

Colour-light-composition artworks

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Our senses are permanently exposed to a flood of parallel perceptions, which they must handle. This is an individual process and therefore very different from one person to another. Are there sensory relations that are generally valid across cultures? I have developed an art project that aims to provide an answer to this question: Colour-light-compositions [1]. As an artist, I compose with light and colour, and as a result I visualise music and space with it. In this paper, I give a description of an outdoor and an indoor colour-light-composition on the basis of my observations that become the starting point of my evaluation process. The focus is on the kinds of sensual and physical relations that exist, e.g., between weather, architecture and space, the individual (and also synaesthetic) ways of perception and the colour-light-compositions.

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Introduction

Contents, basis and source of Colour-Light-Compositions

My colour-light compositions are an artistic interpretation of sensory perceptions of time-conditioned processes, which I make visible through light and colour in architecture, urban space, landscape, or nature. The underlying concept makes it possible, conditioned by colour and light, and sound and space, makes it possible to combine the detected stimulation of various senses at the same time.

This approach establishes the basis of my own distinct creative language and methods of expression.

The time-conditioned processes serving as the initial impulse for many artworks can be musical compositions, e.g., classical and experimental music, or acoustic incidents from everyday life or nature. I listen, and colours arise within me in associative, complementary or newly emerging relations. As part of the process, I systematically analyse the characteristics and parameters of the affected context. This analysis is based on my background knowledge of colour and its effects on the body and psyche, my own synaesthetic disposition and empathy, as well as the musicality of the initiating impulse. On many levels I mentally penetrate the complex structure of what is there (existent) and what will be (resulting from the impulse).

Colour, sound, music, and space trigger sensual perception through hearing and seeing.

*“It is not sufficient to only be able to hear music.
One also has to be able to see it.”*

Igor Strawinsky

My method is phenomenological: I reduce and transcend. In this sense my own subjectivity provides the mental and emotional substance.

I'm concerned with correlations between musical keys and hues, with cultural and time-conditioned dependencies, and with symbols and associations in the here and now.

Uniquely responding to each space, I modify the composition and rewrite the light score accordingly. For musical compositions, I perform live in the specific space, creating, lighting scenes using a mixer console. For other pieces, I program digital light signals, which are afterwards reproduced electronically. One such example is my associative piece *Storming*, which deals with natural phenomenon.

In all my artworks, I pay particular attention to the dynamics of light and colour changes, as these stimulate the viewer's consciousness, arousing personal experience of the immediate situation as well as associative awareness, whereby through a kind of sensory and reflective learning previous and current experiences can be newly related. The result is heightened perception, which can also deepen the way that phenomena and the environment are discerned in the future.

Cognitions and their position in my artwork

To explore colour and tone associations that are perceived similarly, independent of the cultural environment, almost all my light events begin with a prologue composed of #c 138Hz — blue, a 220Hz — yellow, g 196Hz — red.

According to my experience, for most people these pairs of colours and tones match.

I rarely use colour as a symbol. Its meaning varies too much from one culture to another, apart from a few exceptions, e.g., blue is generally the colour of the strange, of distance, and of infinity. The eye not only reacts to colour perception, but also to the sound of a tone.

Hearing strongly amplified tones stimulates the periphery of the retina, while simultaneously perceiving colours that are glossy metallic. Hearing is also particularly sensitive to high tones (2,000Hz). As well, it can differentiate between many more blue shades than those of other hues, and this impacts on sensory perception as a whole.

Measurability, comparison, and perception of colour shades and tone colours are facts in my artwork. Human sensibility for colours and sounds are both based on waves, although of different types. Visible

light wavelengths vary in range from 380 and 720 nanometres. This corresponds numerically to a frequency range of approximately 400-800 trillions Hertz. This is roughly one octave.

The frequency of a heard tone always has the same relation to the subsequent halftone. The frequencies of the musical scale do not proceed linearly but logarithmically. Each tone can be specified exactly and defined mathematically. Music therefore is an ordered sequence of timed tonal experiences.

Colour shades do not provide our perception with the same consistency. With some wavelength ranges we perceive many colour differences with others, less so.

This situation is in my mind and I react in my colour-light concerts with a special method. I demonstrate this phenomenon to the audience by fading in and fading out the light and through varying the speed of colour changes.

The psychologist Heinrich Frieling performed extensive colour studies on the comparison of tonal keys and colour associations, with the result, that in minor keys the colourless dominated and major keys are colourful [2]. The specific colour associations were found to follow the circle of fifths. Johann Wolfgang von Goethe writes in his colour theory §748 [3]:

“Colour and tone are not at all comparable but both can be related to a higher formula. Both, each on its own, can be derived from a higher formula.”

