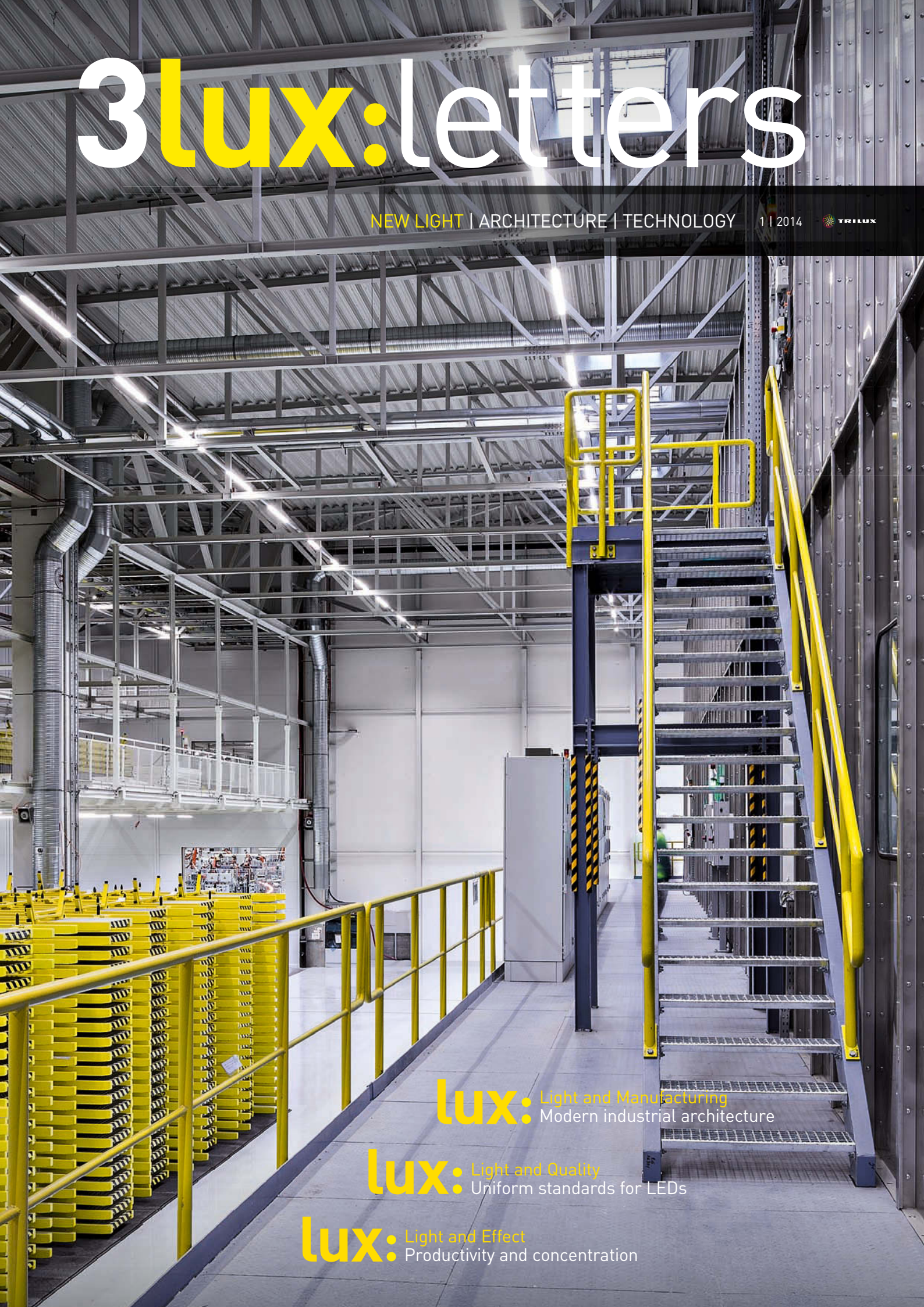
# 3lux:letters

NEW LIGHT | ARCHITECTURE | TECHNOLOGY 1 | 2014 TRILUX



**lux:** Light and Manufacturing
Modern industrial architecture

**lux:** Light and Quality
Uniform standards for LEDs

**lux:** Light and Effect
Productivity and concentration




**Front page**: Automotive manufacturer Volkswagen Slovakia built a new body shop at its Bratislava location. TRILUX luminaires provide optimal illumination for the production of the VW Touareg and Audi Q7.

Photo: Boris Golz

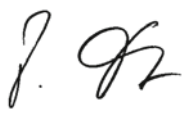
## Dear Reader,

The planning and construction of industrial buildings are strongly influenced by different functional processes, their continual advance and not least technological progress. Such buildings range from production and assembly halls to cleanroom facilities for the manufacture of medical products to power stations. Independent of the building's use, the running costs over its entire life cycle are gaining ever more significance. Good lighting planning with LEDs plays a considerable part in this. In his article "Round buildings, ramps and recycling: 3 instances of the right lighting for businesses" (page 10), architecture journalist Dirk Meyhöfer outlines the general developments and trends in modern industrial architecture and their influence on lighting.

In our interview (page 18) Interior designer and lighting designer Felice Dittli (dittlidesign), light artist and cultural manager Rolf Zavelberg (Aktivraum – Agentur für angewandte Lichtkunst) and architects Jürgen Reichardt and Björn Maas (RMA | Reichardt Maas Assoziierte) talk about their work and the illumination of old and new industrial architecture. The Gatra AG bus station in the Swiss village of Effretikon (page 22), the Volkswagen works in Chattanooga, USA (page 28) and the new Dachser GmbH & Co. KG handling depot in Berlin's Schönefeld district (page 32) highlight the increasing significance of energy-efficient and resource-saving lighting solutions in industrial buildings. Our planners' question (page 36) focuses especially on the application of LEDs in the industrial sector and the associated maintenance requirements, and is complemented by the introduction of a new guideline, which defines uniform quality standards for LED luminaires (page 38). Moreover, organisational psychologist and engineer Daniel Stabenau explores biologically effective light, which can support the human day/night cycle in industrial buildings too (page 40).

I hope you will very much enjoy reading the current issue of 3lux:letters!

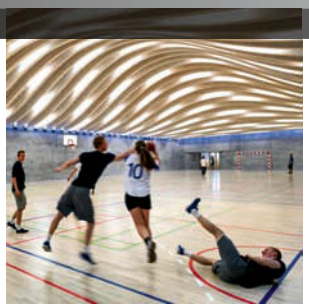
Yours sincerely,



Thomas Kretzer, CEO TRILUX Vertrieb GmbH




# LIGHT AND INDUSTRY



**Sports and events hall at the Gammel Hellerup high school**
Hellerup, DK
BIG-Bjarke Ingels Group
www.big.dk

The sports hall does not rely solely on artificial light. Instead, daylight is also able to filter into these underground rooms.

Photos: Jens Lindhe

In the daytime, schoolchildren make use of the tables and chairs on the roof for their work together or during break time. When night falls, this seating becomes luminous.

The new sports and events hall at the Gammel Hellerup high school outside Copenhagen not only links the various buildings in the existing 1960s school complex. When the architects from BIG situated the hall five meters below ground level it was then possible to design a new playground on its roof. The sweeping lines of the wooden building are continued in the ceiling construction on the inside of the hall. Moreover, spaces in the continuous roof provide the sports centre with daylight. However, the roof does offer something rather special in the hours of darkness when the chairs, tables and benches in use during the daytime are transformed into impressive lighting objects. The integrated LEDs are fed by the school's own solar power generator.



# From the X-line to the E-line – a reliable industrial lamp

Industrial production and assembly halls often see round-the-clock shift work. In order to ideally illuminate high rooms, an efficient, easy-to-service and financially feasible lighting system is essential. A lighting system that meets these demands and which has been continually advanced over the years is the E-line by TRILUX. The lamp was first introduced to the market in 1993 under the label X-line. The integration of the characteristic properties of round reflectors into an industrial strip light meant that design played a crucial role for the first time in the history of industrial lighting. The light already featured easy-to-use spring locks for fastening the device supports; this made it the first industrial strip light that could be installed without tools. In 1999, the X-line was re-branded as E-line and at the same time the supporting profile, the connector socket for the continuous row luminaires and the wiring were adjusted to suit current needs. In 2008, almost ten years later, the E-line was improved in regard to the advanced T5 technology and equipped with specifically optimised reflectors, grates and diffusors. After a complete reworking in 2012 the E-line is now fitted out with LED device supports, which in connection with the integrated optics mean reflectors, grates and troughs are no longer necessary. In addition to this, existing old systems can now be quickly modernized without tools and are then up to date with regard to energy consumption. The lighting system is available in various colours, types of light distribution and luminous flux packages between 4,000 and 20,000 lumens.

Photos: TRILUX

Conventional system with a T8 fluorescent tube (left).

The modernized LED version after quick and easy refitting (right).

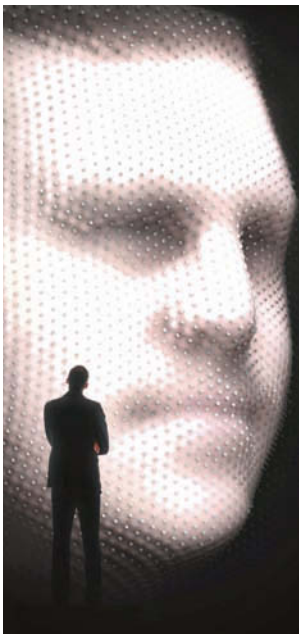
In her work where a carnivorous plant in a glass bowl is given only light & food Rosmarie Weinlich aims to visualize how life starts.

One of the most recent exhibits is an installation that dates from 2013 "lichtaufwärts light upwards" by artist Susanne Rottenbacher.

Photos: Kunstmuseum Celle

**Floodlights – lighting art in Germany in the 21st century**
Kunstmuseum Celle, DE
Part 1: until 30 March 2014
Part 2: 20 June – 5 October 2014
www.kunst.celle.de

The art form that is lighting installations came into being more than 100 years ago. The electric bulb, luminous diodes, neon lights, fluorescent tubes, projectors, floodlights and laser lights – each new technical development provides artists, even today, with creative inspiration and many possibilities. In Germany in particular, lighting art has become an increasingly important medium in recent years. Reason enough for Kunstmuseum Celle to devote a two-part exhibition to the subject. The show "Floodlights – lighting art in Germany in the twenty-first century" is exhibiting works from the collection of Robert Simon dating from the year 2000. All the exhibits are by artists whose origins, residence, training or apprenticeship relates to Germany. The second part of the exhibition will be on show in Celle as of the end of June.



The natural shade achieved in the colouring is a result of the fact that the stretched membrane is backlit with LEDs.

The pavilion sketched out the faces of the visitors like a gigantic bed of nails.

**MegaFon Pavillon**
Winter Olympics
Sochi, RU
Asif Khan
www.asif-khan.com


Renderings: Asif Khan

During this year's Winter Olympic Games in Sochi, Russia, the visitors had the opportunity to admire their own reflected images in a façade that was eight meters high. London-based designer Asif Khan succeeded in reproducing the faces of the sports fans on the pavilion belonging to a Russian cell phone service provider. To achieve this, five photos per person were converted into 3D models. A special computer program subsequently communicated this information to 10,000 outsize needles which, depending on the shape of the face to be illustrated, were pushed out to a greater or lesser extent and stretched out to form a translucent membrane. Every likeness could be admired for around 20 seconds, with their impressive effect further reinforced by LEDs attached to the needles, which could be up to two meters long.

With its airy appearance, the chair comes with LEDs offering cold white or warm white light.

An apartment completely without lights on the walls or ceilings because the furniture itself functions as a light ... This was probably the thinking of the designers working for Italian Natevo corporation when masterminding the armchair Nuvola. With its comfortable seat made of elastic netweave, the light is produced by LEDs and shines into the room indirectly, making this item of furniture look like a cloud. Available in the light colours cold white and warm white, a remote control can be used to set the appropriate lighting mood for the occasion. The chair itself and other items of furniture such as tables, stools and chairs come in the colours white and black and in a natural shade. Various wall decorations complement this radiant collection.

