HST floodlights, Linestra lamps, fibre optic system, double-focus downlights

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**Matthäikirche, Berlin/Germany**

**Client:** Evangelical parish of the Matthäikirche

**Architects:** Kreuz + Kreuz, Stuttgart

**Lighting design:** Liane Kaven, Berlin

**Lighting solutions:** Arcade QT-DE floodlights, individual Canal elements with special covering, QT-DE floodlights with special paint
Reception, direction and orientation
Like an overture, entrance halls and foyers put visitors in the mood for the enjoyment of art and culture. Architecture and lighting therefore have particularly high status here. The aim is to combine an inviting distance with operational necessities.

Lighting serves for orientation purposes. Zones for waiting and distribution, ticket offices and cloakrooms, emergency and control areas, as well as access to gastronomic facilities, all become recognisable through differentiated lighting concepts.

Usually it is integrative lighting solutions with downlights which welcome and direct visitors in the entrance area. Where artificial lighting continuously supplements daylight and at night replaces it completely, automatically controlled illuminated ceilings are being used more and more frequently.

In the Wallraf-Richartz Museum in Cologne, digitally controlled daylight ceilings radiate shadow-free overall light into the room.

In the foyer of the Alpbach Congress Centre, downlights provide uniform horizontal illumination.

Imposing overture: the historical entrance hall of the State Museum of Art in Copenhagen was carefully illuminated by means of diffuse lighting.
Recognition and perception
Whereas up until now it was wallwashers and accent spotlights that dominated lighting concepts in the exhibition rooms, the distinct trend that can be observed today is towards integrative lighting solutions using architecturally concealed lighting sources. More and more frequently, electronically controlled luminous ceilings simulating daylight are being employed. Apart from luminous ceilings, the central illumination components are wallwashers and dynamic lighting control systems such as Zumtobel’s Luxmate lighting management system.

In order to avoid glare and a negative effect on the exhibits by harmful UV and IR radiation, the amount of daylight – and even more so the entry of direct sunlight – has to be limited or, in certain cases, even excluded. For that reason vertically oriented windows are equipped with sun-protection devices in order to control the entry of light. A further alternative is to be found in the skylight structures, which require special sun-protection or light reduction devices, depending on the intended situation.

The light emitted from the luminous ceiling is highly diffuse. The filigree sculptures in the Liechtenstein Art Museum are perfectly highlighted without the use of spotlights.

Indirect cove lighting in combination with direct distribution of light set off the exhibits in the Austrian Gallery in the Belvedere Palace in an interesting and varied atmosphere.

The “Sieben Hügel” exhibition in Berlin: accentuated light supplied by narrowly focused spotlights provide a dramatic setting for the exhibits.
“Daniel Libeskind, Beyond the Wall 26.36”
Deliberately directed lighting is used to let the visitor experience the plasticity of the objects.
Exhibit and preserve

In illuminating objects, it is the surface of the luminous ceiling, in combination with spotlights and floodlights, that enhances the effect of a work of art. If objects are placed on the wall, then the solution may be uniform or partial wall illumination using wallwashers, yet it can just as easily be the exact limitability of framing spotlights.

In illuminating glass cabinets and showcases, it is especially necessary to avoid reflections and to pay attention to conservational aspects. The logical consequence of this is to turn away from LV halogen luminaires with their troublesome heat development. More and more frequently, new LED systems and fibre glass optic systems are being employed.

The skilful simulation of daylight using appropriately chosen lighting colours puts the exhibits in the Wallraf-Richartz Museum into effect, creating a light that seems quite natural.

A valuable cultural collection in showcases and glass cabinets demands special attention: reflection-free and UV-reduced lighting solutions have been used at the Benedictine Monastery in Admont.
**Communicating and lecturing**

When it comes to rooms used for communication purposes, one of the key issues is flexibility. Audio-visual media, such as screen presentations or video projections are used here – perhaps in a thoroughly spontaneous way. Therefore it must be possible to change the lighting situation accordingly in a quick and easy way.

