

## Fading lights

Crossover from candle to LED  
Presentation Kulturakademin  
Göteborg 6/5/2019  
Chris Van Goethem

## Introduction

- Chris Van Goethem
  - Stage manager
  - Teacher
  - Researcher
- RITCS
  - Royal Institute for Theatre, Cinema and Sound
  - Erasmus University College Brussels



## Introduction

- Expertise Centre for Technical Theatre
  - History of technical theatre
  - Art and technology
  - Sustainability, health and safety
  - Competence systems
  - Teaching techniques and simulation techniques.
  - Training for industry and intermediaries - training providers.

## Fading Lights

- Joined research project
  - Expertise Centre for Technical Theatre (RITCS)
  - Stockholm University of the Arts
    - Anders Larsson
- History of lighting in theatre (and events)
- Focus on turning points

## Practice based research

- Based on
  - Historic documents, drawings, ...
  - Safeguarded equipment
- Trying out, rebuilding, testing
- With contemporary knowledge and skills





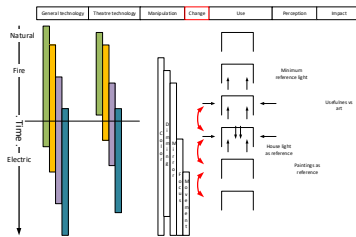
History is not about dates  
it is about relations

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#### • Evolutions

- Run parallel (oil, candle, ...)
- Are geographically different (baroque vs Elizabethan)
- Travel slowly
- Focus on changes



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Nests and things that didn't happen,  
but were important for the history

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- When innovative, creative people come together
- Icons in history are not always mainstream
  - Teatro Olimpico
  - Appia
- Inventions that didn't make it
  - But have influence on thinking
  - Occur later again

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Lighting only exists  
in relation with it's environment  
(and vice versa)

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- Perception of light is dependent on the objects it falls on
- Sets
- Costumes
- ...

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Lighting only exists  
in relation with the perception  
of the audience

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- Light is subjective
  - Depending on what you are used to
- Light is a language, depending on
  - Cultural conventions (symbols, colour, etc. )
  - Religious conventions (symbols, colour, etc. )
  - Geographical background (colour temperature etc. )

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Lighting history  
is  
the history of control

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- Not the history of inventions, but how we use them
- Control of
  - Intensity
  - Colour
  - Colour temperature
  - Focus
  - Angle
  - Shape
  - Movement

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A journey through time

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Based on the evolution of sources

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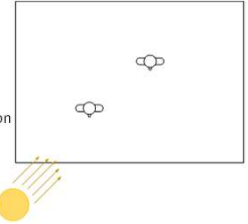
## Natural light

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## Natural light

- Daylight
- Oriented to the east
- Organization of the play depending the sun position
- Black curtains represent night
- Torches as indication of night



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## Open flame Animal and vegetable oil and grease

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## Animal grease

- Viking light Birka



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## Tallow candle

- Pig, cow or sheep fat
- Dipped
- Much smoke
- Smelly



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## Tallow



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## Wax candles

- Rolled or Dipped
- Bee wax
- Expensive
- With addition of tallow



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## Experiences working with candles

- Principle of a candle
  - Wick heats up material, which evaporates
  - Evaporated material enflames
- Melting temperature
  - To low > candle liquidises completely
  - On top of each other > wings > weakening of candle
- Container vs candle
- Size wick
  - Larger = bigger flame, but more smoke

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## Animal oil and fat

- Czech
- Mixed with sand



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## Vegetable oil

- First real oil lamps
- Limited wick height



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## Rushlights and tapers

- Rushlight
  - candle or miniature torch
  - soaking the dried pith of the rush plant in fat or grease.
- Taper
  - Wick in wax
  - Used to light candles or oil lamps

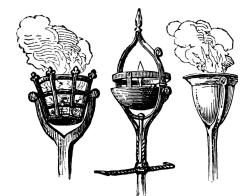


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## Cresets

- Creset or pitch (tar) torch



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## Torches

- Torch or candle?



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## Abraham of Suzdal

- *Abraham of Suzdal*
  - Bishop from Russia
  - Visiting Florence for concilium of 1439
- Annunciation (San Felice)
- Ascension (San Maria del Carmine)
- Filippo Brunelleschi
- Relation with Giorgio Vasari?