At times I select the colour of the light in correlation to the space, sound, or textual content of the musical composition. Each natural phenomenon, each emotion can stimulate the imagination of a colour. More often, however, I work with complementarities or with some other parameters. A complementary coloured light evokes somatic nervous excitation.

When during a stroll along the Baltic Sea coast Dietrich Buxtehude asked Johann Sebastian Bach whether he also heard the ocean's rush in G major (i.e. yellow-green or silvery), Bach said he didn't hear it so [4]. On the other hand, in observing the ocean, I would raise the question in a different way, demanding a more profound distinction addressing perceptual impacts in terms of different keys according to the swell, the wind direction, and the depth and texture of the water. I also perceive space as sound and colour. Thereby, I might perceive a church interior as light grey-blue as in F major. Another space might be 'earthy and heavy' as in D major. When such a feeling becomes conscious, I consider it perceptually, but my colour-light composition does not necessarily follow the chromaticity that I perceive, but rather in a composition I consider synaesthetic attributes to ensure that subjective sensations do not become too dominant.

Synaesthesia is a genetic predisposition and quite rare. It is not learnable. Colours and, for example, tones are perceived as inextricably linked. Other synaesthetes however may have different perceptions of colour/tone pairs. Synaesthesia is not an illness, but sensations can make a synaesthete feel sick due to the impact of unusual sense perceptions. This somatosensory condition is not comprehensible to many people because they are not so highly sensitive to stimuli. I am a synaesthete, I know about these experiences. Colours arise in the head, i.e., the contents of consciousness are linked in numerous ways. Colour is already synaesthetically and inseparably coupled with another sense, which means that synaesthetic phenomena cannot be influenced by associative thoughts.

Often used in concert halls, static light not only does indeed ensure more intense listening, but also arouses drifting in thought. Obligated to remain immobile, nonetheless, in response to the impulse to wander, people's eyes roam around the hall. Thereby, in the end effect causing distraction, static room light is tiring and does not stimulate the senses in a directed way. The aim of my colour-light compositions is, when realised, to symbolically enwrap the audience like a coat that feels physically tangible.

Light and colour affect all aspects of our perceiving senses. A colour-light concert is intended to provide the chance to unconditionally and subjectively experience the presence of what is happening as the interaction of light, colour, sound, and space. Each visitor is thereby engaged through personal participation, i.e., taking part through his/her own sensual perception as well as personal thoughts and memories and the possibilities of individual sensibility of physiological vision.

It is important to me that light does not illuminate something, but rather acts as a link between content, sound, audience, and architecture. Our perception registers only what our senses allow us to access. I develop the interplay of the colours through light following a distinctive order and script (dramaturgy) specifying light intensity, dynamics of light and colour changes, and the individuality of the theme of the artwork. Depending on factors such as the thematic criteria, venue location, and season/weather, etc., I differentiate compositions according to qualities such as saturation, hue and lightness, reflecting spatial and material surfaces, perspective, and own point of view.

Two recently realised projects

Outdoor colour-light composition

Colour Dialogues – temporary art project at wind power stations in Northern Germany

In 2015, the project *Colour Dialogues* was realised and visible on site for three weeks. Each of the nine compositions of varying content was conceptualised for the interplay of three to five wind power plants.

Located in a sparsely populated marsh region in Northern Germany near the North Sea, the dimensions of the wind power stations entail a height of up to 150 metres; the base of the towers with a diameter of approximately five metres; and, rotor blades with a length of up to fifty metres. On-site observation served as the basis for the contents of these light compositions, entailing such aspects as: artificial light (red flashlights on their top) and noise levels, e.g., of the highway or ocean, due to the turbines specific geographical location and the environment; sounds and optics of the turbines' caused by the different movements of the rotor blades and the occasional rotation of the gondolas; material and surfaces of the towers; weather, especially its unpredictability, and the phases of the moon, i.e., natural light.

Reaching a height of 150 metres, the lighting of the highly efficient lamps fully enveloped the towers. In contrast, the rotor blades were illuminated when they cut through the light beam.

Concerning the composition of the light, eighteen different hues, all with the same saturation, formed the basis of all instances of this project. Many nuances and different intensities were defined from these tints. From the material of these notes I composed the contents, determined by ordered sequences of colours and intensities, tempi, and colour transitions (fading or hard changes). Each composition was exactly programmed according to my artistic specifications and could be reproduced automatically on-site for each defined duration. The layout was prepared for production by programming it digitally, so that it was reproducible at any time. Later on I added some more explanatory graphics showing different volumes and intensities of colour and light changes.