**Nuvola Di Luce**
Natevo by Flou Spa
www.natevo.com

Photos: Natevo

Lucid Stead is a work of art in Joshua Tree, California, that must appear to the viewer rather like a mirage in the desert. Artist Phillip K. Smith III covered the rough façade of this 70-year-old former homesteader shack with horizontal strip mirrors without changing the original structure of the edifice in any way. The result: a surrealistic, almost invisible object that changes depending on the ambient light. At twilight, the abstract effect produced by the wooden hut became even greater thanks to the computer-controlled changes in colour on the backlit areas on its door and four window openings. Depending on the viewer's vantage point, these areas also appear in other shades of colour. An unusually colourful mood in what is otherwise a barren desert area.

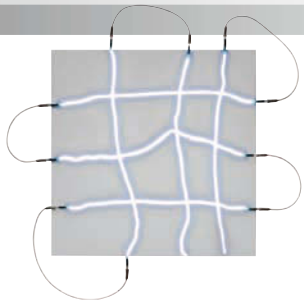
**Lucid Stead**
Joshua Tree, USA
Phillip K. Smith III
www.pks3.com

Photo: Steven Kring

In the daytime the mirrors meant that the old homesteader shack looks like a surrealistic entity the individual levels of which seem to float.

Photo: Lance Gerber

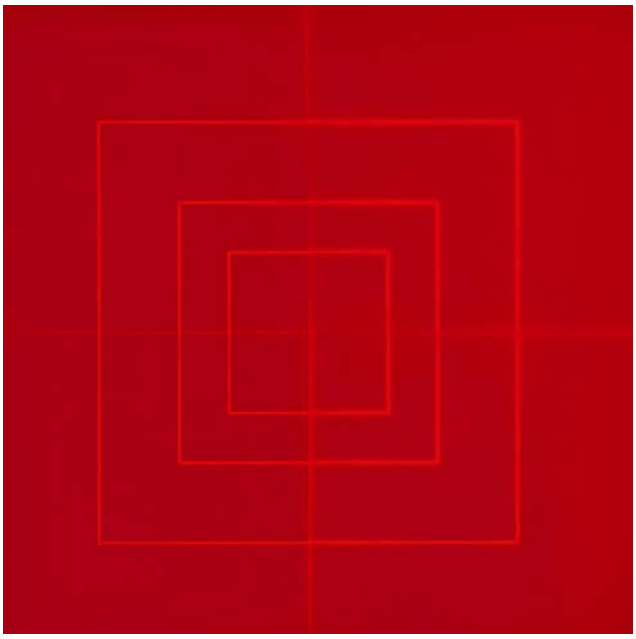
At night with their colourful backlighting the door and window areas dominate the background reflected in the mirrors.



In Récréation No. 6 François Morellet arranged bent neon tubes both horizontally and vertically in front of a neutral background.

**Light.Art.Kinetics.**
Museum Ritter
Waldenbuch, DE
until 27 April 2014
www.museum-ritter.de

Hellmut Bruch's sequence of squares obeys the series of numbers discovered by 13th century mathematician Leonardo Fibonacci.



Photos: Museum Ritter

The current exhibition "Light.Art.Kinetics." at Museum Ritter in Waldenbuch is showing around 60 selected works from the Marli Hoppe-Ritter collection which present real light and its actual movements. On display is a comprehensive selection of classics in light kinetics from the post-War era as well as more contemporary exhibits that are equipped with modern technology. Encouraged by the work of such different groups of artists as ZERO, GRAV, T and N, lighting kinetics in Europe experienced its first heyday in the 1960s. While back then only fluorescent tubes and simple motors were available, today's artists can make use of modern LED technology and computerized controls. A development that visitors can explore for themselves until April 27, 2014.

## lux: STATEMENT

Dipl.-Ing. Stefan Fehse
DIA179
german industry architecture GmbH
Berlin

# Light and industry, how do the two go together?

Today, entrepreneurs want light, transparent working spaces that are of a high quality. At the same time, employers should always feel comfortable at work, irrespective of whether they work on a manufacturing line or in a development department. In this context, lighting plays a crucial role, as with its clear functions it can be skillfully integrated to support good design: Primarily, daylight should be utilized. A number of architectural instruments are available for this purpose. In addition to this, building automation can enable a resource-efficient regulation of artificial light and daylight. The industry provides many functionally designed products for modern lighting solutions. Light fixtures and luminaires from one and the same product family can be used for different working areas, accentuating each individually.

The proper use of light in industrial architecture is to illuminate the workplace in such a way that the employees can best fulfil their tasks. Being able to see the outdoors, for example, over the façade or roof of vast industrial halls, heightens the employees' sense of wellbeing at work. Additionally, a contemporary lighting concept has to optimise conditions in the work place and should above all be user-friendly. In conjunction with modern (interior) architecture, the right lighting concept can increase staff motivation levels, and the employees will express this positive feeling when interacting outside the company, too. Last but not least, transparency is an important factor in lighting as in the daytime natural light can fall into the building and at nighttime artificial light reveals what's happening inside.

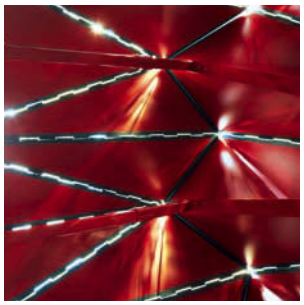
The façade of the production facility of automotive parts supplier Eberspächer in Wilsdruff nr. Dresden has been embellished with profiled glass.

Photo: DIA179

Whenever the dark outsides are opened up at night these little kiosks become a special kind of eye-catcher.

Photos: Make Architects

Attractive to look at, these boxes open up similarly elegantly to paper fans.



**Kiosk**
Make Architects
Ice Sculpturing Festival
Canary Wharf, London, GB
www.makearchitects.com

The individual origami folds are further accentuated by means of colored LEDs on the insides.

These two striking kiosks created by Make Architects were inaugurated in January this year during the Ice Sculpting Festival at Canary Wharf in London. When closed up, these black boxes have a mysterious look, not least because of their strikingly convoluted exteriors – kindling curiosity as to what is hidden inside them. When the boxes are finally opened up, the special origami folding technique used in the construction of these kiosks certainly catches the eye. A colourful LED integrated into the individual folds makes for a very special lighting effect, thus attracting the attention of the passersby. A structure made of steel forms the framework for this portable 2 x 5 meters stand which is covered with durable, powder-coated aluminum sheeting and is thus as good as vandal-proof.

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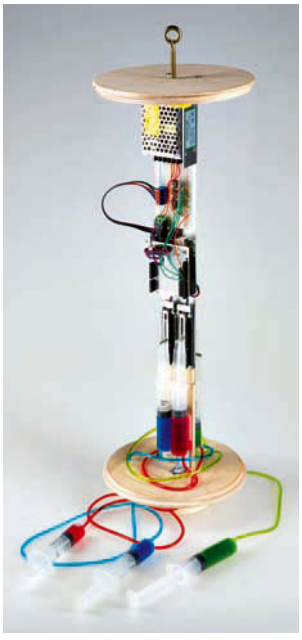
The central element of the prototype with its syringes, sliding switches and microprocessor which regulates the LEDs.

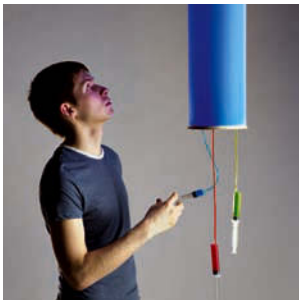


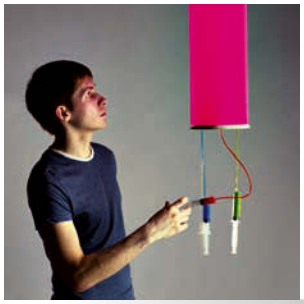
Photos: Anton Demidov

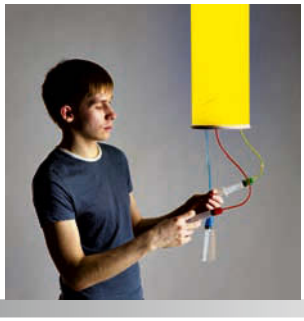
**Colour Injector Lamp**
Taras Sgibnev
www.behance.net/taras_sgibnev

Russian designer Taras Sgibney has come up with an unusual idea for his "Colour Injector Lamp", the colour of whose light can be changed by means of injections. Three syringes hang at the lower end of the cylindrical light, each filled with either red, green or blue ink. In order to change the colour of the light the three syringes are used to push in or pull out the desired quantity of the relevant colored liquid which passes through tubing into three more syringes on the inside of the housing. This allows sliding switches linked to a microprocessor to be operated. The latter in turn calculates the desired colour shade and regulates the integrated LEDs. This allows the user to select the shade of colour he desires interactively by means of the percentage of the relevant primary colour.

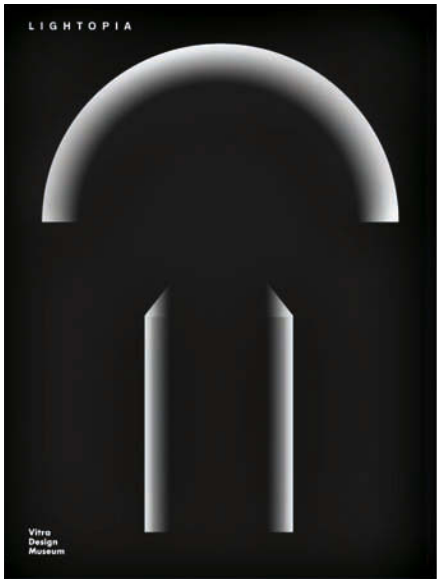
The changes in color are effected digitally through the act of adding and/or removing different colored liquid manually.







**LIGHTOPIA**
Mateo Kries, Jolanthe Kugler (Editor)
Published in 2013
Vitra Design Museum
3 volumes in slipcase
396 pages, ca. 422 illustrations
German, English
28,6 × 21,6 cm, softcover
ISBN: 978-3-931936-05-1
www.shop.design-museum.de




Lightopia relates the cultural history of lighting design from its early days in industrial society to various future visions. A three-part anthology delivers extensive background knowledge on the eponymous exhibition, which was on show at the Vitra Design Museum in Weil am Rhein until March 9, 2014. Volume 1 features essays on the historical, scientific and psychological aspects of light. Volume 2 presents a selection of the 100 most important luminaires from 1900 until today, including an introduction on their design and designers. Volume 3 rounds out the overall picture of how designers approach light through interviews with significant luminaire designers and light artists.

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**Hamburgs alte Fabriken - einst und jetzt**
Eckhard Freiwald,
Gabriele Freiwald-Korth
Published in 2013
by Sutton Verlag
168 pages, 280 illustrations
24,5 x 22,5 cm, bound
German
€ 24,95
ISBN 978-3-95400-129-3
www.suttonverlag.de

A number of important factories feature in Hamburg's history. Today however, most of them either no longer exist or serve as commercial complexes, are used as office buildings or for residential purposes. A significant motivation behind this richly illustrated book was to seek the traces these factories have left behind. Eckhard Freiwald shows how industrial life has changed in the Hanseatic city. With over 250 historical photographs from public and private archives, complemented by current images, he documents the changes industrial buildings have undergone. He describes the background to their creation and development, and shows how they are now used, say, as residential buildings or cultural centres.


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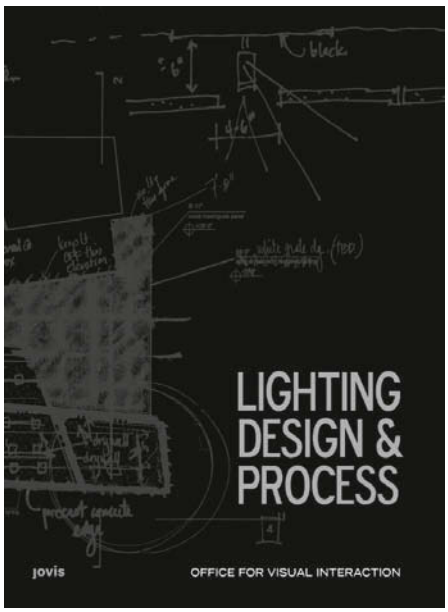
**Lighting Design & Process**
Office for Visual Interaction
Published in 2013
by Jovis Verlag
260 pages, 280 illustrations
22 x 27 cm, hardcover
English
€ 48,00
ISBN 978-3-86859-256-6
www.jovis.de




The Office for Visual Interaction (OVI), set up jointly by Jean Sundin and Enrique Peiniger in New York, sees light as a fundamental architectural element. The designers of OVI draw inspiration from the interaction of light with surfaces and materials. For almost two decades they have been designing innovative lighting concepts for important architectural projects such as The New York Times publishing building, the Canadian Parliament and the United States Air Force Memorial. This book shows a collection of their most impressive projects. With over 400 fascinating photos, drawings, sketches and graphics, this monograph provides a deep insight into the art and science of light.