In modern systems, lighting scenarios can be programmed and linked to the presentation media. The software is compatible, so that the media programmes and the lighting management system can be controlled via a user interface.

Lighting systems with different kinds of lighting modules for both accentuated and overall illumination, and with elements for designing and other special functions, allow an intelligent and elegant interplay.

Integrated into the ceiling, they avoid causing any disturbing effects in the visual field of the conference participants.

Many congress and conference rooms are also used for other events, receptions and banquets. In such cases, the lighting system should be able to support temporary installations and decorations.

Changing room utilisation demands flexible lighting solutions: at the Congress Centre of the European Forum in Alpbach, the Canal lighting system fulfils a variety of illumination requirements thanks to its multi-functionality.
Listening and looking

What is needed in concert halls and theatres is lighting with a highly decorative character. It plays a leading role in the spatial impression that is created during the intervals, as well as before and after the performance. The lighting assumes a space-creating function. That is why, very often, a decision is made in favour of a starry sky set or integrative lighting solutions using lighting points.

Yet, during the actual performance the hall lighting has a quite different role to play. It retires completely into the background, in contrast to the stage lighting, which has its own lighting dramaturgy.

Where the room lighting has at the same time the function of stage lighting, track systems with various types of spotlights provide a sensible alternative.

Lighting in the service of the acoustic architecture: various lighting systems (downlights in combination with illuminated surfaces in different colours) add an unusual ambience to the imposing Lucerne Concert Hall.

Through a skilful use of downlights, a harmonious relationship between vertical and horizontal illuminance was achieved at the Waterfront Hall in Belfast.

In the concert hall of the Goethe Institute in Toronto, the choice was made in favour of a balanced mix of horizontal and vertical illuminance. Spotlights on tracks direct the light to where it is needed.
The cafeteria on the ground floor of the Liechtenstein Art Museum is illuminated in a reserved way, using diffuse lighting.
To meet and to enjoy

Like museum shops, gastronomic facilities are acquiring increasing importance for institutions of art and culture. They make visitors stay longer in the building, they increase the frequency of visitors, and they open up additional sources of income. In their architecture, the gourmet and shopping areas in museums have to correspond to the architectural appearance of the whole. Today, there is a preference for minimalistic interiors with appropriately modern lighting solutions. Apart from neutral overall lighting, it is uplights and downlights, as well as wall-mounted luminaires, which correspond to the contemporary feeling for space. On the other hand, decorative lighting solutions tend to be avoided.

Kunsthaus Bregenz: the KUB Café is an exercise in tasteful restraint. Skilfully designed lighting creates intimacy and encourages conversation.

In the restaurant area of the Benedictine Monastery in Admont, uplights show off the cross vaulting to advantage.
Guiding steps

While the architecture in exhibition areas is generally more reserved in relation to the art, in many access zones the architect’s will to form comes out much more strongly. Stairs and corridors bear the architect’s own personal signature and become a spatial experience.

That is why in these areas the lighting concept is usually surprising. Small recessed floor and wall-mounted luminaires play an increasingly important role, as do LED luminaires, which give orientation and directions.
Office lighting is oriented towards the needs of the employees and their jobs. In the administration area of the Liechtenstein Art Museum, recessed louvre luminaires meet these requirements.
Design and organisation

It is less the screen work than the communication with artists and those people responsible for the exhibition, together with the elaboration of new concepts, which determine the lighting used for administration and service rooms in an art and culture organisation.

Apart from the general ergonomic requirements of the workspace, aesthetic considerations have to be taken into account in this area, too. Individual and representative design is a must. If academic and conservative issues are being worked on, then a high degree of precision and lighting stability is required.

The functionalities of modern lighting solutions have to do justice to all components of the visual surroundings. Before actually illuminating the working area, it is important to first go through an optimisation process in order to harmonise the relative brightness of walls, ceiling and all the other surfaces – in the course of which the orientation of windows and the conditions of the room with regard to contrast also have to be taken into account.