For the lighting technology I select equipment meeting the different requirements of the production and the nature of the reflecting surfaces. I use highly efficient LED spotlights that consume as little energy as possible. At times, however, conventional spotlights using analogue technology are preferred because of their richer colour rendering. Table 1 shows the excerpt of the light composition *Storming*.

				3.1	3.2		1.1	1.2		2.1	2.2		4.1	4.2		5.1	5.2
nr.	sec	sec	%	nr.	nr.	%	nr.	nr.	%	nr.	nr.	%	nr.	nr.	%	nr.	nr.
step	step to step	time	satiation	colour	colour		colour	colour		colour	colour		colour	colour		colour	colour
1	2	40	70	3.3	3.3	50	3.1	3.3	60	3.3	3.3	70	3.3	3.3	50	3.1	3.1
2	2	40	70	3.3	3.3	50	3.1	3.3	60	3.3	3.3	70	3.3	3.3	50	3.1	3.1
3	2	40	70	3.3	3.3	50	3.1	3.3	60	3.3	3.3	70	3.3	3.3	50	3.1	3.1
4	2	40	70	3.3	3.3	50	3.1	3.3	60	3.3	3.3	70	3.3	3.3	50	3.1	3.1
5	2	40	70	3.3	3.3	50	3.1	3.3	60	3.3	3.3	70	3.3	3.3	50	3.1	3.1
6	2	40	70	3.3	3.3	50	3.1	3.3	60	3.3	3.3	70	3.3	3.3	50	3.1	3.1
7	2	40	70	3.2	3.3	60	3.1	3.3	60	3.3	3.3	70	3.2	3.3	60	3.1	3.1
8	2	40	80	3.2	3.3	70	3.1	3.3	70	3.3	3.3	80	3.2	3.3	70	3.1	3.1
9	2	40	90	3.2	3.3	80	3.1	3.3	80	3.3	3.3	90	3.2	3.3	80	3.1	3.1
10	2	40	100	3.2	3.2	90	3.1	3.3	90	3.3	3.3	100	3.2	3.2	90	3.1	3.1
11	2	40	100	3.2	3.2	100	3.3	3.3	100	3.1	3.1	100	3.2	3.2	100	3.3	3.3
12	2	40	100	3.2	3.2	100	3.3	3.3	100	3.1	3.1	100	3.2	3.2	100	3.3	3.3
13	2	40	100	3.2	3.2	100	3.3	3.3	100	3.1	3.1	100	3.2	3.2	100	3.3	3.3
14	2	40	100	3.2	3.2	100	3.3	3.3	100	3.1	3.1	100	3.2	3.2	100	3.3	3.3
15	2	40	100	3.2	3.2	100	3.3	3.3	100	3.1	3.1	100	3.2	3.2	100	3.3	3.3
16	2	40	100	3.2	3.2	100	3.3	3.3	100	3.1	3.1	100	3.2	3.2	100	3.3	3.3
17	2	40	90	3.2	3.3	90	3.3	3.3	70	3.3	3.1	90	3.2	3.3	90	3.3	3.3
18	2	40	90	3.3	3.2	80	3.3	3.3	50	3.3	3.1	90	3.3	3.2	80	3.3	3.3
19	2	40	80	3.2	3.3	70	3.3	3.3	30	3.1	3.3	80	3.2	3.3	70	3.3	3.3
20	2	30	80	3.2	3.2	70	3.1	3.1	100	4.2	4.1	80	3.2	3.2	70	3.3	3.1
21	h	20	70	3.2	3.3	70	3.3	3.1	60	3.1	3.1	70	3.2	3.3	70	3.1	3.3
22	h	10	70	3.2	3.2	100	1.3	1.3	70	3.1	3.1	70	3.2	3.2	100	1.3	1.3
23	h	20	100	5.3	5.3	70	3.1	3.3	100	6.2	6.1	100	5.3	5.3	70	3.1	3.1
24	h	20	60	3.2	3.2	70	3.1	3.3	80	3.1	3.1	60	3.2	3.2	70	3.1	3.1
25	h	10	100	5.3	5.3	100	2.3	2.3	80	3.1	3.1	100	5.3	5.3	100	2.2	2.3
26	h	10	60	3.3	3.3	70	3.1	3.1	100	6.1	6.3	60	3.3	3.3	70	3.3	3.1
27	2	40	50	3.2	3.3	70	3.3	3.1	90	3.1	3.3	50	3.2	3.3	70	3.1	3.3
28	2	40	40	3.3	3.3	70	3.1	3.3	100	3.3	3.1	40	3.3	3.3	70	3.1	3.1
29	2	40	30	3.2	3.3	70	3.1	3.1	90	3.3	3.1	30	3.2	3.3	70	3.3	3.1
30	2	40	20	3.3	3.3	70	3.3	3.1	100	3.1	3.1	20	3.3	3.3	70	3.1	3.3
31	h	40	40	3.2	3.3	80	3.1	3.1	80	3.1	3.1	40	3.2	3.3	80	3.3	3.1
32	h	40	50	3.3	3.2	100	3.1	3.1	70	3.1	3.1	50	3.3	3.2	100	3.1	3.1
33	2	40	60	3.3	3.3	90	3.3	3.1	60	3.1	3.1	60	3.3	3.3	90	3.1	3.3
34	2	40	80	3.3	3.3	80	3.1	3.3	50	3.1	3.1	80	3.3	3.3	80	3.1	3.1
35	h	40	100	3.2	3.2	80	3.1	3.1	40	3.1	3.1	100	3.2	3.2	80	3.3	3.1
36	h	10	90	3.2	3.2	70	3.3	3.1	100	3.1	3.3	90	3.2	3.2	70	3.1	3.3
37	2	40	80	3.2	3.2	70	3.1	3.3	90	3.3	3.1	80	3.2	3.2	70	3.1	3.1
38	2	40	70	3.2	3.2	60	3.1	3.1	80	3.3	3.1	70	3.2	3.2	60	3.3	3.1
39	2	40	60	3.2	3.2	60	3.3	3.1	70	3.1	3.3	60	3.2	3.2	60	3.1	3.3