# THREE INSTANCES OF THE RIGHT LIGHTING FOR BUSINESSES

Even in times of digital industrialization and climate change, buildings for industry or power supply, for logistics and small business enterprises are an architectural and consequently a creative issue. Here we illustrate the key role of lighting in contemporary industrial architecture using the examples of a production hall in Weil am Rhein, a car dealership in Hamburg and a waste incineration plant in Cologne.

By Dirk Meyhöfer

SANAA Factory Building, Architecture: SANAA, Photo: Julien Lanoo ©Vitra (www.vitra.com)

Architectural history leaves no doubt: In the design of industrial and commercial buildings, form must follow function. That's how we have done things since the modern age. Icons of industrial architecture of the caliber of a Berlin turbine hall for AEG (Peter Behrens) and the cult Battersea Power Station – which even made it onto a Pink Floyd cover – are a thing of the past. Today there isn't much steaming and hissing going on and the dramaturgical staging of labour is obsolete in an era in which industrial activity is scarce and we work ubiquitously from our laptops, without a permanent location.

**SANAA production hall in Weil am Rhein**

Of course, that's not entirely true. The Swiss office furniture manufacturer Vitra is one of the most important protagonists for contemporary industrial architecture, and has for the last 20 years curated a fantastic open-air exhibition on the topic at its German site in Weil am Rhein. From Álvaro Siza to Zaha Hadid, it features all those representing the avant-garde. Since 1993 the halls have never looked rugged or functionalist, rather, they are extremely efficient and at the same time aesthetic statements revealing a true love of detail – in the sense of Vitruvius, they follow the triad of beauty, strength and utility. The latest example is the production hall by Japanese Pritzker Prize-winners SANAA, founded by Kazuyo Sejima and Ryue Nishizawa. The two architects' signature features are lightness and precision, and a "simple" approach in a field where flustered colleagues devise overly bold constructions in a desperate search for a personal signature. They manage to implement a surprising formula of "less is more", be it at the Rolex Learning Center in Lausanne or for the Folkwang University of the Arts on the Zollverein Industrial Complex in Essen. This means organizing intricate room schedules and production processes in a way that is spatially clear yet attractive. On the Vitra Campus they achieve this aim in a complex production building. The circular form was hitherto unusual for production halls; here it was conceived – with

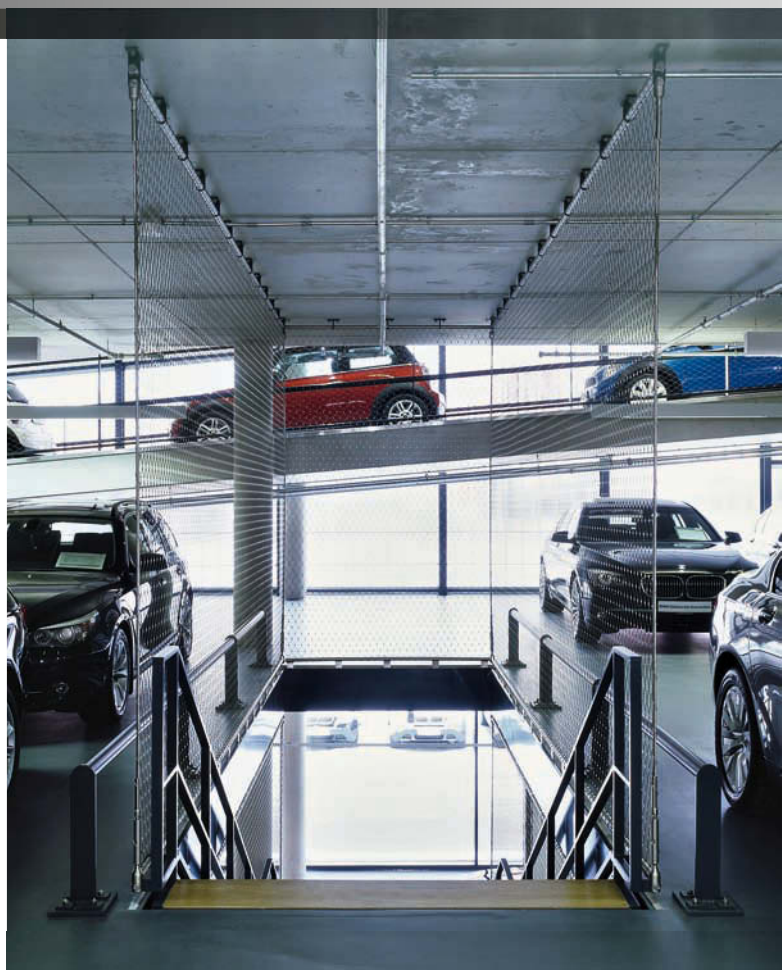
The building used by Vitrashop in the South of the campus is the first production site the SANAA office has ever realized.

a slight variation – from the existing architecture and site. SANAA designed a striking geometric outer shape with a diameter of more than 160 meters and a height of 11.4 meters. Of course, those familiar with the two architects' work know that they like to dissolve and subvert classical symmetries and rigid shapes. The same applies in this case: "My impression is that the circle, the perfect circle, is a bit too rigid," says Ryue Nishizawa. Maybe this bears witness to their approach of playfully (and manually) challenging the dictum of CAD programs.

In our context, perhaps the most pertinent assertion is that the sophisticated and all-encasing curtain façade appears like a huge light. Corrugated acrylic glass elements, each 1.8 meters wide and 11 meters high, colourless on the outside and white on the inside, are hung in a seemingly irregular pattern. This produces the effect not of a wall, but of a homogenous shell, which occasionally glistens in an almost surreal way and seems to be floating. Rigorously parallel strip lighting in the ceiling and windows in the upper half of the façade ensure a pleasant daylight atmosphere inside the hall.

**BMW branch in Barsbüttel**

Almost 1,000 kilometres further north, in Hamburg, Carsten Roth, Professor of Architecture and Chair of Industrial Construction and Structural Design in Brunswick, wonders whether Vitra and SANAA are simply an exceptional case. For in reality the corporate identity specifications of companies that put a great emphasis on quality architecture tend to be very rigid. Carsten Roth adds: "What options do I have if the typical guideline is that the right angle must dominate and the building should look like a big white panel?" His job description for a BMW branch in Barsbüttel near Hamburg read as follows: "How can the dynamism of a car fleet be reflected in a building? How can the elegance of our cars be translated into architecture? How can the brand values of our corporation be portrayed in a car dealership?" His solution is a structure with

Thanks to the use of a lot of glass, the light-suffused BMW branch office in Barsbüttel seems almost to float above the ground.

a silhouette reminiscent of automobiles and a building whose purpose is visible from the outside. With a ramp (despite the specification for a right angle!) that starts outside and goes right up into the second floor, an allegory for the corporation's dynamism. The building also houses a large workshop on a floor area of 65 by 30 meters (gross floor area approx. 2,000 square meters).

Well-placed lighting presents the vehicles on the ramp as ephemeral exhibits. Here, Carsten Roth collaborated with renowned Hamburg lighting designer Prof. Peter Andres, celebrated for his studies in his own daylight laboratories and his lighting design for Airbus Industries. Their assembly halls in Hamburg's Finkenwerder district on the Elbe are no longer illuminated by floodlights, but glow and smolder from the inside in the evenings, making the airplanes shine.

In the car dealership, the principle is similar. Peter Andres emphasizes the transparency of the glass architecture by letting the light spill out from the building and showcasing the car dealership and its contents as a glowing garage, which is after all the purpose of the building. The emphasis is on the content, not on the packaging. The display is not interrupted from behind by the parking lot lighting: "Flood lights were yesterday", says Andres. Nowadays he uses big mast lights for general lighting of the courtyard areas – without over-illuminating the building façade.

**Waste incineration plant in Cologne's Niehl district**

In contrast, the colourful lighting makes sense in Cologne's Niehl district, as it turns the functional and austere waste incineration plant into a nighttime eye-catcher. This plant, infamous for bribery scandals rather than architectural details in the past, underwent a technological and aesthetic refurbishment including new lighting design a couple of years ago. And if this type of recycling factory and its neighbouring open-air arena for Rock and Pop concerts has today reached cult status, this is owed to the nightly scenographic interventions

Outdoor lighting for the waste incineration plant in Niehl, Cologne, was retrofitted only a few years ago..

Photos: Klaus Frahm

Photo: © dd - Fotolia.com

blurring the lines between the real and the virtual. This has led to the odd circumstance that even a waste incineration plant can feature as a motif for an album cover.

This type of illumination has become possible thanks to new lighting technology. Above all else, LED is now a sustainable and financially feasible solution. Hamburg-based lighting designer Carsten Zieseniß believes that we are about to enter a new era concerning the use of lighting in industrial and commercial architecture – and he doesn't so much mean superlative Lux magnitudes. According to Zieseniß, the sustainable technology of the LED lighting generation will be increasingly used to 'dematerialise' the sometimes quite hefty structures by illuminating them at night, or to visually help the orientation of passing drivers and suppliers. Crucially, LEDs can be integrated into façades. And so, lighting design becomes ever more relevant for industrial architecture as it encompasses the intersection of new technology, sustainability and marketing.

**Qualified engineer (architecture) Dirk Meyhöfer**

Born 1950 in Herne, he studied architecture and worked for ten years as editor of the journal Architektur & Wohnen. Since 1987 he has worked as a freelance journalist (DJV), architecture critic, publicist and curator in Hamburg. His special fields are architecture, urban planning, design, the home and conservation. He is an expert on architecture education and works as an author for popular and architectural journals, but also for public broadcasters. His work includes many book publications.