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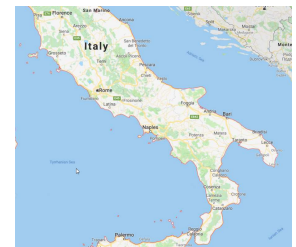
Apostles on the mountain. This was marvellously done, especially as the heaven was somewhat larger than that of S. Felice in Piazza, though with almost the same apparatus. As the Church of the Carmine, where this was enacted, is considerably broader and loftier than S. Felice, another heaven, besides the one which received Christ, was arranged over the principal tribune, in which large wheels like windlasses moved ten circles representing the ten heavens, from the centre to the circumference, full of lights representing the stars, arranged in copper lanterns and so fixed that when the wheel turned they always remained in position, as some lanterns do which are in common use to-day. From this

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## The Italian nest

- Sabbattini
- Serlio
- Torelli
- Furtenbach
- Di Somi
- ...
- Theatre goes inside



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## Sabbattini – stage lights

- Placed out of the way of changeovers, actors, etc.
- Behind the first border, lighting the heavens
- Poles in the wings
  - (independent from floor to avoid shaking from dance)
- Footlights
  - (he doesn't like them)
  - You need large wicks to have enough light
  - Smoke and bad visibility
  - Smell



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## Sabbattini - Houselights

### White wax candles (flambeau)

- Dripping on audience
- Lose solidity
  - (You have to make them short and thick)



### Oil lamps

- Safer, less spill on audience
- Smell when going out
- Several lamps to a chandelier



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## Sabbattini – lighting the lights

- The stage is no problem, there are enough stage hands.
- Houselights
  - With flash-rope
    - Petrol or "au de vie"
    - Parts can fall, can stop halfway,
  - With poles
    - Little candle + water
    - Takes longer
  - Lowering the chandeliers (oil lamps)
- Keep water in the neighbourhood everywhere

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## LIGHTING OF CANDLES - (1761)

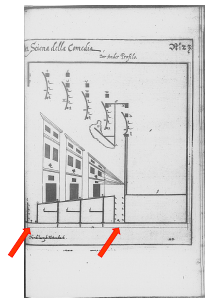
- In 1761, at the coronation of George III, groups of 3000 candles were connected together with threads of gun cotton, and lit in half a minute. Those clustered below were showered with hot wax and burning thread.

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## Furtenbach

- Borderlights
- Second row of footlights?



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## From heavens to borders

- Heavens
- Sabbattini
- Furtenbach
- Baroque stage

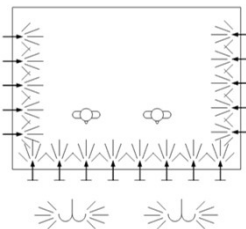


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## Candle or oil light setup

- Chandeliers
- Foot lights
- Side lights
- Border / heavens lights



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## di Sommi

- Quattro dialoghi in materia di rappresentazioni sceniche
- Thinking about
  - the meaning of light
  - perception

For the part which he has in the comedy, the architect also must represent happiness and joy. And because usage has always been, and still is, that as a sign of joy fires be lighted, and lights placed along the streets, on house roofs and on towers -from this arose the present custom of thus imitating those joyful occasions, for no other need than to give an impression of joy at the first glimpse of the stage.

But when the first sad event, the unexpected death of a queen, occurred, and the chorus thereupon proclaimed its surprise that the sun could bear to witness such a sad event: in that moment I had (as I had already prepared) the greater part of the lights on the stage which did not serve for the purpose of perspective, shaded or put out. This caused very deep horror in the spectators' hearts.

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## Occupation: Snuffer

- Length of opera is adapted to snuff, trim and change candles



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## Experiments

- Colour
- Lenses
- Mirrors
- Dimmers
- Black lantern
- ...
- Darkening of the house??



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- Boze
- Bottle or oil holder?



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## Balls / denteliere with colour

- In set, like precious stones
- Ex paradise tree



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## Dimming - footlights



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## Floating wick

- Church
- Floats



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## Meanwhile in England

- Actor lights the other actor with a candle

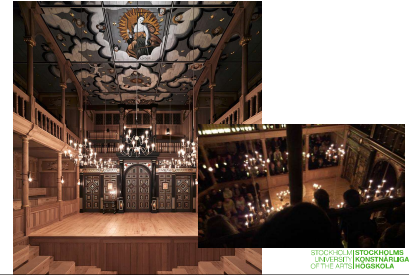


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## Sam Wanamaker Playhouse

- Indoors
- Close to Globe
- Candle light



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## Light - symbolic

" the whole scene is heavy with the sense of night and the darkness of conspiracy, ye the effect is produced by nothing but the spoken word and the gestures of the players"

(Walter Raleigh, critic, on a scene of Julius Cesar)

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## Oil lamp

- Vegetable oil
- Animal based oil
- Limited wick height



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## Oil lamps

- Footlight with
  - 1 reservoir
  - 5 wicks
  - Reflector



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## Oil lamps improve (Cardan)

- Longer burning time
- Better, continuous flame
- But positions stay largely the same as before



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## Argant burner

- Oil Lamp
- 1780s: Swiss chemist Aime Argand develops the modern oil lamp which soon replaces the candle as the primary light source.
- Mounting Positions: The same as with candles—Chandeliers, Foot lights, and Ladders in the wings.
- (A Brief History of Stage Lighting)

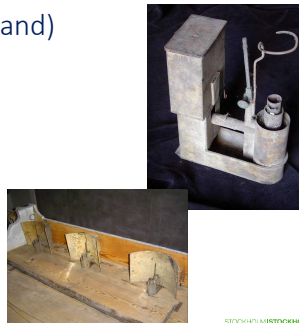


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## Oil lamps improve (Argand)

- Better flame
- Flat (round) wick (reused in gas and petrol)
- Higher light output
- But positions stay largely the same as before
- (playing away from the footlights because of higher output?)



