

# Touched by Light

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Received 12 December 2016, Accepted 07 March 2017

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## Abstract

With LED as illuminant a new era of dealing with lighting has dawned. Digitalisation, light guidance and light quality take on greater significance. Physical and emotional impacts of light on the human being have become common topics in the everyday life of a modern society. The amount of light which determines the character of spaces is steadily increasing. Our visual perception has adapted and assimilated to it over the years, decades, centuries. What was once perceived as bright today can't either be used in a functional way or even less meet current standardization regulations. The project "Langsames Licht / Slow Light" searches for ways to practically implement theoretical insights and experience from the subjects of art, science and design, allowing a targeted use of light.

**Keywords:** *Sensitive use of light, Sustainable lighting, Perception (physical, emotional, sensual), From theoretical knowledge to a practical use of light*

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## 1. Introduction – interdependence of matter and light

The title "Touched by light" may initially evoke religious associations as light represents the divine, the strong, the sublime, the elusive, emotions and, of course, the origin of all life.

Already Socrates prayed at dawn under the rising sun. Socrates – respectively Plato – indicated that the vision of the existing is only possible when light is present. That also the illuminated and light are closely connected, and that without light the object is not visually perceptible. This knowledge from ancient times has become quite current – since electricity was invented and artificial lighting has swiftly spread. Just as contemplation of perception, reality and truth was anticipated by Plato in his allegory of the cave, which today, in times of medialization, seems to be more topical than ever.

For my concept "Langsames Licht / Slow Light", the interdependence of matter and light, as well as the question of what we perceive and how we perceive things, provide the basis for every project about a modest, reasonable and also sustainably aesthetic dealing with light.

## 2. Awareness and Knowledge – first steps in dealing with light

The concept "Langsames Licht / Slow Light" is concerned with raising awareness for the various effects and interactions of light. Collaborating closely with engineers and scientists from different disciplines, I question viewing habits and the impacts of light, while exploring the possibilities of current technologies. I am convinced that we are far from exploiting them to their full potential. As omnipresent as the medium of artificial light may be in our everyday life, the need for scientific research and our lack of knowledge about how to deal with new technologies is just as great. As a result there is a need to create an awareness of the different approaches and to bring them closer together. Dynamic systems, for example, confront us with technological challenges. They are

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fault-prone and run on software that must be set up and looked after by specialists. The programming of these systems is extremely complex.

For a sensitive use of light we need to create an adequate environment. Cooperating with political representatives of the communities is essential for the success of modest lighting. Once people are sensitized, they start to realize and recognize the different qualities of light, and discuss them. For me this is always a first major step to a deliberate use of light, which may continue in further projects and finally affects the general view of night-time spaces in communities.



Fig. 1. Sensitive use of light

### 3. Influence of light – physical and emotional perception

Light is almost always present. Depending on the situation, our constitution or our conditioning, we can experience the same light in a negative way as well as in a positive one. Perception is a complex, physical process that always also causes emotional reactions. Sensory-input is neuronally processed. Only a part of the information reaches our consciousness. Arriving information is constantly correlated with our experience, our knowledge and the abundance of associations, we are capable of.

When a ray of light falls through building openings, it gives the room a certain magic atmosphere. We physically react to it. We decelerate our steps or stand still; we lower our voices or remain silent and listen. In this case, interaction of environment and light has an essential influence on our feelings, our perception and our behaviour.



Fig. 2. Daylight concept for a church, Lichtenberg 2008/09 – Siegrun Appelt with Andrea Konzett

#### 4. Impact of light

##### 4.1. *The power of light and its manipulative force*

Light generally represents the good – shadow or darkness represent the bad. But light also has a destructive, deadly power. Bundled light is used as a weapon. A laser beam, whose precise ray cuts firm material, is able to cause injuries. Stronger lasers are used for missile defence. Very bright and dazzling light is one of the methods of white torture, which doesn't leave visible damage on people, but tortures them by exposing them constantly to light. The permanent illumination causes stress in the victims, they lose their sense of time, they can't sleep, and in the end this weakens their physical functions.