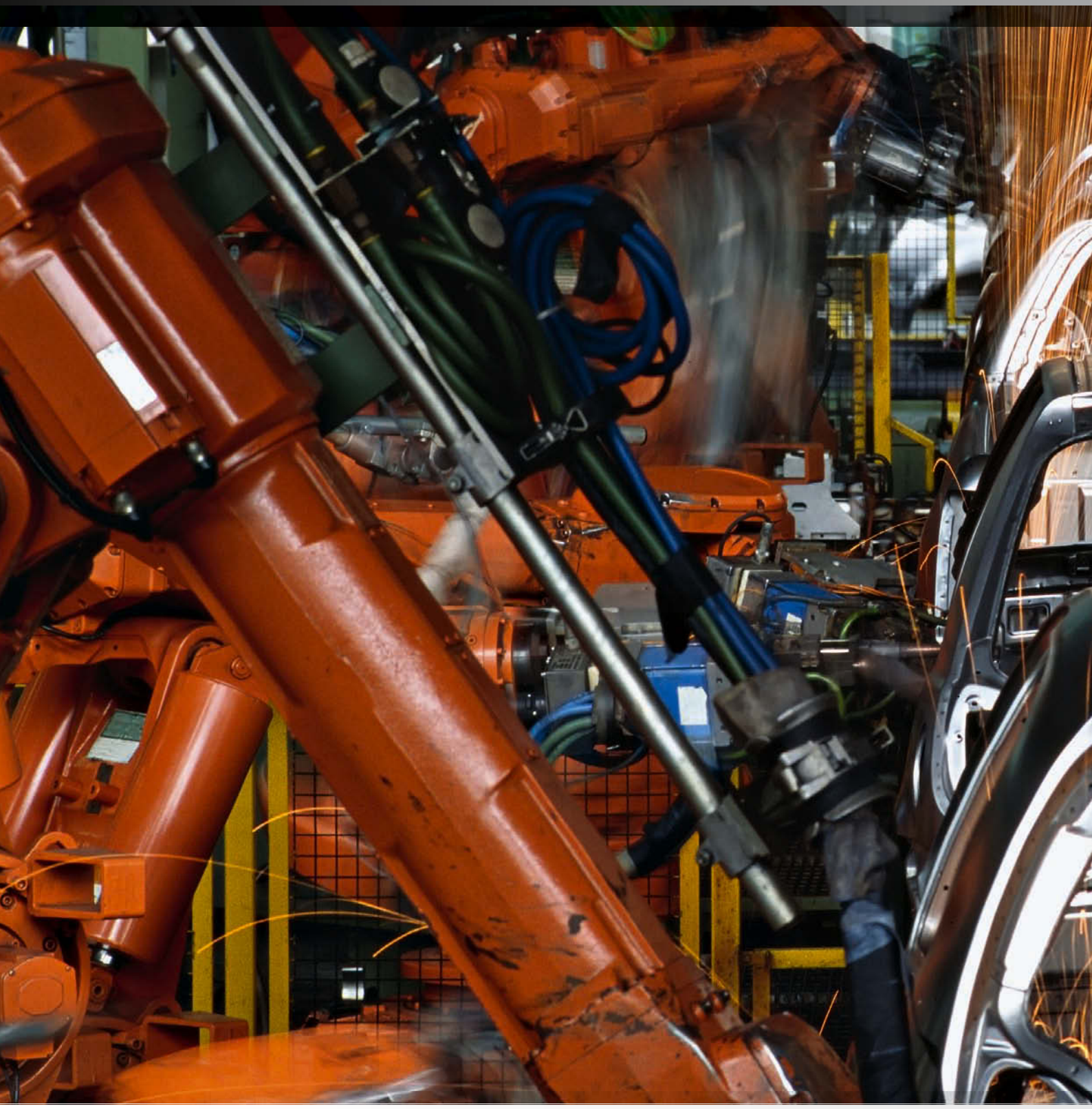
# STANDSTILL

The erstwhile booming industrial city of Detroit officially declared bankruptcy in mid-July 2013. With a debt of USD 18.5 billion, the "Motor City" is the first major city in the United States that has lost its financial liquidity. Until recently, the three major automobile manufacturers Chrysler, Ford and General Motors where based there, all of which had established plants in Detroit during the post-War automobile boom. But with the slump in the automotive industry, most of the production sites were closed or moved to other cities. Entire industrial sectors migrated, and with them, their tax revenues. Thousands of workers lost their jobs, a fact now manifested in high crime rates and poverty. 78,000 buildings have been abandoned, among them previously thriving factories which are now slowly falling into ruin.

Photo: The Rouge/Dearborn Michigan/Andrew Moore

**“Ruins can be more beautiful than some structures of glass and stone.”**

Erich Limpach, 1899–1965, German poet and author



# PROGRESS

In 1951 a remote-controlled robotic arm was developed with which people could work on radioactive material from a safe distance. As an advancement of this, the first official industrial robot was created in 1954 according to plans by American George Devol, who registered a patent for it in the USA. Five years later he and his partner Joseph F. Engelberger presented the first robot that could perform a simple form of resistance spot welding. This paved the way for entry into the production processes of the automobile industry. The first industrial robot fitted with a hydraulic drive was used as of 1967 in Japan and as of 1970 by Mercedes-Benz in Germany. Today we can barely imagine automobile manufacture without the often orange-painted robotic arms.

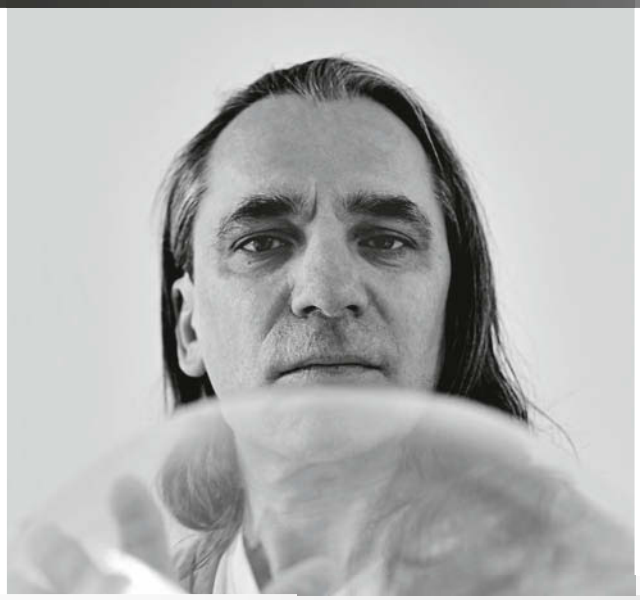
Photo: ©iStockphoto.com/josemoraes

**“One day it may be that machines not only compute, but also think. But one can say with certainty that they will never have imagination.”**

Theodor Heuss, 1884–1963, German politician and writer

# LOOKED INTO

3lux:letters asked three renowned lighting experts three questions on the subject of "Light and industry".



**Felice Dittli**
**Interior designer/lighting designer**
**dittlidesign, Lucerne, CH**

**Light is a design element and sets the tone; it supports the architecture and can evoke emotions. How important is light for your work and how do you use it?**

**Felice Dittli:** For years we have worked in the areas of interior design, product design and light – both luminaire design and lighting design. In taking such a broad approach to design we see ourselves as thinking outside of the box. It is our firm conviction that there is a benefit to be derived from there being a considerable, mutual dependency and influence between the individual disciplines. This not only goes for us as designers, who repeatedly find ourselves in different positions within a project but above all for our clients, to whom we wish to deliver an "integral overall package".

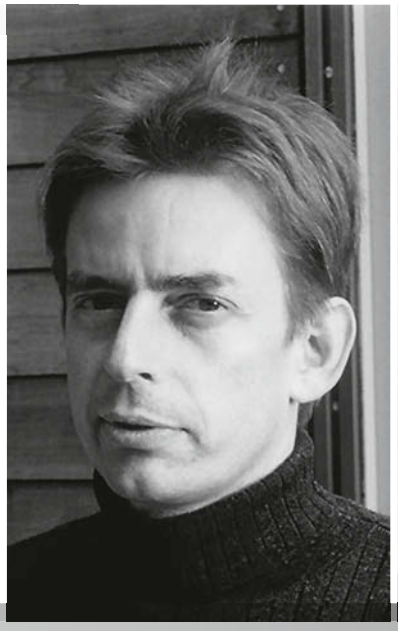
Light is everything. Light is everywhere. Interior design and architecture cannot survive without it! But products also rely heavily on light, we need only think of surface, structure, colour and so on. On many occasions our love of light and luminaire design has led to the scope of our task being extended. What could be better!

Photo: dd_werk3_brodbeck

Les garçons de la rue in Milan, IT

**Rolf Zavelberg**
**Light artist**
**Aktivraum – Cologne**

**Rolf Zavelberg:** I call my work "poetry of light", as I use my feeling for spaces and moods to visualize what makes a particular place or building special. My aim is to emphasize their (possibly hidden) beauty and to open up associations for the observer that allow him scope for leisure and inspiration.
To lend a presentation interest and a narrative quality I like working with sensors and light regulating equipment. The narrative element can easily be dispersed both by the client but also by visitors in the guise of a personal experience, a civic meeting or via the media. This aspect is of particular importance in Corporate Lighting.



**Jürgen Reichardt und Björn Maas**
**Architects**
**RMA | Reichardt Maas Assoziierte Architekten, Essen**

**Jürgen Reichardt and Björn Maas:** People spend a large portion of their lives at work. But since firms generally have a tight budget for workplace lighting, this means juggling functional/technical requirements with the desire for emotional charm. Since sustainability is paramount, using a free and greatly varying resource, namely daylight, intelligently should be a matter of course. Great importance should also be attached to artificial light that is functional but also sensual in design. While indications of quality such as level of lighting, evenness of lighting intensity, the limiting of glare and light direction can be simulated in a 3D-BIM model, sadly this is not the case for emotional or identity-forming qualities. In combination with functional aspects the individual architectural "character" of location, space and construction should be shaped and reinforced using light.

Photo: Gordon Axmann, Aktivraum

Site-specific art in Park Weitmar, Bochum

Photo: Klaus Ravenstein, Essen

KHD in Cologne

**Today many former industrial complexes have been made cultural sites and staged with a striking light concept. What is your opinion of this approach to abandoned industrial monuments?**

**Felice Dittli:** We have yet to work on a disused industrial building. Industrialization progressed differently in Switzerland to the way it did in Germany, which explains why we don't have very many old factories in our country. In the former industrial monuments I am familiar with I feel the landmark concept is often taken too far. Generally, coloured light is employed too explicitly, perhaps too expressively. As light designers we are currently working on an orangery from the 19th/20th century that is being put to new use. In cooperation with the architect and client we are trying to find a solution that is as sensitive as possible. There is not to be too much emphasis either on the luminaires themselves or the amount of light. Rather than thinking in terms of landmark, culture or marketing, we seek a more subtle handling of architecture, environment, space and surface. This approach could also be applied to old factories that are being put to new use.

Photo: dd_mani thür_zeller

Office/production building Conception in Kägiswil, CH

**The requirements of modern industrial and commercial architecture have continually risen in recent times – not least in terms of illumination. Which project do you think has a particularly good lighting concept and why?**

**Felice Dittli:** Unfortunately, I have neither been responsible for such a project myself, nor could I name one that truly impressed me. Naturally, I am all too aware of the difficulties arising from such a project but must they all look equally dull and uninspiring? It is understandable that all lighting projects demand a specific lighting solution, and sometimes a pragmatic one to boot, if only to ensure people can see properly, but on the other hand, they also require a much broader approach. Why do people feel so at ease in certain places, what do I express with my design, how do I present the enterprise, etc? There ought to be some scope for creativity here.

**Felice Dittli,**

Born 1961 in Uri, Switzerland. After training as a structural engineering draftsman he studied interior design, product design and building design at the Basel School of Design graduating in 1986. He has received various fellowships and awards inside and outside Switzerland for his work. Since 2009 he has lectured at the Basel School of Design. He is also co-founder of various studios such as Atelier Triptychon, Werk3 and dittlidesign. **www.dittlidesign.ch**

**Rolf Zavelberg:** The way something is realized is what is crucial: my desire is to reflect the aesthetics of the industrial architecture together with its respective history. Take for example the historical railway bridge in Wipperfürth, for which we developed a permanent installation in 2012. The light design blends harmoniously into the landscape, spotlights emphasize the steel construction and underscore its natural beauty. To ensure the spectacle is interesting but not overly colourful visitors' movements and data such as the position of the sun or temperature, guide the colours through a predetermined colour spectrum. These playful elements not only invite narration but also visualize motion.

**Jürgen Reichardt and Björn Maas:** Especially in Germany's Ruhr district we find many examples of light installations in abandoned industrial monuments, the best known arguably being the colour installations of the blast furnaces in Duisburg Meiderich. But sadly we note a certain inflation in what seems to be such a simple recipe, and this is also true for less striking cases. We see hefty differences in the artistic categories of stage set, design and architecture: stage set and design can work with the sensations of short-lived (light-)effects, architecture cannot. Here we would wish for a calmer, more prudent treatment, which is better suited to the "character" mentioned earlier. Especially in conurbations too much light destroys the peace of the night, and natural contrasts between day and night such as the fascinating spectacle of the starry sky are cancelled, as a night spent in the desert or jungle proves all too impressively.

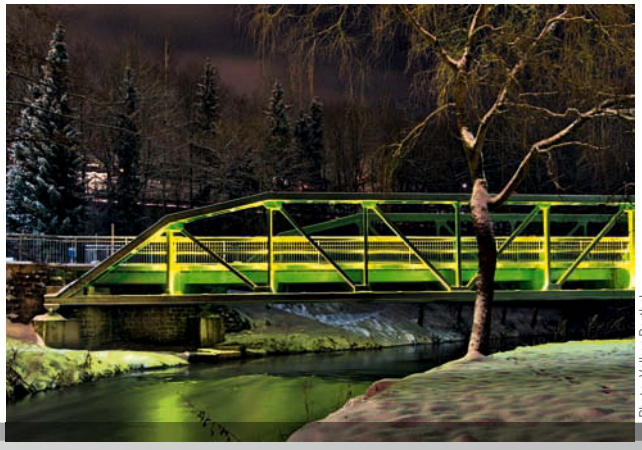


Photo: Volker Barthel

Historical railway bridge in Wipperfürth

Photo: Jens Willebrand, Köln

Staircase to „Peter Backwaren" in Essen

**Rolf Zavelberg:** New technical options are exploited to the full all too rarely. The natural daylight curve could be imitated for shift workers. Where work is completed late in the evening, it would make sense to reduce light's blue content some time before the end of the shift. This would allow melatonin production to start earlier, which would mitigate the negative impact shift work has on the hormones. It is also possible to couple light more to work processes. That saves energy, increases attentiveness and helps avoid accidents. Installing illuminating and illuminated ceilings and adjusting light to the daylight enhances people's wellbeing and raises productivity.