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## Open flame gas, lime and petrol

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## Turn of the century 1880 - 1920

- (Oil lamps)
- Gas light
- Lime light
- Petrol lamps
- (Arc lights)
- (Electrical light)



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## Gas light

- Open flame
- Bad combustion

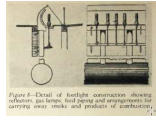


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## Equipment



- Fixed pipe system
- Valves (per group)
- Burners
- First plug (dip)

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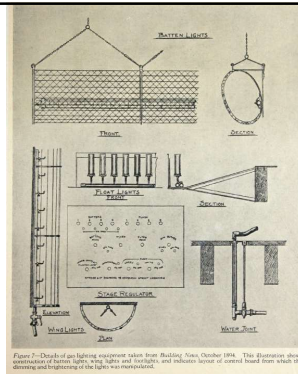


Figure 7 - Detail of an lighting apparatus taken from Building from October 1884. This illustration shows connections of burner lights, wing lights and footlights, and indicates layout of control board from which the lighting and engineering in the light was regulated.

## Gas light

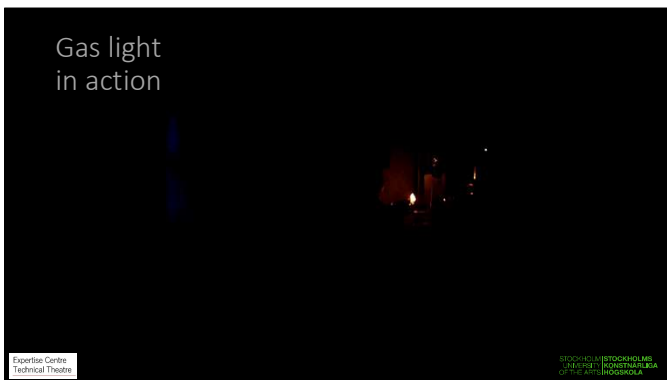
- Single
- Fish tail
- Argand



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## Gas light in action



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## Burners

- Sun Burner
- Can be dimmed  
(for the first time)

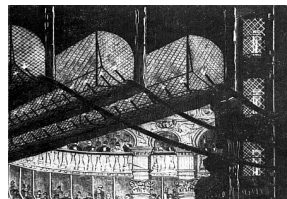


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## Gas light - positions

- Mounting Positions:
  - House lights
  - Footlights
  - Wing Lights (vertical "strip lights" between each pair of scenic wings).
  - Border Lights (horizontal "strip lights" hung between each pair of scenic borders)
  - First positions taken over from candle light



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## Colour

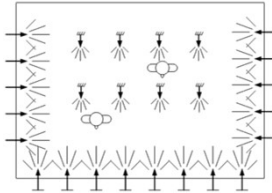
- Medium
- Woven film of cotton or silk
- The whole stage (bar) at the same time is coloured

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## Gas light

- Higher output
- Control over intensity
- Control over colour
- Positions stay largely the same
- But added top light
- Darkening of the house (control over house lights)



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## Typical setup

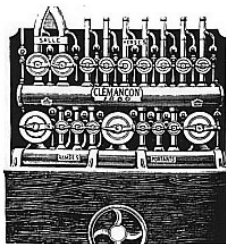
- Example (late 1850s) Royal Theatre in Stockholm
- 562 burners:
  - 66 in the Foot Lights
  - 8 sets of Wing Lights with 9 gas jets each
  - 8 Border Lights with 44 burners per position.