In the administration and service areas of buildings devoted to art and culture it is primarily high-quality lighting systems, often those employing innovative technologies, that are used.

Innovative lighting solutions are now also being employed in historical buildings: in the Johannesskirche in Magdeburg, the flexible Canal lighting system was used.

In the administration areas of museums, special attention is paid to aesthetic considerations. High-quality lighting solutions are valued above all in representative zones – as seen here at the Getty Center in Los Angeles.
**Archive work and restoration**

In places where works of art are preserved or worked on, particularly high demands are made on the lighting. Conservational aspects have to be taken into account as do high-security technical systems. Many works of art and natural history exhibits have to be effectively protected from ultra-violet and thermal harm, while any danger of luminaires catching fire or exploding has to be absolutely excluded.

The wide range of ultra-violet and infrared filters on offer, the choice of the correct light source and a high form of protection, all help to ensure extensive protection for exhibits that are in storage or being worked on. Working in close collaboration with conservationists, specialised lighting designers create a conservational lighting concept that corresponds to the respective demands.

If economic effectiveness is an important factor, then it is primarily continuous-row lighting systems with industrial luminaires that are used.

In the archive towers of the Bibliothèque de France in Paris, batten luminaires provide the ideal lighting conditions.

At the Liechtenstein Art Museum, balanced lighting provides shadow-free illumination for space-saving record shelves.


**Parking and working**

Traffic infrastructures are a must for visitor-oriented buildings devoted to art and culture. Multi-storey car parks and parking garages are the first immediate points of contact between the building and the motorised visitor. Therefore, apart from a high degree of security and orientation, care also has to be taken to make an inviting impression. Modern rooms for technical equipment are essential for efficient and economical building management.

Apart from following experts’ advice to provide horizontal illuminance of all areas used for movement or parking, it is above all the uniformity of the lighting that makes a car park building safe and attractive. When coupled with a large number of vertical lighting elements, good general lighting prevents car burglaries and theft.

The inherent danger in places which are particularly susceptible to accidents, such as driveways and entrances, can be effectively reduced by providing additional luminaires with orientational arrangements. Technical lighting systems, continuous-row lighting systems and luminaires of high protection classes are used in the parking and technical equipment areas of contemporary buildings devoted to art and culture.

Liechtenstein Art Museum: It is also for security reasons that the delivery of valuable art treasures demands optimally illuminated surroundings.
Illumination and medialisation
Whereas facades always used to be well-established advertising vehicles for brand-name messages or event announcements, they have recently become more and more frequently designed as illuminated objects. Even in the external area of buildings devoted to art and culture, artistic signals are now being sent out. Well-known lighting artists even go so far as to transform the facade into a dynamic art object. Changing lighting installations become conveyors of art’s message that are visible for miles.

Often scenarios are developed which can only be implemented by means of professional lighting control systems such as Luxmate. Among the preferred lighting systems for the illumination of facades are high-performance floodlights and batten luminaires installed behind glass. If these are installed close to the floor, they have to be safe and protected against vandalism.

“Environmental Work” facade design for the Bregenz Kunsthaus by Keith Sonnier. The unique interplay of colours is made possible through the Luxmate lighting management system. Active Light in its perfection becomes visible from a great distance.
The experience of art

Lighting for pictures

The definition of light involves a decision which is as technical as it is conceptional.

Light can be used to mystify panel paintings or to illuminate them in their pure nature as objects. What is decisive is the intention of the artist or the exhibition organiser, yet conservational aspects and the choice of the correct angle of illumination also play an important role.

In addition, there are many other facets that have to be taken into consideration, including the colours and type of the object involved.