**Jürgen Reichardt and Björn Maas:** Already during the concept phase for "Peter Backwaren" synergies were perfected to achieve an overall performance of building structure, technology, energy consumption and sustainability in line with DGNB. A dynamic thermal and lighting building simulation let us show comprehensive user profiles at hourly intervals using LED lighting exclusively for the first time in a baking factory. Thanks to specific modifications to the prism panels and heat sinks the highly-efficient, innovative LED lighting is suitable for the flour-contaminated atmosphere of bakeries. As a special accent in the townscape a set of stairs extends out like a glass platform into the road space.

**Rolf Zavelberg,**
Born 1959 in Bonn, the topic "light" has always been a leitmotif in his life. Today, he creates unusual light presentations that communicate his personal style, his "poetry of light". His wide range of experience covers industrial monuments (e.g., Alte Schmelz), concert buildings (Tonhalle Düsseldorf), churches (Münster in Konstanz), museums (Bundeskunsthalle in Bonn) and parks. **www.rolfzavelberg.de**

**Jürgen Reichardt,** Born 1956 in Idar-Oberstein, studied architecture in Karlsruhe and Braunschweig. He was Assistant Professor for Industrial Architecture at TU Braunschweig, Head of Planning at agiplan in Mülheim/Ruhr and since 1996 Professor at the msa Münster. In 1992 he opened the office Prof. Reichardt Architekten, which today goes by the name RMA | Architekten. **Björn Maas,** Born 1975 in Oberhausen, he studied architecture in Münster and Groningen. Since 2008 he has been a partner at RMA | Architekten. **www.r-m-a-architekten.de**

# MOVING

For the company headquarters of Gebrüder Andres Transport AG (Gatra AG) in Effretikon, Switzerland, a town with a good 11,000 inhabitants, the local company of HLP Architekten designed a new bus depot, which went into operation at the end of 2012. A prime concern for Gatra was that the building should be practical and functional on an everyday basis.

By Nathalie Martin

The new bus depot can house up to 30 vehicles. They run on behalf of the transport operators Glatttal (VBG) and Zürich (VBZ) for the Zurich Transport Authority (right and bottom).

**Location:**
Effretikon, CH

**Client:**
Gatra AG, Effretikon, CH

**Architects:**
HLP Architekten AG, Effretikon, CH

**Light planner:**
TRILUX

**Luminaire:**
Belviso
InperlaL
Mirona
Nextrema
Oleveon
Pareda

**Photos:**
Boris Golz, Arnsberg


CITARO
Mercedes-Benz
VBZ
Züri Linie
Danke
ZH 773630
30
Glattalbus

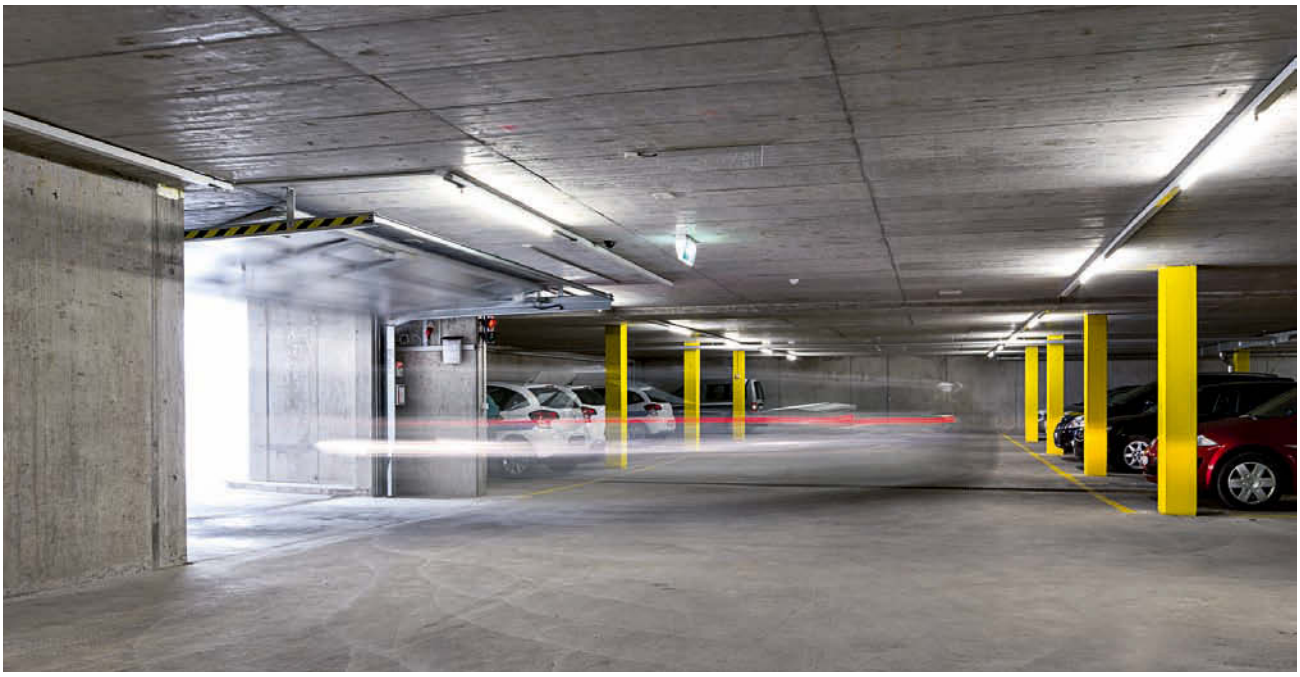
The wet room luminaire Nextrema ensures safety in the firm's own vehicle wash facility (above).

The blue of the facade and the steel structure correspond with the Gatra AG corporate colour. At night Mirona LED luminaires illuminate the new building (below).

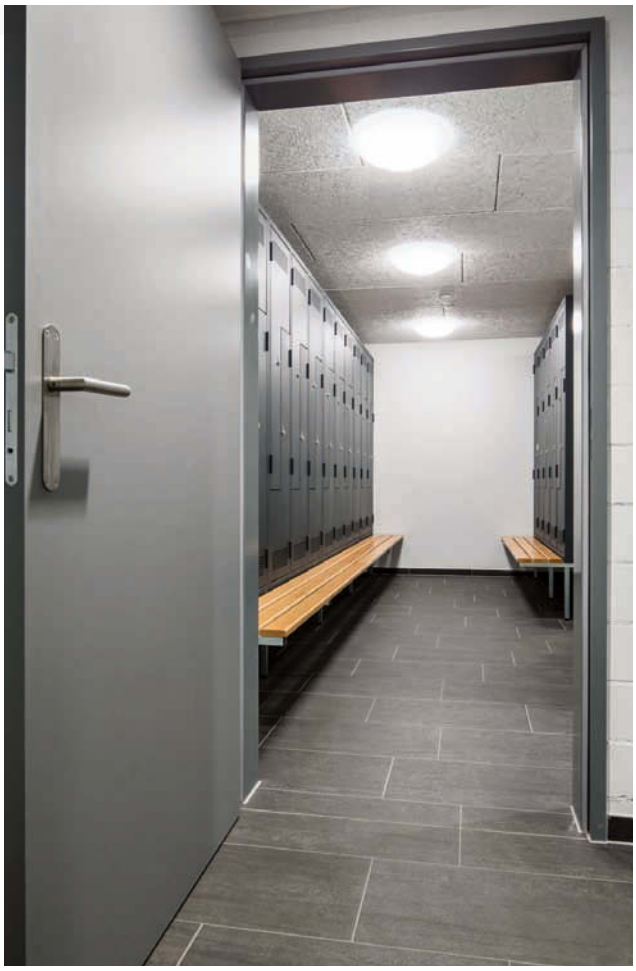

17
16
15

The bus depot includes an underground car park for the bus drivers' cars (below).

The office and the communal rooms stand out for the stark contrast between black and white (right).



More than a century ago, Arthur Andres laid the foundations for the company in Egg/Forch, Switzerland in the form of the haulage business that was attached to Restaurant Rössli. Today, the company has a payroll of over 200 and is headquartered almost 20 kilometres to the north in Illnau, Effretikon. The "town in the country" lies midway between Zurich and Winterthur in the Canton of Zurich and has excellent public transport links. Part of the public transport in this region including connections to Kloten Airport, are handled by ATE Bus AG, part of Gatra AG. Its new building has over 2,800 square meters of gross usable floor space and features a large depot for 30 buses, an office, social and recreation rooms and an underground car park. The bus drivers park their own cars there; given their irregular working hours staff mobility is very important to the company. Also part of the new complex is the newly constructed vehicle wash facility and the existing workshop for vehicle maintenance and care. The planners conceived the roughly 1,400 square meter depot proper as a steel skeleton structure, which allowed them to comply with the client's wish for a hall with as few supports as possible. Only a single row of six rectangular columns along the centre of the hall bear the butterfly roof, which has a span of 36 meters. Almost free of supports the layout also relies on well-conceived access and exit routes to create a very practical depot on a daily basis. Five main doors function as entrances, while the five opposite serve as exits, and in-between there are two adjacent parking lanes marked by yellow lines, which can each house three buses. The blue of the Gatra AG company logo and the blue for the depot's load-bearing structure and outer skin forms a contrast to the yellow markings. The building section above the entrance to the underground car park stands out clearly against the blue; constructed of exposed concrete it houses the recreation rooms and the office.

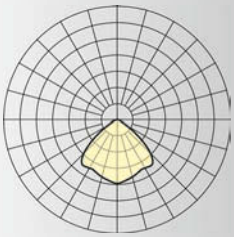




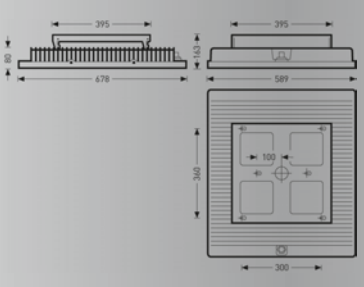
# Mirona QL LED

The robust Mirona QL LED in a cast aluminium housing guarantees an ideal light output and high light quality.

All the components of the anthracite-coloured Mirona QL LED (namely the housing, electronics and optical system) were conceived for special requirements and high buildings. Designed for ambient temperatures of minus 30 to plus 45 degrees Centigrade, the LED floodlight is equally suited for use in cold storage warehouses and on hot factory ceilings. Glare-free, even light and high light intensity are provided by 9 LED segments, which in the QL LED 24000 version are each fitted with 66 mid-power LEDs (in the QL LED 12000 there are 33 mid-power-LEDs). Once the service life of up to 50,000 operating hours is over, or should there be a new LED generation, the modules can be simply and easily replaced. The pre-switching devices can also be replaced.



Luminous intensity distribution




# CHATTANOOGA THINKS BLUE

Not only the vehicles that are produced here are economical. The Volkswagen assembly plant in Chattanooga, United States amply demonstrates how resource-saving and environmentally friendly automobile production can be. The TRILUX products play a key role in the plant, which went into operation in 2011, and is LEED Platinum-certified.

By Patricia Sahm

The office and recreation rooms were equipped with LED lighting, while the TRILUX track system was used in the production areas (right).

View of the new VW facility in Chattanooga/Tennessee, United States (below).