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## Gas light - control

- Clemencon (FR)
  - Master
  - Individual controls
  - Shunts (minimum flow)

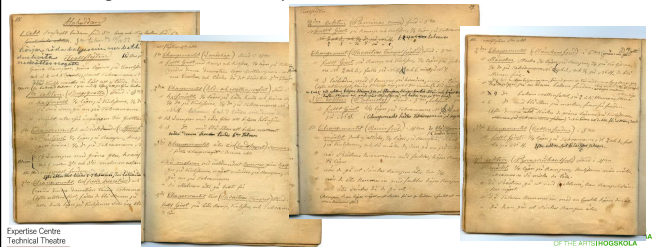


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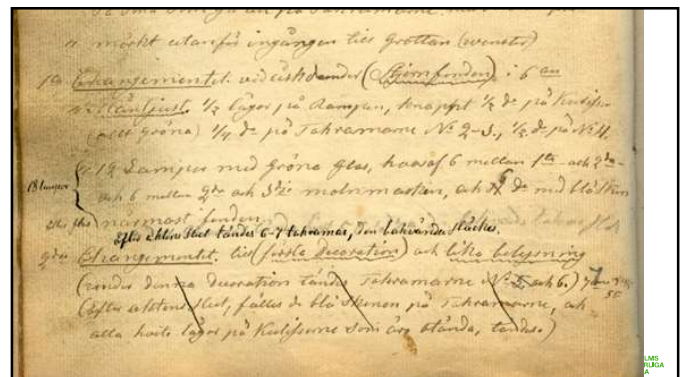
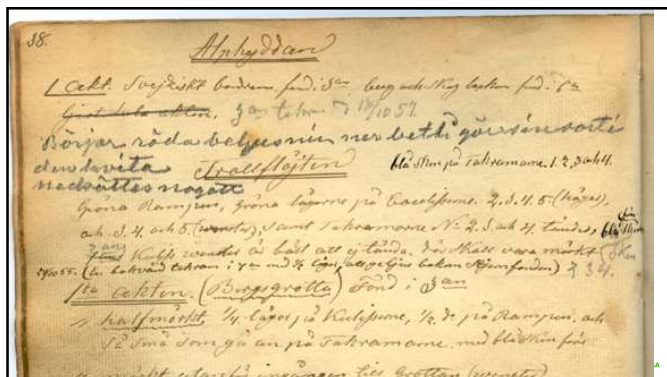
## Gas light - cues

- Gas light cues, Stockholm Opera



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## Henri Irving

- Lyceum theatre London 1878
- First lighting rehearsals (at night)

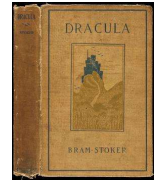
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## Bram stoker about the changeover

(Financial manager Henri Irving)

- "in fact, darkness was found to be, when under control, as important a fact in effects as light"
- When the workmen had been trained ... darkness itself became the curtain
- The workmen were provided with silent shoes and dark clothing ... (Stoker)



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## Fire risk

- Gaslight = open flame



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## Lime light

- Hydrogen - Oxygen



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## Lime Light

- 1837: English actor-manager Charles Macready uses a limelight at London's Covent Garden.
- 1856, Princesses Theatre, London, a **lens** was placed in front of a limelight to give a spotlight.
- 1870s-1880s: The limelight is in general use in "modern" theatres. By the end of the 1880s **as many as eleven units** were used in productions at **Stockholm's Royal Theatre**.
- 1890s: The limelight is beginning to be replaced by the newer and brighter carbon arc lamp.
- Still in regular use in London theatres until about 1910.

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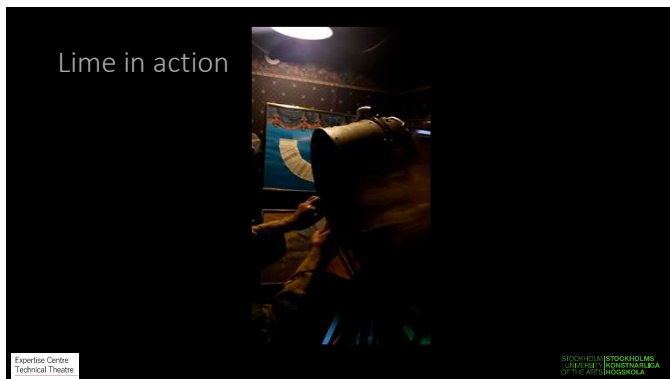
## Limelight

- Double bag under pressure



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### Limelight

- Limelight
- Control over focus > first focussed light
- Manual, still used from stage
- Higher intensity and colour temperature
- Use of colour
- First "lighting effect"?

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## The war of the currents

2 killed (1 man, 1 elephant)

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### End 1880's

**Alternating current (AC)**

- Westinghouse Electric Company.

**Direct current (DC)**

- Edison Electric Light Company

**AC ⚡ DC**

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## THE CURRENT WAR

THE TALE OF AN EARLY TECH RIVALRY

### DC

**DIRECT CURRENT**

The flow of electricity is in one direction only. The current begins at the same electrical potential, and it acts as a constant force pushing the electrons through.

**THOMAS EDISON**

**LATE BLOOMER**

Edison's DC system was the first to be used for power. It was simple and reliable, but it was inefficient and expensive.

**FALLING OUT**

Edison's DC system was the first to be used for power. It was simple and reliable, but it was inefficient and expensive.

### AC

**ALTERNATING CURRENT**

Electric power switches between direction and is measured by cycles per second. It is more efficient and can be transmitted over long distances.