Spot with 15° beam angle and ambient luminescence

Spot with 15° beam angle and diffuse ambient luminescence

2 spots with 15° beam angle, no ambient luminescence

2 spots with 15° beam angle, with ambient luminescence

Spot with 15° beam angle

Spot with 15° beam angle and soft-edge lens

All pictures: mounting height 2.90 m
horizontal distance 0.90 m
Framing spotlight without ambient luminescence

Diffuse ambient luminescence

Daylight-white fluorescent lamp with open light distribution

Spotlight with oval outline lens

Spotlight with oval outline lens and barn doors

Soft-focus framing spotlight

Floodlight with 45° beam angle and oval outline lens

QT-DE wallwasher with symmetrical light distribution

QT-DE wallwasher with asymmetrical light distribution
Lighting for objects

In order not to reduce the three-dimensional plasticity in the eye of the beholder to two levels, art objects are usually illuminated by several luminaires, and by various types of spotlights from several lighting directions.

The special challenge in this lies in showing off objects attractively from all sides, yet without blinding the observer from any position.

The optimum solution for sculptural illumination is a balanced mixture of diffuse and deliberately directed lighting.

Lighting for showcases

Small or very sensitive objects are exhibited in showcases. Their illumination should be correspondingly subtle. Small light sources make the exhibits really sparkle.

If the exhibition objects are protected by glass from being touched by visitors, there are special lighting techniques, such as glass-fibre or LED illumination, to protect works of art from heat or harmful UV and IR radiation.
Spotlight with 15° beam angle, lighting from front, below, right

Spotlight with 15° beam angle, lighting from front, below, left

Side lighting from right

Starflex glass-fibre lighting from curved tubes

Starflex glass-fibre lighting from curved tubes, supplemented by diffuse underlight

Lighting from right

Lighting from above

Lighting from below

Starflex glass-fibre lighting from curved tubes with dark background
Lighting and conservation

Light – without which it is impossible for visitors to view the exhibits – can have a negative influence on colours and materials.

In many museums the exhibition objects are protected from direct sunlight by daylight ceilings or the appropriate skylight constructions, although this does not exclude a certain amount of UV or IR radiation. There is always a danger of damage, particularly in the case of very sensitive materials such as textiles and natural fibres, papers, ink and watercolours.

First and foremost, it is organic material that is affected by photo-chemical processes, although some minerals and older, coloured glasses may also suffer. The formation of cracks and shrinkage are among the most frequent effects of thermodynamics. Protection can be provided by means of special filter glasses and reflectors, for example fibre-optic or LED systems. Specialists from Zumtobel, together with conservationists, seek optimum solutions for each individual case.

Important factors for a lighting solution are on the one hand the lux hours and thus the duration of exposure, on the other hand the watt hours per square metre with regard to the thermal load. By using the appropriate formulas and methods of calculation, and having a knowledge of the threshold values of the different materials, the influence of light can be exactly calculated, making it possible to establish a basis for optimum lighting concepts.

Highly sensitive materials
- Textiles, cotton wool, natural fibres, skins and furs, silk, ink, paper, volatile colours, watercolours, wool, some minerals: 50 lx maximum illuminance, 50,000 lxh/year

Less sensitive materials
- Textiles with stable colours, oil paintings, treated wood, leather, some types of plastic: 200 lx maximum illuminance, 480,000 lxh/year

Hardly sensitive materials
- Metal, stone, glass, ceramics, most minerals: independent of the exhibition conditions, hardly any danger of damage caused by light
**Calculation of the position of luminaires**

In calculating the optimum luminaire position, the size of the picture and the optimum viewing angle should be included in the design, alongside architectural data such as room height and observation zones.

The necessary results are obtained by mathematical formulas, in order to avoid mistakes in the choice of the luminaire, its radiation angle and where to mount it.