**Location:**
Chattanooga, Tennessee, USA

**Client:**
Volkswagen Group of America

**Architects/Light planner:**
SSOE, Toledo, Ohio, USA

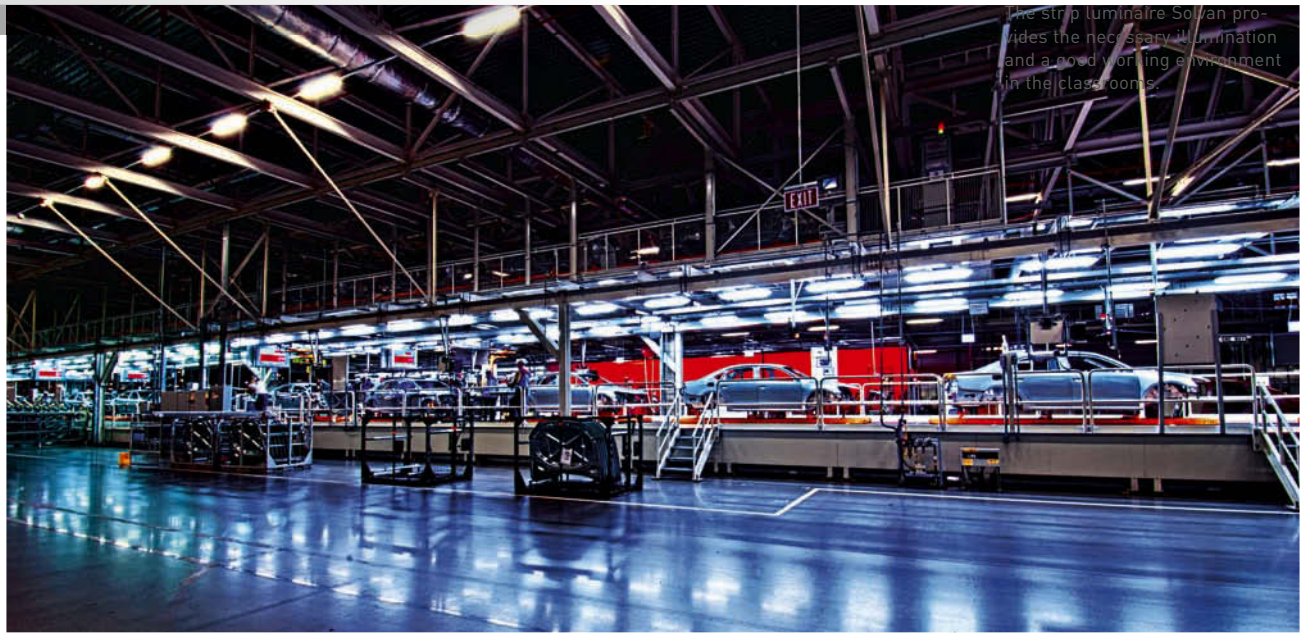
**Luminaire:**
E-Line

**Photos:**
Dan Reynolds/Volkswagen Chattanooga


EXIT

The Passat is manufactured for the American market on a very long production line.

Across a complex covering almost six square kilometers a complete automobile factory was erected in the space of only two years in Chattanooga,Tennessee, United States. From the very planning stages, the VW factory was designed to comply with the high requirements of the U.S. LEED standard (Leadership in Energy and Environmental Design) for sustainable architecture. The plant is a steel frame structure with internal concrete supports and a robust metal facade. Alongside the 33,000 solar panels and the resource-saving paint shop, which uses no water, the Volkswagen "Think Blue" initiative was continued in the lighting, and both indoor and outdoor lighting relies entirely on economic LEDs. Likewise energy-saving lighting was deployed for the production buildings and offices. Quickly convinced by the energy-efficient TRILUX products the planners at VW opted for a track system that was totally unknown in the United States and had never been used there before. For the installation German engineers had to adapt the usual European standards to U.S. norms and measures, and enable the system to run on the different of 110 volts and 277 volts by incorporating an additional circuit, not that this is unusual in American factories. Prior to the plant opening in May 2011, a total of 34 kilometers of the E-Line system was installed in the factory buildings in Chattanooga. In addition, several thousand lights were fitted in offices and corridors. TRILUX supplied around 90 percent of interior lighting for the plant, which meant electricity consumption could be cut to four watts per square meter. For this plant that means an energy saving of up to a third for a facility of this size. Today, over 2,500 employees produce 150,000 models of the American Passat, which is the only vehicle of its class to feature an innovative fuel-saving clean-diesel technology.




The strip luminaire Solvan provides the necessary illumination and a good working environment in the classrooms.

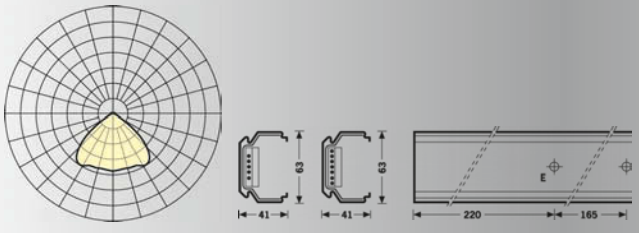
The E-Line is more than capable of providing permanent lighting for shift workers.



# E-Line LED

A narrow, simple yet robust fixture that is ideally suited to the tough requirements of factory buildings.

With a yield of up to 134 lm/w the E-Line LED is the ideal choice for factory buildings with high ceilings. Low initial costs and low energy consumption substantially shorten the light's payback period. Maintenance is seldom needed as the solution has a service life of up to 50,000 operating hours, which is perfect for the permanent use shift work demands. Thanks to its even, sealed surface the E-Line LED still performs well in environments subject to strong contamination. The flexible solution enables low-contrast light in both wide and narrow beam versions and is available in different finishes, light colors and with an intensity of between 4,000 and 6,500 lumen. It also withstands extreme temperature fluctuations from -15 °C to +35 °C.




Luminous intensity distribution

# WELL COOLED

In the logistics industry, ecological aspects are becoming ever more important as regards both the transport of goods and the planning and outfitting of buildings. This is why Dachser GmbH & Co. KG opted for an energy-saving LED lighting concept for its new food transshipment warehouse in Berlin's Schönefeld district.

By S. H. Kubitzki and Nathalie Martin

The family-owned company chose Coriflex strip lighting for the new transshipment facility in Berlin's Schönefeld district.

**Location:**
Thomas-Dachser-Allee 2, Berlin-Schönefeld

**Client:**
Dachser GmbH & Co. KG

**Architects:**
Löser + Körner, Architekten + Generalplaner GmbH

**Light planner:**
TRILUX

**Luminaire:**
Coriflex

**Photos:**
Boris Golz, Arnsberg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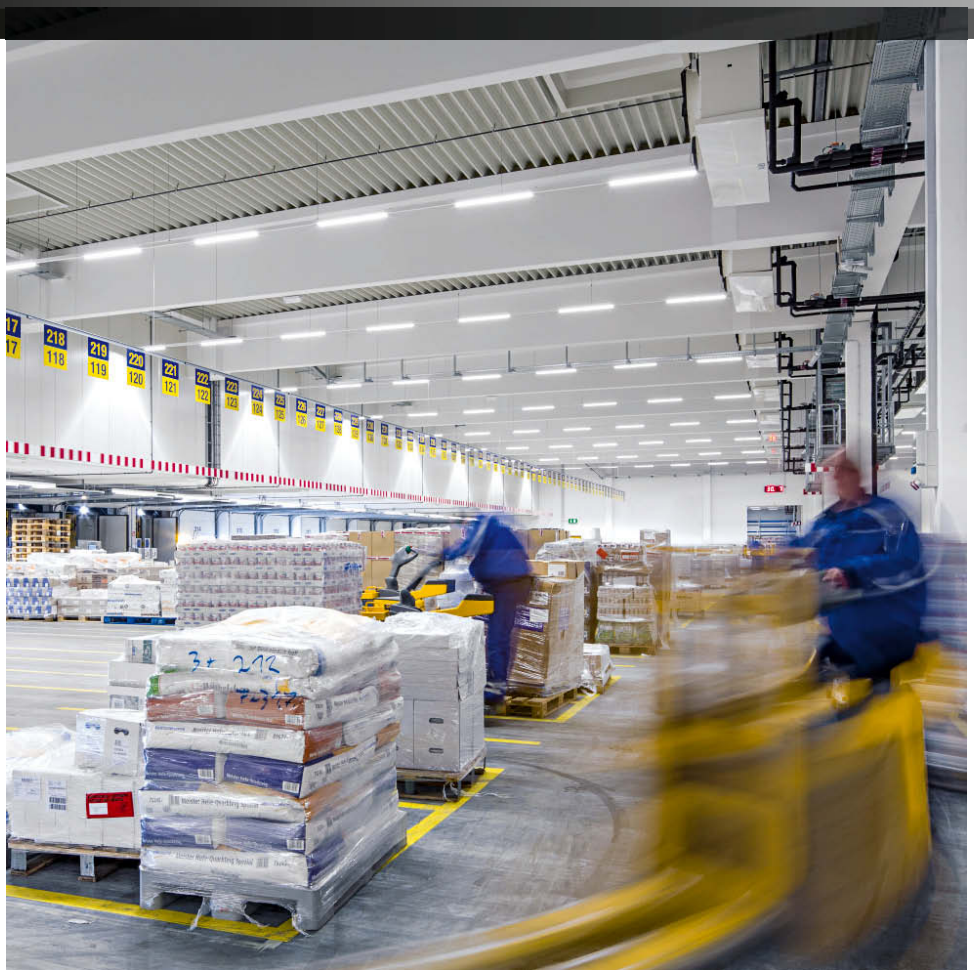


Dachser Food Logistics concentrates on foods warehoused at above-zero temperatures, Every day the logistics service provider delivers food to around 480 million consumers in 21 different countries.

In the logistics centre in Berlin's Schönefeld district, the staff work two and a half shifts with operations only stopping for a couple of hours at night (on the right).

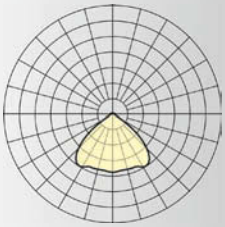
Dachser GmbH & Co. KG is one of the leading logistics services worldwide; its business fields include air and sea freight as well as food transport. At their complex just outside Berlin a new transshipment warehouse has been built for "Dachser Food-Logistics", which has been part of the group's portfolio since 1982. Generally, goods are delivered to transshipment facilities, stored briefly, "intelligently bundled" and then sent out again. This means articles from various manufacturers will be bundled together for the recipient (say a retail warehouse). For this reason, the location is important as is also accessing the warehouse and orientation within the facility itself. Completed in summer 2013, the new hall is immediately adjacent to Berlin Schönefeld Airport (which is to be replaced by the Berlin Brandenburg Airport one day) and in the direct vicinity of the A113 interstate. As a result, temperature-sensitive foods such as meat, sausages, coffee, dairy products, but also confectionary, canned foods and convenience products can be forwarded swiftly to their customer. In this context, short distances are decisive in and around the building; for this reason, the hall is not deep and it boasts as many doors as possible. Up to 76 trucks can be loaded and unloaded simultaneously at the new, 7,200-square-meter transshipment warehouse. Integrated into the facility are overhead offices; their location is clearly visible on the sapphire-blue facade and affords employees a good view of the warehouse zones and lanes for fork-lift trucks. Some 165 meters long, 51 meters wide and over seven meters high, the warehouse has a purely functional design that focuses on efficient handling. It also delivers an excellent eco-balance, as the family-owned company installed energy-saving LED technology in the transshipment area. With over 1,000 meters of lighting required, the new system quickly pays off: The company will be producing some 48 tons less of $CO_2$ missions a year. Moreover, there is no loss of light in the LED strip system despite an ambient temperature of just 4°C.

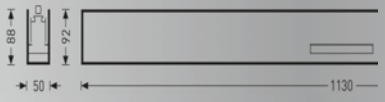



# Coriflex LED

The luminaire can be attached directly to the ceiling in no time at all using a cable or chain.

The Coriflex LED differs from conventional strip lighting systems in using the plug-and-play principle: As accessories such as tracks, device mounts and reflectors are already integrated it can be installed in half the normal time. What's more it is extremely economic to run with up to 95 lm/W and offering 50,000 hours in operation. The front, middle and back modules of extruded aluminium are all 1.13 meters long and can be combined with each other as desired. Available in white, silver and anthracite it makes an ideal choice a mounted or suspended model for lighting factory buildings, offices or classrooms and semiWnar rooms.