Table 1: Excerpt of the light composition Storming © Gisela Meyer-Hahn.

Figure 1, Table 2 and Figure 2 show examples of colour choices and colour transitions in three different colour-light compositions for wind power plants in Northern Germany.

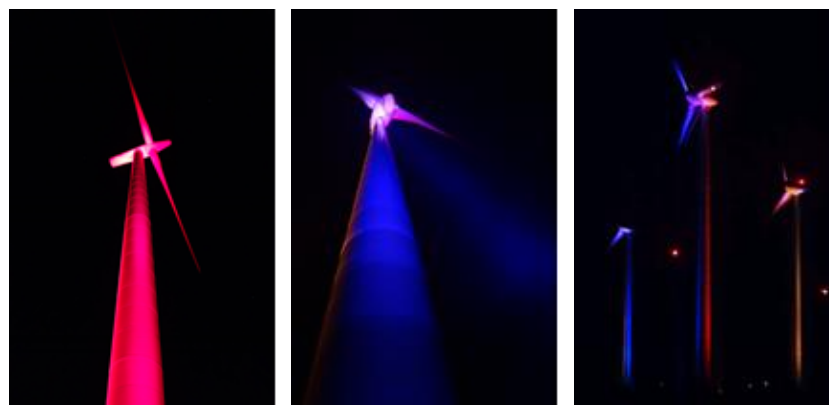


Figure 1: Storming (left), Raining (middle) and Helix (right) compositions.

	Storming	Raining	Helix
Source for some compositions: weather conditions and their effects	Whipping wind sounds, occasionally making the towers whistle and gondolas rattle. Additional loud noises of the rotor blades were like sharp blows.	Under rainy conditions. Visual and audible effects as with strong rain accompanied by fierce squalls. Water flowed in torrents down the towers, forming lake landscapes on the ground. The sound of the falling and dashing water added to the swishing sound caused by the rotor blades meeting the rain.	Calm weather, no drifting clouds, and little moonlight. This is the atmosphere, in which colour and light can work with an abstract choreography independent from weather conditions. Body and mind are relaxed and can be open for new ideas.
Artistic idea; goal of the composition; effect on perception	The idea is to compensate the body/mind sensation of weather effects and highly technical noise levels.	Association with water was created by the blue colour of the light. The water vertically flowing down along the towers and the diagonally falling rain thereby became visible, and at the same time were connected associatively from a distance.	The aim is to make use of the ensemble of turbines as a projection surface for the interplay of the coloured light composition. To surrender to colour and offer all manner of colour stimuli to the eye in order to incite bodily experience of their effect and to connect with other observations and memories in the mind.
Colour choice	Intense shades of red with imbedded nuances of orange, yellow, green, violet. Only intense colour shades.	Light blue, light turquoise. Changing intensities.	Spectral colours with many nuances, varying intensities, polarity, and escalation.
Time intervals of the different colours	20-30 seconds	30-40 seconds	20 seconds
Colour changes	a) 1 second b) sometimes abrupt	slow, soft, flowing	slow, soft
Perception's effects on the audience	The audience has been directly influenced by the weather, the coldness and rain. Therefore, from the beginning the observers have been in stress. Progressively, the colour composition took the initial stress away, because speed and grades of the colour transitions match with the colours people feel during storms. Body and mind form a unified whole with the weather.	The audience became silent observers. Atmosphere in balance, and like dreaming.	The audience, at first, observed silently and relaxed. Later on people began to communicate with one another and to talk about colour and its meaning. They stayed for a long time— with happy feelings.
What is the physiological eye doing?	Perception of red with small pupil.	The pupil widens with the appearance of blue; perception of blue is peripheral.	The eye is stimulated in various ways.
Further observations	Our senses react more directly, if I use in summertime rather fiery red, in wintertime rather bluish red.	Blue as a vertical phenomenon.	Association of a luminous blossom in the dark.