Formulas for calculating the necessary offset distance “x” between spotlight and wall for illuminating a picture with the height “y”:

\[ x = \tan(30^\circ) \times y \]

Some results:

<table>
<thead>
<tr>
<th>Room height</th>
<th>Distance spot/wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.7 m</td>
<td>0.60 m</td>
</tr>
<tr>
<td>3.3 m</td>
<td>0.95 m</td>
</tr>
<tr>
<td>4.0 m</td>
<td>1.35 m</td>
</tr>
</tbody>
</table>
The colours of light

The art of lighting includes the careful choice of lamps and lighting technology. In doing so it is not so easy to find the optimum luminaire from the wide range of products available. Combined with the innumerable possibilities of light sources that can be used, there is an almost endless number of solutions.

In their attempt to achieve with artificial lighting the continuous spectrum of colour rendition of daylight, lamp manufacturers have made considerable progress. Nevertheless, depending on the colour of the art object, certain lamps still intensify the colours of a painting to great effect, or – in a negative case – make the picture seem uninviting or flat.

<table>
<thead>
<tr>
<th>Type of lamp</th>
<th>Description</th>
<th>Electric power (W)</th>
<th>Luminous flux (lm)</th>
<th>Light colour **</th>
<th>Level of colour rendition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluorescent lamps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T16</td>
<td></td>
<td>14–35</td>
<td>1100–3300</td>
<td>ww, nw, tw</td>
<td>1B, coloured</td>
</tr>
<tr>
<td>T16</td>
<td></td>
<td>24–80</td>
<td>1650–6150</td>
<td>ww, nw, tw</td>
<td>1B</td>
</tr>
<tr>
<td>T16-R</td>
<td></td>
<td>22–60</td>
<td>1700–5000</td>
<td>ww, nw, tw</td>
<td>1B</td>
</tr>
<tr>
<td>T26</td>
<td></td>
<td>18–58</td>
<td>940–5200</td>
<td>ww, nw, tw</td>
<td>1A, 1B, coloured</td>
</tr>
<tr>
<td>Compact fluorescent lamps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC-S</td>
<td></td>
<td>5–11</td>
<td>250–900</td>
<td>ww, nw, tw</td>
<td>1B</td>
</tr>
<tr>
<td>TC-SEL</td>
<td></td>
<td>5–11</td>
<td>250–900</td>
<td>ww, nw</td>
<td>1B</td>
</tr>
<tr>
<td>TC-D</td>
<td></td>
<td>10–26</td>
<td>600–1800</td>
<td>ww, nw, tw</td>
<td>1B</td>
</tr>
<tr>
<td>TC-DEL</td>
<td></td>
<td>10–26</td>
<td>600–1800</td>
<td>ww, nw</td>
<td>1B</td>
</tr>
<tr>
<td>TC-T(l)</td>
<td></td>
<td>13–26</td>
<td>900–1800</td>
<td>ww, nw, tw</td>
<td>1B</td>
</tr>
<tr>
<td>TC-TEL(l)</td>
<td></td>
<td>13–57*</td>
<td>900–4300</td>
<td>ww, nw</td>
<td>1B</td>
</tr>
<tr>
<td>TC-L</td>
<td></td>
<td>18–55</td>
<td>750–4800</td>
<td>ww, nw, tw</td>
<td>1A, 1B</td>
</tr>
<tr>
<td>TC-F</td>
<td></td>
<td>18–36</td>
<td>1100–2800</td>
<td>ww, nw</td>
<td>1B</td>
</tr>
<tr>
<td>* Osram DULUX T/E 57 W new model 2001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Halogen incandescent lamps for low voltage (12 V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QT-tr 9</td>
<td></td>
<td>5–20</td>
<td>60–320</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QT-ax 12</td>
<td></td>
<td>20–100</td>
<td>300–2300</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QT-LP ax 12 (IRC)</td>
<td></td>
<td>35–50</td>
<td>750–1200</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QR-CBC 35</td>
<td></td>
<td>20–35</td>
<td>250–610</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QR-CBC 51</td>
<td></td>
<td>20–65</td>
<td>240–1450</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QR-CBC 51 (IRC)</td>
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<td>20–50</td>
<td>450–1550</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QR 111</td>
<td></td>
<td>35–100</td>
<td>360–1370</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>Halogen incandescent lamps for mains voltage (230 V)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QT 18</td>
<td></td>
<td>60–150</td>
<td>780–2500</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QT 32</td>
<td></td>
<td>60–250</td>
<td>780–4200</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QT 48</td>
<td></td>
<td>60–150</td>
<td>700–2550</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QT-DE 12</td>
<td></td>
<td>60–500</td>
<td>810–9900</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>QT-DE 12 (IRC)</td>
<td></td>
<td>250–400</td>
<td>5500–9500</td>
<td>ww</td>
<td>1A</td>
</tr>
</tbody>
</table>