As an artist I go similar ways, when I work with light. I use light to touch people. I share this purpose with experts from different scientific areas and also with architects and designers.

##### 4.2. *Art and science*

Art allows me to act from a subjective point of view – whereas in science reasonable research results are required. As an artist I make claims which are based upon my personal experience and my observations, whereas scientists are not allowed to do that – they observe third party's experience and analyze it with scientific distance and best possible objectivity. These two approaches complement one another and can support each other.

## 5. Perception

### 5.1. The individuality of perception

Being touched by light takes place in my art on all different levels. Some of my works are based more on physical perception. Some works rather address our visual perception. And all of them touch our associations and worlds of memories.

Each viewer and user of an artwork has his own view on it. This fact brings us to an old theme of art – the viewer completes the work and every viewer does it in a new way, over and over again.

### 5.2. Two installations – 64 kW / 114 kW

The installation “64 kW” that was shown at the Venice Biennale of Architecture in 2008 and a comparable installation with the title “114 kW” in Frankfurt at the Kunsthalle Schirn in 2006 are two examples for immediate and physical contact with light. At the Kunsthalle Schirn visitors became quiet due to the impression of bright light.

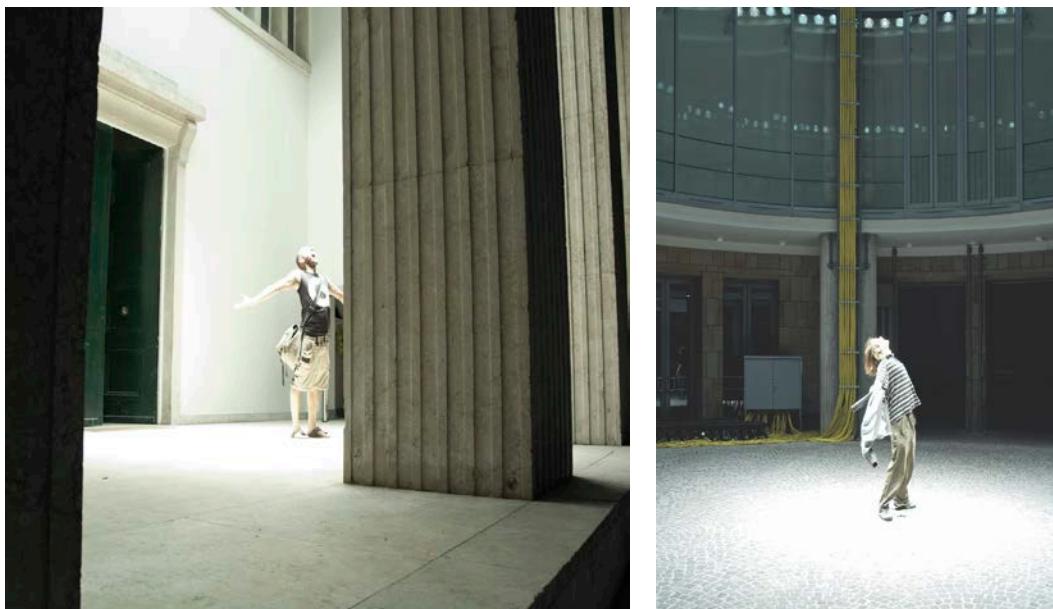


Fig. 3. Friendly togetherness: people are focused on the light and have the chance to be in the light without aggression or pushing each other. Many visitors, even the children, reacted spontaneously by taking the same posture as these young men did in Venice and Frankfurt.