**NICOLA TESLA**

**WAR OF CURRENTS OFFICIALLY SETTLED**

In 1892, the U.S. Supreme Court ruled in favor of AC, settling the war of currents.

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### AC vs DC

- (Direct Current Incandescent Lighting, The Mather Electric Company)

**INSTALLATION**  
California Hotel and Theatre, San Francisco, Cal.

**MATHER electric company, DC dynamo**

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- Own production plants
- Batteries



Figure 24—In the early days of electric lighting in theatres, each theatre provided its own electricity. The earliest installations employed batteries. Here is shown the power plant of the Paris Opera, as given in the

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- Electrical connections

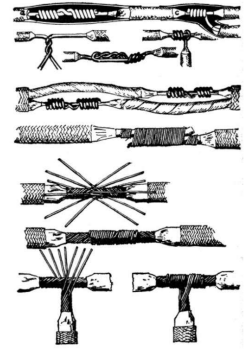


FIGURE 164.

GA

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## Electric spark effect



Henry Irving was a pioneer in the art of stage lighting. He made extensive use of the spotlight, which had been first introduced in the Paris Opera, and he accomplished much in the extension of the application of electric lighting to the production of scenic effects. In his production of *Faust*, he arranged, with Mr. Gouraud, a system of circuits for the production of sparks and fire in the fight between Faust and Valentine. Connections to the outside circuits were made through plates on the actor's shoes.

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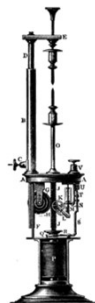
Electrical light - arc

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## Arc light

- First electric light
- Technically idem lime
- But even more white
- First use from house?

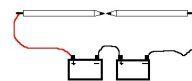


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## Arc lamp

- Carbon rods
- Point source



*IN 1805 Sir Humphrey Davy invented the electric arc. In the forties it came into use on the stage and later superseded the lime light. The earliest lamps provided for adjustment of the carbons by hand.*

- (Direct Current Incandescent Lighting, The Mather Electric Company)

ARC LAMP FOR INCANDESCENT CIRCUITS.  
From 600 to 3,000 Candle Power.

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## Arc and mirror

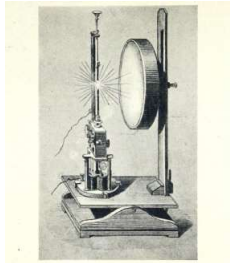


Figure 11—The lamp here shown is a special spot light intended for lighting a definite point in the scene, but not for following the movements of the players. It consists of an arc lamp located at the focus of a parabolic mirror.

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## Magic mirror

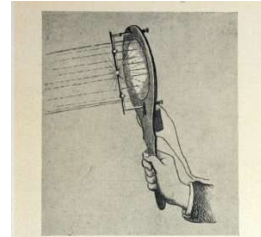


Figure 12—Realistic lightning was produced in the Paris Opera in 1860 by means of a so-called magic mirror, which consisted of a parabolic mirror with an electric arc at the focus. An electro-magnet operated by a thumb switch permitted the carbon electrodes of the arc to be snapped together at will, thus producing flashes like lightning.

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## Spotlight



Figure 13—Scene in the Opera "Moses" in which a spot light was used to bring out Moses in his white robes. The scene was photographed, showing, in the foreground, Moses and his attendants opening little doors of metalwork, electric light being very little known and spotlight mirror having been previously used.

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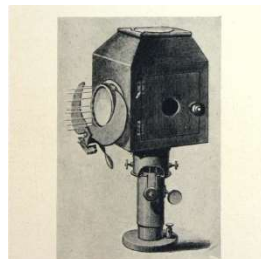


Figure 14—The first electric spot light was apparently the one here shown. It was employed in the Paris Opera in connection with the production of "Moses" in 1860.

## Sunrise

- 1849?: An arc lamp is used to create a sunrise effect at the Paris Opera's production of Meyerbeer's *Le Prophète*.
- 

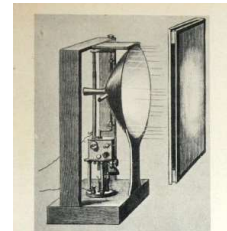


Figure 15—Apparatus used to represent an artificial sun in the production of "The Prophet" in the Paris Opera in 1840. An electric arc was located at the focus of a parabolic mirror and the beam of parallel rays projected upon a silk screen. This was the earliest aesthetic application of electric light on the stage. This illustration and the six following were taken from *La Lumière Electrique*, by Emile Algaye and J. Boudard.

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## Rainbow



Figure 16—The scene in the Opera "Moses" in which the rainbow was produced as explained in Figure 15.