** ww = warm white, nw = neutral white, tw = daylight white
<table>
<thead>
<tr>
<th>Type of lamp</th>
<th>Description</th>
<th>Electric power (W)</th>
<th>Luminous flux (lm)</th>
<th>Light colour **</th>
<th>Level of colour rendition</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAR lamps</td>
<td>QPAR 16</td>
<td>40–50</td>
<td>400–540</td>
<td>ww</td>
<td>1A</td>
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<tr>
<td></td>
<td>QPAR-CB 16</td>
<td>50</td>
<td>370</td>
<td>ww</td>
<td>1A</td>
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<tr>
<td></td>
<td>QPAR 20</td>
<td>50–75</td>
<td>310–800</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>QPAR-CB 20</td>
<td>50–75</td>
<td>350–900</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>QPAR 25</td>
<td>50–75</td>
<td>500–1000</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>QPAR 30</td>
<td>75–100</td>
<td>1170–1600</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>QPAR-CB 30</td>
<td>75</td>
<td>1250</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>QPAR 38</td>
<td>75–100</td>
<td>1250–1600</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>PAR 38</td>
<td>60–120</td>
<td>600–1200</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>PAR-CB 38</td>
<td>120</td>
<td>1200</td>
<td>ww</td>
<td>1A</td>
</tr>
<tr>
<td>Metal halide lamps</td>
<td>HIT(-ax)</td>
<td>70–400</td>
<td>5200–42000</td>
<td>ww, nw, tw</td>
<td>1A, 1B, 2A, 2B</td>
</tr>
<tr>
<td></td>
<td>HIT-CRI (G8,5/G12)</td>
<td>35–150</td>
<td>3300–14000</td>
<td>ww</td>
<td>1A, 1B</td>
</tr>
<tr>
<td></td>
<td>HIT-DE</td>
<td>70–400</td>
<td>5000–36000</td>
<td>ww, nw, tw</td>
<td>1A, 1B, 2A</td>
</tr>
<tr>
<td></td>
<td>HIT-DE-CRI</td>
<td>70–150</td>
<td>5700–14500</td>
<td>ww</td>
<td>1A, 1B</td>
</tr>
<tr>
<td></td>
<td>HIE</td>
<td>70–150</td>
<td>4900–12500</td>
<td>ww, nw</td>
<td>1B, 2A</td>
</tr>
<tr>
<td></td>
<td>HIE-CRI</td>
<td>70</td>
<td>6100</td>
<td>ww</td>
<td>1B</td>
</tr>
<tr>
<td></td>
<td>HIPAR</td>
<td>35–70</td>
<td>1850–4750</td>
<td>ww</td>
<td>1B</td>
</tr>
<tr>
<td>High-pressure sodium</td>
<td>HST (SDW-T/TG*)</td>
<td>35–100</td>
<td>1300–4800</td>
<td>ww</td>
<td>1B</td>
</tr>
<tr>
<td>vapour lamps</td>
<td>HST-CRI</td>
<td>150–400</td>
<td>13000–38000</td>
<td>ww</td>
<td>2B</td>
</tr>
<tr>
<td></td>
<td>HST-DE</td>
<td>70–150</td>
<td>6800–15000</td>
<td>ww</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>HSE</td>
<td>35–150</td>
<td>2200–17000</td>
<td>ww</td>
<td>4</td>
</tr>
</tbody>
</table>