Fig. 4. 64 kW – 32 bright lights on the ceiling of the entrance area are directed at the same point on the floor. Visitors have to pass the light before entering the pavilion. The focused brightness blinds the eyes and the heat of the lights is too hot for staying more than a few minutes. Light intensity: ~ 470,000 lux (4.7 times brighter than the sun on a cloudless summer day) It is a very direct, almost simple confrontation with the medium of light, with energy and also with the question of a conscious use of it.



Fig. 5. The scene shows three different reactions to light. The man who is located directly in the light is trying to shelter from the destructive power of light. The woman at his right seems to enjoy the powerful light and turns to it. The man in the foreground of the picture is just an observer of the scene in the light.

### *5.3. Sound and light – interaction of stimuli*

Relations between space, time and movement have been always very important to me. Natural light constantly changes, moves and influences space and time and also all of nature, not only human beings.

In what way a certain light atmosphere and a certain light intensity influence the existing, and also the perceived sound level of a space, and how a certain noise level affects light intensity and light atmosphere, is a neglected question regarding dealing with light. The interaction of the several stimuli and its influence on – or rather manipulation of – our perception is a topic of research I consider to be crucial if we want to find new ways of dealing with light and with space. That is why I concentrate my observations on this topic and draw attention to it for quite some time now.

### *5.4. Physical limits of perception*

The sensory stimulus that hits us provokes a physical reaction in terms of adaption and simultaneously influences our perception of other stimuli, for example sounds, smells or temperature. If a sensory stimulus is very strong, the fine nuances get lost and other stimuli struggle with coming through. The concentration rests on the bright, the loud, the strong smelling.

Regarding my long-term observations and what I know about perception, I assume that a defensive mechanism is activated, as capacity has physical limits. Our body reacts within these limits while processing the stimuli. Too many or too strong stimuli stress us.

Therefore an appropriate coordination of the stimuli and their intensity is very important for our perception. Of course this also concerns the question of safety. What do I perceive? What do I want to perceive. Where do I feel safe, and where am I actually safe?

### *5.5. Safety – spatial visibility versus light intensity*

As we all know, more light doesn't necessarily lead to more safety. Bright light can cause strong contrasts, which irritate our eyes and block our vision of the environment. To me, spatial visibility seems to be more important than light intensity – this means a good interplay of light and dark, vertical as well as horizontal, with smooth transitions, so that the space itself becomes graspable in its dimension.

## **6. Master plan – pathway lighting, Bregenz, 2005**

The spatial visibility was also an important point concerning the path lighting as part of a master plan which I designed for the lakeside area in Bregenz in 2005. With the support of the lighting company Zumtobel I created a masterplan with a light system and a Full-Cut-Off lamp that reacts to motion by changing discreetly, getting brighter when necessary. It was published in the company's annual report. My intention was to enable a good view of the nocturnal space and the lake, as well as to save energy.

Intelligent systems, like we developed in 2005, have become interesting for many cities over the past few years. In 2005 we were quite early in the process of the development as I could slip my artistic experience with light, space and perception into the functional implementation. This shows how important it can be to cooperate and to bring together the knowledge of different disciplines.