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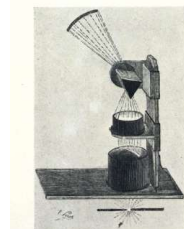


Figure 17—The second important development in electric scenic effects was the representation of a rainbow by means of the apparatus here shown. This device was used in the production of "Moses" in the Paris Opera in 1860. Light from an arc was passed through an arc-shaped slit, after which the rays were concentrated by means of a lens and passed through a prism which produced the spectrum.

## Carbon arc spotlight

- Softlight
- Possibility for colours



Figure 18—Spot light using an electric arc and providing a soft screen representing a scene in 1860. From *The Electrical World*, May 1866.

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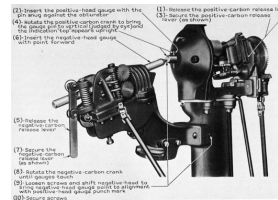
- 1890s: The carbon arc lamp begins to replace the calcium light in the "modern" theatre. The illustration on the left is a Kliegl No. 5, a 5" Lens Box with a 25 amp (2750 watt) carbon arc burner (1913).



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## Carbon arc follow spot



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## Modern versions

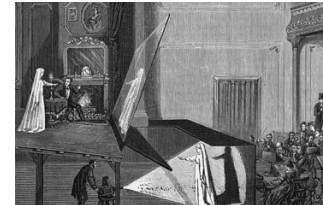
- HID High Intensity Discharge Lamp
- Xenon short arc
- Mercury Vapor
- Sodium
- Metal Halide

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## Peppers ghost

- More light
- New possibilities



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## Electrical light – incandescent

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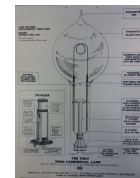
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## First light bulbs - (1879)

- Edison
- Swan



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## Savoy Theatre - 1881

- world's first electric lighting system
- 824- 16 candle power Swan lamps (stage)
- 334 lights (auditorium).

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## International Electrotechnical exhibition 1882

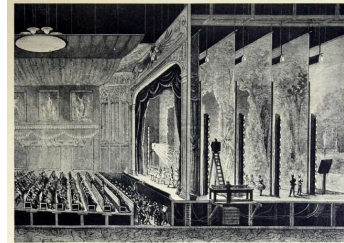


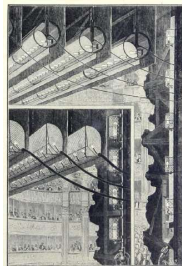
Figure 18—Cross-section of electrically lighted theatre constructed in Munich for the International Electrotechnical Exposition in 1882. This was a remarkable installation which appeared theatrical managers all over the world. It will be noted that no lamps are used in the auditorium—the lamps themselves being invisible and their light concentrated through a daylight-wire system of lighting which is still popular. The electrician who operates the drummer may be seen at the side, his drummer being located on the floor below. Footlights, borders, wing lights and house lights are all shown in action. This illustration and the six following were taken from *LA Lumière Electrique*, August, 1882.

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## Paris Opera - 1887

- Mounting Positions: The same as with gas-lighting: Footlights, Border lights and Wing lights.



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## Stockholm Opera House - 1898

- When the new Stockholm Opera House opened in 1898, the stage was illuminated with a three colour (white, red, and green) lighting system using 544- 25 candle power lamps per colour-- a total of 1632 lights.
- 40 lamps per colour in the Foot Lights,
- 9 Border Lights with 40 lamps per colour.
- 9 sets of Wing Lights with 8 lamps per colour
- (A Brief History of Stage Lighting)

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- 1910 Lighting setup  
Royal Theatre  
Stockholm



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## Bunch light

- Movable light

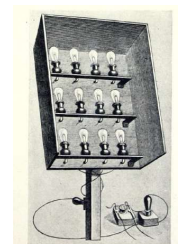


Figure 30—Bunch light, for concentrated illumination like curtain points in the scene. Its use is illustrated in Figure 36.

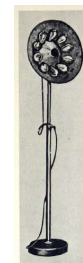
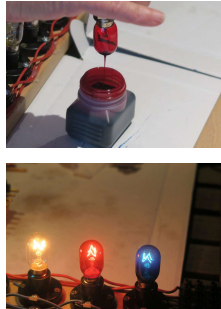


Figure 36—Bunch light made up of incandescent lamps in special head reflector as used in 1898.

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## Dipped bulbs

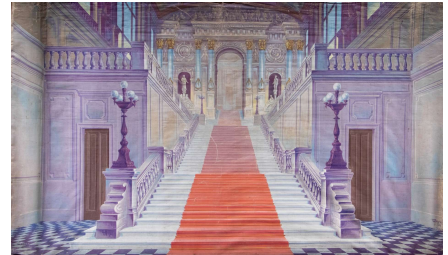


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## Painted sets

- Kortrijk 1912
- Blue pigment



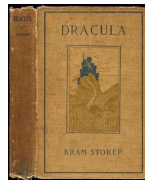
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## Bram stoker about the changeover

(Financial manager Henri Irving)

- "Electric light differs from other lights in that when it is lowered in degree it changes colour"
- "the light was an unpleasing one for the stage, unless the vacuums were tinted."