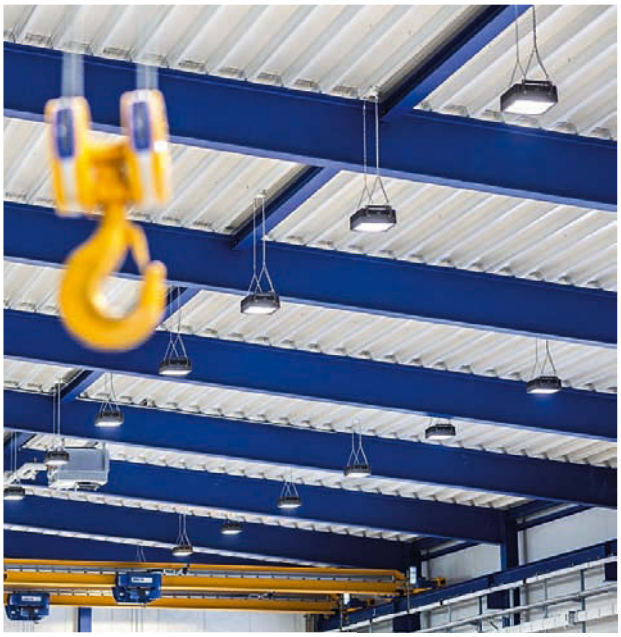

Luminous intensity distribution

# PLANNERS ASK, MANUFACTURERS ANSWER

In the everyday work of a planner, many a question comes up which cannot be found in any handbook. Answers to such questions are given here by the experts of TRILUX who also tell you one or more tricks.

## So what role does maintenance of LEDs in industrial buildings play?

**Thomas Kretzer**
Managing director
TRILUX Vertrieb GmbH



The issue of "maintenance" plays a significant role even when a lighting system is still on the drawing board. In industrial facilities in particular, malfunctions and the resulting replacement of lighting units while production is ongoing are associated with difficulties and high costs. Keeping this in mind, the lighting partner or architect needs to be increasingly aware of the maintenance issues, which impacts critically on the energy efficient lighting system.

In determining this factor according to the "German Guidelines for Maintenance of Electrical Operating Systems" for interior spaces (CIE 97) and exterior spaces (CIE 154), the calculation is based on data for the Lamp Lumen Maintenance Factor (LLMF), the Lamp Survival Factor (LSF) and the Luminaire Maintenance Factor. In addition, the Room Maintenance Factor (RMF) in interior spaces and the Surface Maintenance Factor (SMF) in outside spaces must be considered. Individual values should be indicated by the manufacturers directly or calculated. They always refer

The lamp Mirona is suited both for montage on ceilings as well as rooms with high ceilings such as halls, warehouses and production sites (see left page).

As regards the additional burden involved lighting wet rooms, the lamp Nextrema can be used in parking garages, industrial facilities and even in car washes (see below).

Photos: TRILUX

to an ambient temperature of 25°C, unless specified differently. Naturally, the individual partial maintenance factors can never be higher than 1.0, and consequently neither can the resulting overall maintenance factor. Generally the result should be around 0.8 for interior spaces and 0.6 for outdoors. The rule here is: The higher the figure, the lower the necessary maintenance effort, while the result has to always be interpreted in relation to the optimum, which would be 1. A maintenance factor of 0.8 for example results in having to oversize the lighting system by 25 percent, so that the necessary light flux of the lighting system can be guaranteed within a given time frame.

In the context of industrial buildings, further specific criteria have to be taken into account and factored in: for example, the Room Maintenance Factor (RMF) is usually smaller than that for conventional interiors, as dirt in production halls tends to be much more frequent than in normal office spaces. Therefore, cleaning of lamps and encasements has to happen sooner. In the summer especially, industrial buildings ( and this applies in particular under the ceilings, where lamps are installed) can get very warm. In this case, the figures for higher temperatures, separately quoted by the manufacturer, have to be considered. In addition to this, lamps in production halls are subject to extreme strain as they are often constantly in use. For intense and long-term use in the industrial sector, TRILUX provides specific luminaires that have a longer rated lamp lifetime of 90,000 or even 100,000 hours, for example Mirona or Nextrema, which in addition to this can also be used in wet rooms.

Further information concerning the determination of a maintenance factor can be found in the "German Guidelines for Planning Security in LED Lighting" issued by ZVEI.

# KEY FIGURES FOR LED SOLUTIONS

In recent years LEDs have gained popularity not least of all because they are sleek, emit little heat and have a broad colour spectrum. But there can be huge differences in quality amongst the immense range of products available. This is why in November 2013 standards were outlined for LED lights.

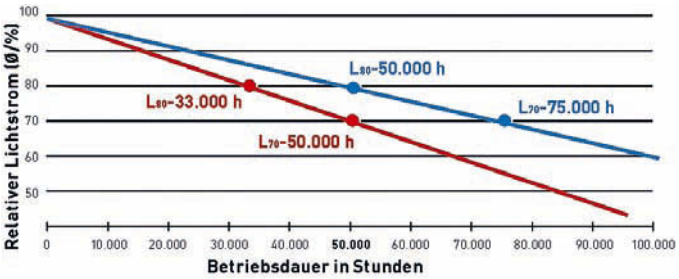
In its "LED Lighting: Guidelines for Safer Planning", the German Electrical and Electronic Manufacturers' Association (ZVEI) recently set out standardized criteria to enable an objective comparison of LED solutions, and allow fair competition. In compiling the guidelines, technical parameters such as performance, lumen intensity, light yield, light intensity distribution, colour quality, ambient temperature and service life all played a large role. For planners not just light intensity, light colour and consumption are important, as above all service life and the maintenance factor are key factors.

LEDs are classified according to luminous flux behaviour and service life, and the factors service life, degradation and total failure are observed. These factors are labelled with the letters $L_xB_yC_z$. $L_x$ refers to the service life, (e. g., 50,000 h), for which a certain percentage x of the original luminous flux is achieved when new. By describes the percentage of LEDs, which at the defined end of service life fall below the aspired luminous flex of x percent ($L_x$). $C_z$ describes the percentage of LEDs that experience total failure.

So if we take an LED labelled **$L_{80}$ $B_{10}$ $C_0$ – 50,000 h** this indicates that only 10 percent of the LEDs that were previously intact at the end of their service life of 50,000 hours supply luminous flux of less than 80 percent of their initial brightness. If no B figure is given, the classification is $B_{50}$, which means that the drop in luminous flux applies to half the LEDs. In the example given above there would have been no total failures ($C_0$) by the end of the service life).

Manufacturers are asked to classify their LEDs according to the ZVEI guidelines so that in future architects and planners can take total failure of LEDS into account. If the figure is worse than $L_{80}$ $B_{10}$ this can mean that in planning new facilities 15 percent more lights have to be calculated to offset the shortfall in luminous flux.

Not the individual LEDs, but the entire luminaire, for example the Mirona industrial light, is used to calculate the key figures.




Outline of the flow of the luminous flux: The dots show the percentage of luminance after the respective number of operating hours.

Detailed view of the LEDs, such as are used, for example, in the Mirona.

Photos: TRILUX

# THE EFFECT LIGHT HAS ON PEOPLE

Light influences people in many ways that far exceed the visual. Light promotes our sense of wellbeing, health, our ability to concentrate and accordingly improves individual efficiency. Especially in situations where people operate heavy machinery or the like, say in industry, it is crucial to provide staff with the best possible lighting.

Photos:TRILUX

Light has a visual and a non-visual impact on people. For one thing it influences the psyche. It generates emotions, creates atmosphere, it highlights or accentuates. Moreover, it makes for enthusiasm, wellbeing and improved perception for specific work tasks. Light also has a considerable impact on the physical constitution. It sets the biorhythm in motion because our inner clock is affected by daylight. Daylight increases human energy levels, which then drop as it gets dark and the body passes to a relaxing sleep phase.

**Increasing productivity and concentration**

The ability to concentrate and perform can be improved by raising the blue proportion of light. This accordingly activates the circadian factor and boosts attentiveness. Blue light in the daytime promotes productivity and health at the workplace. In the evening hours the body secretes the hormone melatonin, which results in tiredness. By increasing the blue proportion of light melatonin is suppressed. Such lighting might make sense if, for example, tasks that affect safety are conducted at very irregular intervals. Employees are more alert and less likely to make errors. However, if staff is exposed to this lighting for a longer period of time it is probable that their biorhythms will be negatively affected, so that regular use over several nights would result in lower overall efficiency. It is vital to use the right light at the right time.

**Circadian lighting systems**

Where lighting, colour temperature and lighting intensity simulate the variations in daylight on a 24h basis we talk of circadian lighting systems. The lighting is designed to support people's day and night rhythm.

**Activating light**

If colour temperature and lighting strength can be manually regulated, motivation, concentration and consequently productivity can be enhanced to meet individual requirements. A

Colour temperatures have a significant effect on the circadian system: Red light promotes the production of melatonin and makes us feel tired, while blue light lowers our hormone levels, making us feel refreshed and awake.

specific white/white regulation offers ideal support for those dealing with intellectual tasks.

**The right light at the right time**

Light that beneficially affects the biorhythm is not only ideal in medical or therapeutic settings but also in offices, industrial plants or schools. But only competent lighting planning ensures these intelligent solutions are used to best advantage. TRILUX offers such services and not only takes into account spatial situations but how the space will be used. Then a decision is made on what lighting is really needed and what the light must provide. This approach guarantees individual lighting solutions that adapt to people's needs and reliably deliver the right light at the right time.

If you wish to find out more about this topic the TRILUX Academy offers seminars and theme days on how light affects people.

**Daniel Stabenau, M.A., M.O.P., qualified engineer (University of Applied Science)** Born 1976 in Iserlohn. After training in electronic communication he studied electrical engineering at Magdeburg-Stendal University of Applied Science. In addition he gained a Master's Degree in Organizational Psychology from Hagen Open University and a Master's Degree in Industrial and Organizational Psychology from the University of Wuppertal. Since 2011 he has worked as a speaker and trainer at the TRILUX Academy.

Visitors were invited to experience this large sculpture from the inside, as well.

Over 3,000 bikes produced by Chinese manufacturer Yong Jiu which means "forever" in English were shipped across the Pacific Ocean in containers.

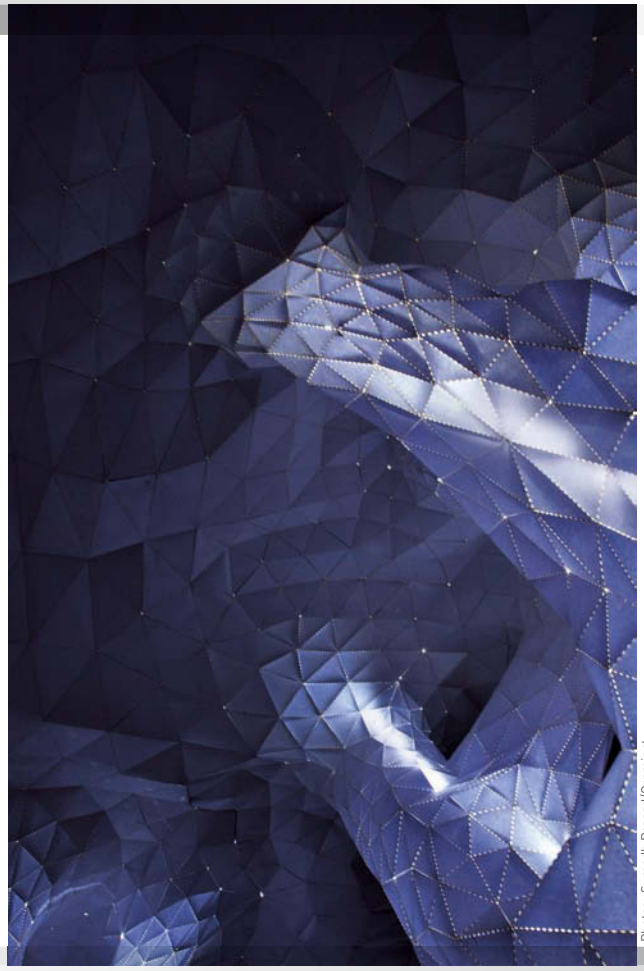
Photos: City of Toronto

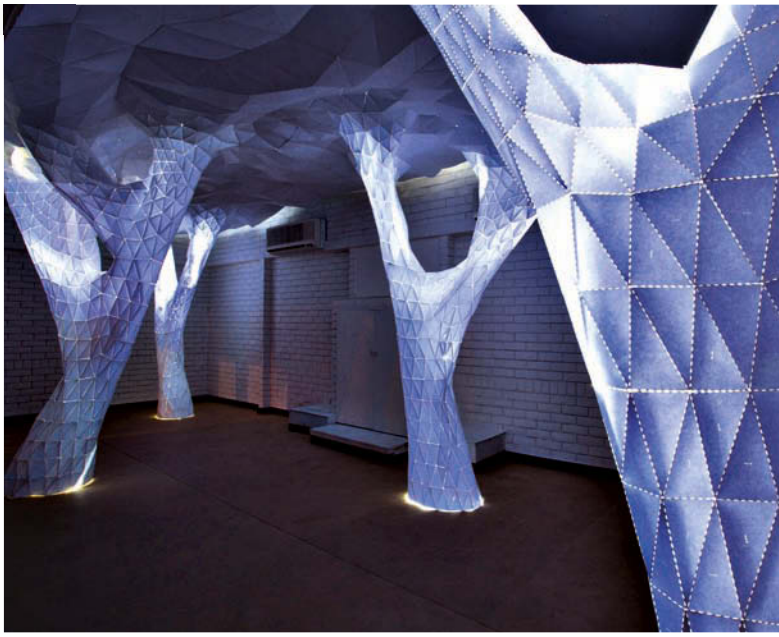
# FOREVER BICYCLES

At a Canadian festival last fall Chinese artist and regime critic Ai Weiwei topped his own 2011 work in terms of scale, quantities and sheer presence.