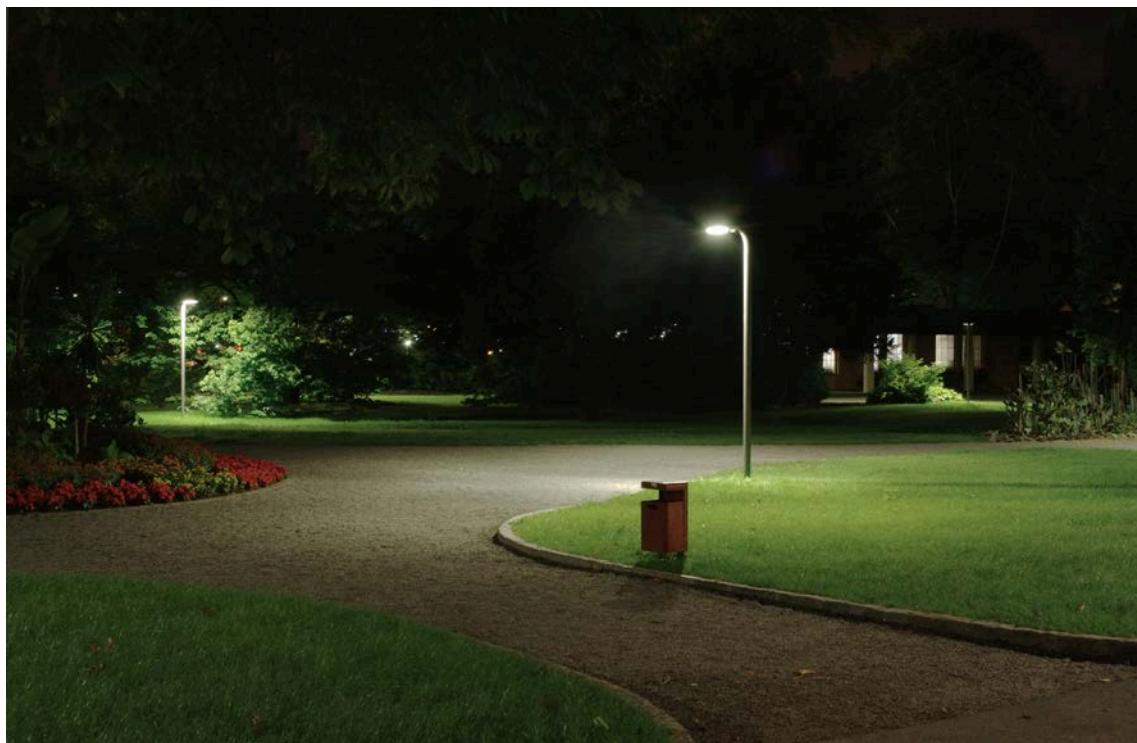


Fig. 6. The picture of the pathway lighting in Bregenz shows the good overview over the space very well. The space looks welcoming although it is not extensively illuminated.



Fig. 7. Comparison old light – new light On the left side the space seems close up, on the right side it is overseeable even in the background.

The common lack of knowledge regarding light and lighting unfortunately implies that bright, extensive light is associated with more safety. That is why in many cases a problematic handling of light is not even recognized.

## 7. Light / shadow / darkness / environment

### 7.1. Perceived darkness

Light and shadow possess an almost infinite wealth of variations. Natural light constantly changes from very bright to completely dark. Peter Sloterdijk says about the relation of light and shadow: "Where there is much light, there is also much shadow; where there is too much light, darkness reigns." This is not only true on a metaphysical level but can also be applied to what our eyes see or do not see. We visually perceive darkness when there is no light, but also when there is too much light.



Fig. 8. The brighter the night, the more we feel threatened by darkness.

One single bright light can create such sharp contrasts, that the eye is irritated and blocks our vision of the surroundings. In order to protect the retina, our eyes always adapt to the brightest parts in our field of vision. And as soon as our eyes have adapted to the brightness, everything around us seems darker. So basically, a lot of light can impair our vision of the surroundings.

### 7.2. Automotive lighting – sharp contrasts

The same problem applies to automotive lighting. The brighter the car headlights, the higher the potential for stress, not only because we are blinded by looking into the light, but also because of eye adaption the driver perceives the normal ambient light beyond the bright light cones as too dark.



Fig. 9. View with dimmed headlights

*Average stopping distance at 50 km/h comes to 27.5-40 metres, at 70 km/h it comes to 45.5-70 metres and at 100 km/h to 80-130 metres. The respectively shortest braking distance applies to emergency braking . An ordinary dimmed headlight has a range of 50-70 metres. Until a speed of 50 km/h the stopping distance is located within a safe area, if the obstacle enters the light from the front, not from the side.*

### 7.3. The interdependence of headlights and public lighting

If the headlights of cars are to become ever stronger and ever more precise, communities have to bring the ambient light in line as well in order to perceive what is going on behind the light cones. If they do not, the stopping distance can be too short. We definitely feel safer and drive faster the brighter the lights are and also the more light there is in the street. In a slow process, the municipalities respond to bright headlights with all-encompassing bright lighting.