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## Richard D'Oyly Carte on the changeover

- Richard D'Oyly Carte, producer London's Savoy Theatre , explained...
  - The greatest drawbacks to the enjoyment of the theatrical performances are, undoubtedly, the **foul air and heat** which pervade all theatres. As everyone knows, each gas-burner consumes as much oxygen as many people, and causes great heat beside. The incandescent lamps consume **no oxygen**, and cause **no perceptible heat**.
  - Heating had to be installed in the theatres!

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## Control of incandescent lighting

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## SALTWATER DIMMER - (a 1900)

- a tank (or barrel) of salt water brine with a permanent electrode submerged.
- As a second electrode was slowly raised (or lowered) into the brine, the conductivity between the two electrodes would increase (or decrease) respectively.
- Lamps connected in series to the dimmer, would be dimmed accordingly, the heat from the boiling brine would often help to heat the backstage areas.
- Messy and difficult to operate and maintain, (a history of light and lighting)



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## Cross fade between colours

- Interlocking
- Master
- Slow motion by worm

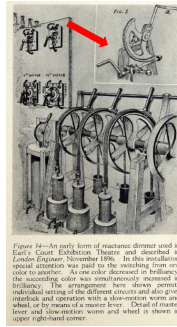


Figure 16—An early form of resistance dimmer used in Early's Court Exhibition Theatre and described in *London Theatre* (November 1896). At this installation special attention was paid to the switching from one color to another. As one color decreased in brilliancy, the succeeding color was simultaneously increased in brilliancy. The arrangement here shown permits individual action in the different circuits and also gives interlock and operation with a slow-motion worm and wheel or by means of a master lever. Detail of master lever and slow-motion worm and wheel is shown in upper right-hand corner.

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## RESISTANCE DIMMER - (a 1910)

- a long length of wire, usually wound in the form of a coil.
- A 'wiper' contact would move along the coil,
- usually controlled by a manual lever (or motor control).
- the coil resistance would decrease or increase accordingly.
- in series with one or more electrical filament lamps

(a history of light and lighting)

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## Control by levers

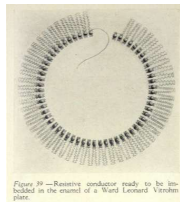


Figure 19—Resistive conductor made to be interlocked in the control of a Ward Leonard Voltage plate.

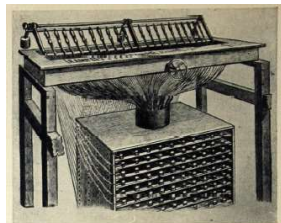
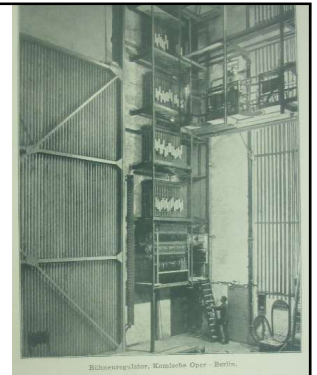


Figure 21—Dimmer rheostat and control board shown in the foreground of Figure 16. It will be noted that this dimmer provides individual control for each rheostat by means of a lever handle. These handles can also be attached to a longitudinal bar which is operated by a slow motion wheel from the front. In this way independent control or interlocked control was obtained.

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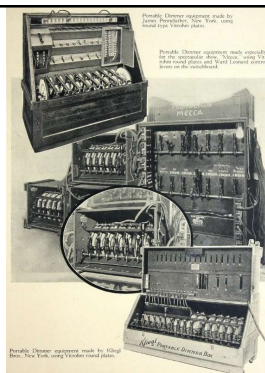
## Fixed installation



Edison's Patent, "Kinetoscope Open-Door" Model.

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## Portable dimmers



Portable dimmer system made by Ward Leonard, New York, using Ward Leonard plates.

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## Colour control

- Ramps and footlights



Figure 17—Detail of footlights shown in Figure 16. These lamps were operated with a lever for regulation of intensity. Change in color was also provided by mechanical means, each lamp being fitted with a revolving screen, one section of which gave the natural light, the two other sections being blue and red respectively. The change from one color to the next was made by pulling a cord connected as to turn the screen.

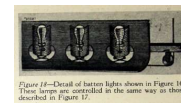


Figure 18—Detail of lamp shown in Figure 16. The color of the light from these lamps was changed by levers and turning color screen. Like all the other lamps in the theatre, this also were connected to a dimmer.