* Philips SDW-TG 50/100 W new models 2001/02

Light emitting diodes (LED)
- red: 0.1, ca. 3.5*
- green: 0.1, ca. 2.0*
- yellow: 0.1, ca. 3.0*
- blue: 0.1, ca. 0.7*
- white: 0.1, ca. 1.5*

** ww = warm white, nw = neutral white, tw = daylight white

* Subject to constant further development
Canal recessed lighting system

Through its simple modular character, the Canal architectural system creates independence of design. Canal is simple to design, simple to change and makes it possible to have any kind of lighting, whether accentuated, functional or covering a large surface. In contrast to track installations, any repositioning of spotlights can be undertaken by the user without any tools and even with the simultaneous use of the light source. Various lighting modules for accentuated and general lighting, as well as modules for design and special functions, make this intelligent and elegant interplay possible.

Xeno spotlight system

Xeno is the name of the new generation of spotlights for professional lighting design, developed by French designer Jean-Michel Wilmotte. A consistent design, the spotlight system provides accent lighting using anything from LV halogen spotlights to projection spotlights. The scope of utilisation can be extended to include a wide range of accessories such as filters, protective glasses, lenses, honeycomb meshes or barn doors.

MQ motorised spotlight

Special requirements in technology and design integration cannot be met by means of standard solutions. A completely new alternative is offered by the new special luminaire which has been used at the Vienna Museum Quarter: the most striking innovation of this project-specific development are three motors which can be controlled electronically and enable the luminaire to be pivoted, turned and focussed from a distance. The luminaire is controlled by a freely programmable digital lighting management installation system, the operating elements of which also enable the spotlight to be dimmed and switched on and off.
Arcade wallwashers

With the Arcade luminaire, a new form of flexible utilisation was developed: spotlight, wallwasher and uplight all in one. The light from the parabolically shaped mirror reflector always has a different effect, depending on the position of the luminaire casing, which can be pivoted by 2 x 90°. When set up horizontally, the light is cast uniformly across a vertical surface. In contrast, the more vertical position of the spotlight produces a stronger concentration of light on the vertical surface. Formally, the luminaire is completely attuned to the miniaturised T16 fluorescent lamp: a reduction to essentials.

Starflex fibre-optic system

With its practical component structure, the Starflex fibre-optic system offers great scope for the creative use of lighting. It makes a diffuse lighting ambience just as possible as the effective accent lighting of objects d’art – even those which are very sensitive to light and heat. Depending on requirements, the number, length and diameter of the fibre cables can be selected as desired, and they can be combined with light outlets in accordance with the type of radiation needed.

LED lighting miniatures

With its Ledos LED lighting system, Zumtobel has presented fascinating perspectives for users of new lighting technology in the fields of both interior and exterior design. The products on offer range from the compact Ledos M(ini) to be integrated in walls and floors to formally reserved recessed wall luminaires, rounded off by the decorative Kava LED line. What they all have in common is that they are maintenance-free, have low-energy consumption and offer interesting possibilities in accentuating, decorative, coloured lighting points.
Zumtobel is the internationally leading supplier of integral lighting solutions for a wide variety of applications in professional interior lighting:

- Industry and engineering
- Offices and education
- Presentation and retail
- Hospitality and wellness
- Art and culture
- Health and care
- Sport and leisure
- Transit areas and car parks
- Orientation and safety

We provide unique customer benefit by integrating technology, design, emotion and energy efficiency. Under the Humanergy Balance concept, we combine the best possible ergonomic lighting quality for people’s well-being with the responsible use of energy resources.

The company’s own sales organisations in twenty countries as well as commercial agencies in fifty other countries form an international network of experts and design partners providing professional lighting consulting, design assistance and comprehensive services.

Corporate goal: We want to use light to create worlds of experience, make work easier and improve communications and safety while remaining fully aware of our responsibility to the environment.
Light for art and culture