Table 2: Properties of the Storming, Raining and Helix compositions.



Figure 2: Ensemble of wind power plants in continually and slowly changing light © Gisela Meyer-Hahn.

Colour observations

Observation from a distance

The light of the highly efficient spotlights reached towers, gondolas and rotor blades up to a height of 150 metres and was visible from a distance of six to seven kilometres (about five miles). The colours seemed to breathe and wrap around the towers like an envelope. Their interplay caused the ensemble to coalesce into a whole. The continually flow of sea-like colour streaming into each other in swelling and subsiding colour intensities and blends caused associations to arise (see Figure 3).

The eye could not disengage from the rotational movement and colour changes. In this dynamic process of perception, time seemed to dissolve.

Close-up observation

In proximity, colour was reflected by the tower and had a direct effect on the vegetative system. Rotational movement and sound became—in moderate weather—monotonous. It was easy to tolerate all colours.



Figure 3: Tower of a wind power plant in blue light from close-up © Gisela Meyer-Hahn.

Results of first example

Outdoor colour-light composition

Realised in relation to the profane ‘architecture’ of the wind power plants in the midst of the region, the impressive colour-light project was well accepted by the public and enjoyed much popularity. At the same time, it contributed to further acceptance of the wind turbine technology. Now, after the end of the project, the towers have returned again to a state of lacking any nocturnal sensual aura.

This art project obtained comments about the compositional content from randomly involved passers-by. After only a short while, one could observe, that personal conditions were immaterial to the individual perceptions. Nearly all participants reacted the same way to the diverse colour-light-compositions under the corresponding external conditions. This project made clear that the physical connections of the participant to the local conditions merged with the sensory impressions of hearing, feeling, and seeing. This impulse is given and realised by the changes of colour and light, visualised by the compositions.

Indoor colour-light composition

ColourLightConcert at the Cathedral of St. Peter, Schleswig, Northern Germany

The Creation Oratorio by Joseph Haydn

The *ColourLightConcert* was created as a comprehensive sensory experience for a November evening in 2015 in the Cathedral of St. Peter in Schleswig and was based on the content and the dramaturgy of the musical composition *The Creation* and its tonal keys, the acoustics and sounds of the space, and the sounds of the voices and instruments.

Colour and light appeared associatively as well as complementarily to the textual context. My dramaturgical concept took into account the continuous change of activities and actors as well as the liveliness of active and passive, i.e., of fast and slow passages, displaying all expressive variants from *pianissimo* to *fortissimo* (Figure 4).



Figure 4: Photo sequence showing associative light atmospheres in the Cathedral of St. Peter, Schleswig © Gisela Meyer-Hahn.

I use colour and light dynamically in an associative as well as abstract way. A colour appearing in a new context may transport a different content at the same place at a later time. So, for example, green may—associatively—appear as the colour of nature and in a different context be the symbol for trust. Or red may represent love, but in another context stands for power, thereby it may respectively either centre the vision or make the room appear dark (see Figure 5).



Figure 5: Photo sequence showing light transitions from a realisation in Dominican Church of St. Blasius, Regensburg © Gisela Meyer-Hahn, Photo: Jochen Vogel.

Results of second example

Indoor colour-light composition

My compositions for colour and light open new relationships between space and sound, text, and language. Realisation can only take place when all protagonists work closely together. The audience, in contrast, often expects only an atmospheric background from lighting. My artistic form of incorporating many levels of perception into colour-light compositions, however, expands the expectations of the audience and requires active participation with many kinds of sensual phenomena.

The audience at the Colour-Light-Concerts all see and hear the same things, but they are in an environment shielded and protected from all other external influences. This liberates thoughts of self-awareness, while simultaneously the senses of hearing and seeing are brought together in the analytical process of the light-colour-compositions.

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