Regarding my observations of the last 20 years, I came to the conviction that the ever brighter headlights have an immediate effect on public lighting which will gradually adapt to the brightness. There is no real awareness of this yet. Even the people working in planning are ignorant of that aspect.

It definitely makes sense to start discussions about the interaction of headlights and environmental light with the responsible decision-makers in politics and industry. In my “Slow Light” projects I take every opportunity to talk about these topics in various contexts, and I have received the impression that the attention to these issues is constantly growing.

The lights of bicycles and motorbikes develop in the same direction. It really surprises me how people use dazzling bicycle lights without being aware of the responsibility they carry. Anyhow it would make sense to cooperate with the vehicle supplier industry in finding alternative systems.

## 8. Langsames Licht / Slow Light – in the Wachau region

In 2010 I was invited to do lighting projects in the Wachau region, a UNESCO World Heritage Area near the Danube. Until now we have completed 17 projects in different communities. The foundation of all the projects is a conscious and cautious approach to the illumination of nocturnal spaces and cultural heritage.



Fig. 10. Energy consumption new – 132 watt (Parish church of St. Nikolaus, Emmersdorf 2012)

*The interplay of light and shadow gives the parish church of St. Nikolaus in Emmersdorf a mysterious and elegant presence. At night the building appears in all its three dimensionality.*



Fig. 11. Energy consumption old – 2000 watt



Fig. 12. Energy consumption new – 192 watt (Church St. Johann im Mauerthale, 2011)

LED spotlights are aimed very precisely at the building without producing any stray light.



Fig. 13. Energy consumption old – 2400 watt



Fig. 14. The entrance to the building is indicated by a warm 60-watt carbon fibre light bulb. Fassade: LED, 3000 Kelvin, 132 watts.

## 9. Conclusion

The intention of “Langsames Licht / Slow Light” is to contribute theoretical insights and artistic experience to functional projects. The step from theory to practice is very complex. Where science and art end, a link to functionality is required, but which is often missing. At this interface, worlds drift apart that I would like to see united.

To sophisticatedly transfer knowledge into the practice-orientated use of light one first step is the involvement with the perspectives and targets of nature sciences, cultural sciences, art, architecture, economics and politics.

Not until then the insights and the experience of the respective areas and new technological developments can be linked to each other and be reasonably integrated in functional projects. It is necessary to sound out the overlaps and the points where they complement each other. Conflicting insights and contrary targets are checked for possible approximation or are incorporated in the projects if needed.

A certain use of light can have a positive impact regarding the targets of one discipline and at the same time show negative effects when it comes to a different discipline. Here is one example from the medical area: a certain composition and intensity of light may – seen from an ophthalmologic point of view – cause damages of the retina while also – seen from a therapeutic point of view – have a positive impact on the progress of a disease.

Also regarding the issue of safety there are different approaches to the use of light. In the context of urban planning whole public areas are provided with a new illumination which is more extensive and brighter in order to ensure more safety. The new lighting leads to an adaptation effect within population. As a consequence of this adaptation process the areas surrounding the zone with the new light are perceived as darker and more dangerous than previously. What happens here I call “extended adaptation”: the modification of one area and the concomitant adaptation process have a direct influence on the perception of the nearby areas and also of areas that are further afar. The feeling of safety increases in the area with the new light and – as a consequence of this – decreases in the areas where the light has stayed the same.

As the safety of a place not only depends on the light situation but also on cultural, aesthetic, temporal and social factors, it is important – especially in such delicate cases which are responsible for processes of change in society – to cooperate with specialists of the respective disciplines in order to work on new and optimised solutions.

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