By Patricia Sahm

Even though since his arrest in 2011 Ai Weiwei has no longer been allowed to travel abroad his art remains globally present. His sculpture Forever Bicycles was there to be admired in Toronto, Canada, at the annual cultural festival Scotiabank Nuit Blanche at the end of 2013. For this evening event Ai Weiwei arranged 3,144 bicycles into a work of art around 10 x 30 meters in size and used lighting to orchestrate it. As with all his works of art, the sculpture also carries a thought-provoking message. Viewed from different angles, this pile of bicycles gives rise to ever different shapes, thus symbolizing the social transformation in China and the world. Its impressive appearance is underscored by lighting in the colours blue and pink placed underneath the sculpture itself. For the viewer, these chrome-colored frames resembled a walk-through labyrinth. From a distance the sculpture even almost looks like a cloud of vapor floating about Nathan Phillips Square. **www.scotiabanknuitblanche.ca**





In this work, the architects at Orproject have fused nature and design.

Photos: Sumedh Prasad/Orproject

# OPTICAL ILLUSIONS

Vana is an installation by London-based architecture and design office Orproject that looks like trees growing up into the skies. In actual fact however, the four columns of light are suspended from the ceiling.

By Nathalie Martin

The staff at the studio, founded in 2006, repeatedly draw on flora and fauna, including the laws of nature and natural phenomena, for their inspiration and their constructions often have a duly experimental feel to them. The idea for Vana also came from the kind of patterns of shoots to be found, for example, in growing plants. The principle is based on the kind of seedpoints from which a network spreads out to its target points, thus making maximum use of the light for every leaf. Inverting the load-bearing structure of plants, which is based on pressure and bending, tension can be used to produce strong geometries. On this basis, architects Rajat Sodhi and Christoph Klemmt developed a tessellated surface area hanging from the ceiling and then what looks like the branches and trunks of a tree grow down into the room. The tessellated structure consists of triangular segments and is illuminated by LEDs on the inside of the "trees". Light falls through the pinned connections between the triangles, filling the room with a surreal glow. **www.orproject.com**

The LED crystals light up when touched and can convey messages if arranged accordingly.

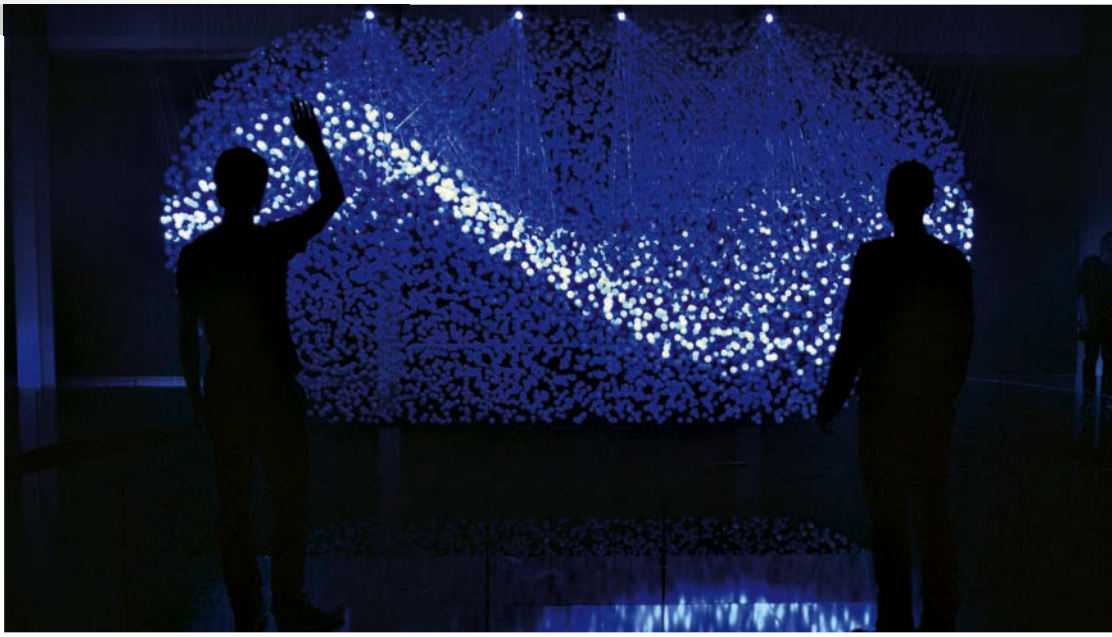
Photos: Daan Roosegaarde

# COMMUNICATING CREATIVITY

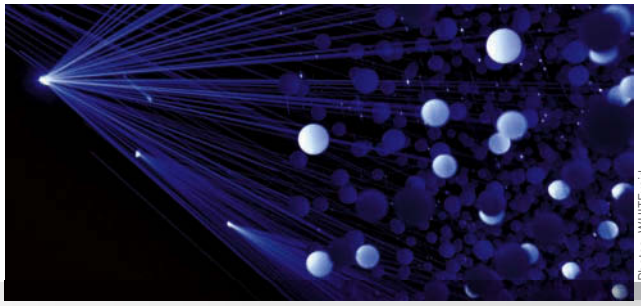
At the opening of the Dutch Design Week in Eindhoven last October adventuresome visitors got the chance to speak through Daan Roosegarde's interactive lighting installation Crystal.

By Nathalie Martin

In his Rotterdam and Shanghai studios the artist Daan Roosegaarde investigates the relationship between humans, technology and space. Crystal is an installation composed of hundreds of wireless LED elements scattered on a charging mat where they recharge via a magnetic field. Any crystals that curious visitors pick up to move, add or regroup light up as soon as they are touched. The Dutch artist himself likes to refer to the crystals as "Lego from Mars" – not just because of their futuristic design, but also because they provide us with an infinite potential to let our creativity run free. The interactive nature of the elements means that Crystal is a perpetually changing and therefore unique work of art, which actively involves its human audience. Take, for instance, the hopeful husband-to-be who arranged the LED crystals to form the words "Marry me" on the black floor in Eindhoven – only briefly of course. In future Studio Roosegaarde plans to develop further Crystal projects destined to improve the relationships between humans and their environment through light. **www.studioroosegaarde.net**



Visitors can influence the speed of the cloud of light dots and create their very own graphics figures interactively.



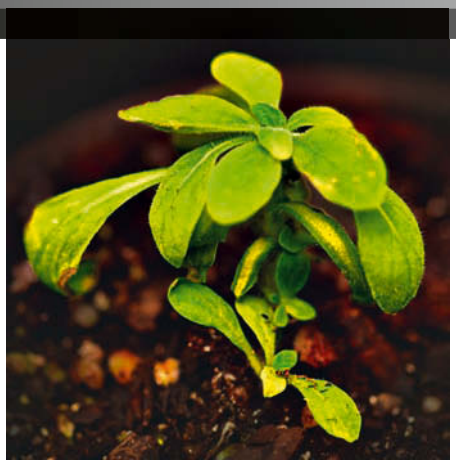
Photos: WHITEvoid

# FLUIDIC–SCULPTURE IN MOTION

For the Hyundai Advanced Design Center Berlin-based WHITEvoid design studio has created a cloud-like installation that does not actually change but is nonetheless constantly in motion.

By Monja Horrer

The purpose of a seemingly free-floating cloud-like sculpture made up of 12,000 small translucent spheres suspended above a water basin is to allow every visitor to experience car manufacturer Hyundai's design philosophy in person. The spheres in this interactive art installation appear to be arranged arbitrarily. However, their positions were calculated using a complex and precise computer algorithm that also takes account of the light angle of the eight powerful laser projectors used. Focused rays of light provide highly accurate illumination of the individual elements. The result: varied, dynamic, 3D graphics which can be experienced from different angles with a constant intensity. In addition to the laser projectors, special 3D camera systems analyse the positions of the visitors, allowing the art lovers' movements to influence the speed of the illuminated figures and thus to create individual structures within the cloud of dots of light. This interaction was tested at the Temporary Museum of New Design in Milan in April 2013. **www.whitevoid.com**



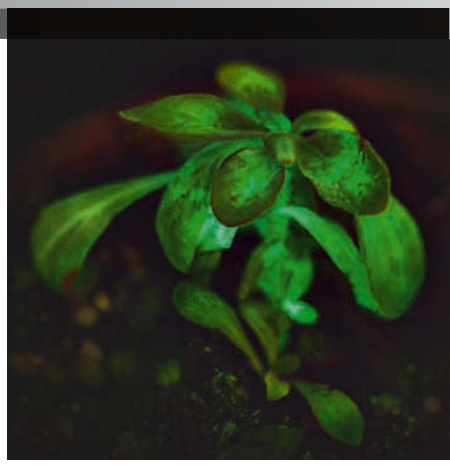


Photo: Dan Saunders

# SMALL GREEN AVATAR

By Patricia Sahm

Researchers in the US have succeeded in using bioluminescence to make plants glow. Had the idea been achieved earlier it would no doubt have greatly please James Cameron as when making his movie Avatar he would not have been needed to use complicated computer animations for the scenes with the glowing plant world. Unlike the situation in the movie, where a simple touch triggers the glowing, the scientists at Bioglow LLC have painstakingly isolated the part of the DNA responsible for luminescence in marine bacteria and added this to the chloroplast of Nicotiana alata – a decorative tobacco plant. To date, the little plants that go by the name of Starlight Avatar only glow green, but scientists are working on producing other colours such as blue, yellow and red. The objective for the future is to continue to develop this illuminated flora so that it can be used for lighting up streets and rail tracks. **www.dietwiegman.tumblr.com**

# RED LIGHT DISTRICT

Everybody knows the expression "red light district" but few people know about its origins. The most "enlightening" explanation of the words "red light district" comes from the United States which is where the term is said to have originated when, in the early days of the railways, red lanterns were part of the workmen's equipment. The railwaymen communicated along the railway lines, on which often only one or two trains travelled, by swinging their lanterns, waving or whistling. Their kerosene lanterns also lighted their way at nighttime. The steam-driven trains often stopped for quite some time in order to take on water or wood. And when one of the workers stopped off at the above-mentioned kind of service he would hang his red lantern on a hook by the door. Presumably he did this so that his colleagues could find him when the train was ready to depart again. The expression "red light district" appears to have made its first written appearance in 1894 in the "Sandusky Register", a newspaper from Ohio. It is said that the author traced it back to an area of Dodge City, Kansas, well-known in the 19th century for prostitution – there, one of the establishments was known as the "Red Light House" saloon. When and where exactly the first red gaslight started burning above the entrance to a brothel has not been recorded. Even though red lanterns were extinguished long ago and only crop up, if at all, in the names of the relevant establishments, even today, the term red light district is still in current use. Incidentally, the designation does not only apply to countries where German and English are spoken. In Italian, such areas are referred to as "quartiere a luci rosse".

Photo: ©istockphoto.com/designsimply

It is believed that historically, the railwaymen's red lanterns were the reason behind the name given to the relevant areas (left).

Even today, bright red is dominant in the streets of sin (below).


Photo: ©istockphoto.com/sborisov

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