Figure 19—Detail of lamp shown in Figure 16. The color of the light from these lamps was changed by levers and turning color screen. Like all the other lamps in the theatre, this also were connected to a dimmer.

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## Effect machines

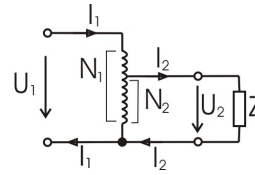
- Opera Garnier 1904



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## Autotransformer dimmer



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## Autotransformer control



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- 1903: Kliegl Brothers installs an electrical lighting system with 96 resistance dimmers (and 20 additional dimmers for house lights) at the Metropolitan Opera House in New York City.

**Dimmers use Levers at the Metropolitan.**  
The electrician at the big opera house in New York overlooks the stage through a special opening in the footlight trough. In his control is the master wheel, which operates all the interlocking dimmers on the main switchboard.

At the Metropolitan Opera House, New York, the electrician looks at the stage from below through an opening in the footlight trough, while in his hands is a sort of yachtsman's wheel which is a master control for all the dimmers on the enormous switchboard. This board controls 11,488 sixteen candle power lamps, incandescent motors, 44 arc lamp sockets, and 228 incandescent stage pockets.

At the Century Theater, New York, the electrician has a sort of pump handle in the footlight trough immediately adjoining the hood of the prompter, and instead of having just a master dimmer wheel, he actually controls all switches and dimmers individually in the marvelous stage equipment. By simply moving little slide indicators, he may cause one gang of lights, or them all, to wax bright or diminish at any of the available speeds. Thus, the coming of night from late afternoon may be set for automatic accomplishment in perhaps fifteen minutes, so slowly that it is almost imperceptible.



Courtesy of Metropolitan Opera Company

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## A nest in Dresden

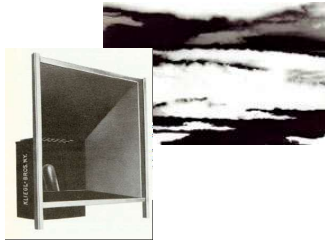
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## Linnebach

- Horizon projection
- Shadows
- Colour
- (TD Dresden)

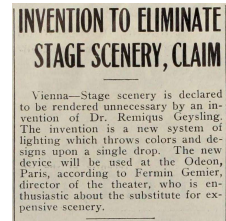


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## (Remigius Geyling)

- Projection (9 x 9 m)
- Slides 50 x 140 cm
- Mapping of round horizon
  - Projection in cardboard
  - Picture from deformation
  - Projection of picture
- First back, later front from bridge



Film Daily - November, 1927

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## (Harold Ridge)

- A theatre of light, colour and space
- Removed the proscenium arch
- Installed permanent cyclorama
  - Schwalbe system with 7 colours

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## But the reality was often still the same



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## The first spotlights

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## Before the lighting companies

- Siemens – Shuckert
- AEG



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## PAR LAMP (SEALED BEAM LAMP) - (a 1940)

- The PARABOLIC ALUMINIZED REFLECTOR (or PAR lamp) is a sealed beam type of lamp, similar to an automotive headlamp. The filament, reflector and lens are all optically aligned at the factory, and sealed into a single lamp - resulting in a highly efficient source. As the PAR lamp is a complete lighting unit, fixtures for them are very simple indeed. Today, PAR lamps are available in various diameters (4.5" to 8"), and various wattages (75-1000 w.) The highly efficient PAR64 lamp (8" lens) is extensively used by the theatre and entertainment industry and the fixtures are often referred to as 'PAR cans'.
- The PAR lamp is also sometimes known in Europe as the 'pressed glass reflector lamp'.
- There are some historical pictures showing one of the inventors, Dick Thayer, with prototype lamps made from "Pyrex" custard cups purchased from the local hardware store. That was in 1937. The first sealed beam automotive headlamps appeared on the 1940 model cars.
- The author's research has also uncovered an early patent drawing of a sealed beam lamp dated Feb. 21, 1939. The drawing is numbered 2,148,314 and is signed Daniel K. Wright.
- Inventor. The lamp looks very similar to a modern PAR lamp. The lamp was thought to have been placed into production, shortly thereafter.
- (a history of light and lighting)

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## Methods of control

In the tube and electronic era

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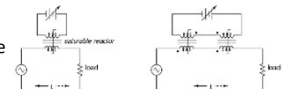
## Thyratron dimmer 1920? - 1940? -



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## Saturable reactor dimmer (1950's)

- DC circuit saturates the coil
- The second circuit has high impedance
- So hardly any current to lamp



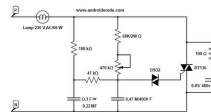
- STRAND LC dimrack
- 24 ch
- 750 kg
- Control has two presets!



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## Thyristor (SCR) dimmer

- 1958,
- Silicon controlled rectifier
- No moving parts in dimmer
- Control by low voltage



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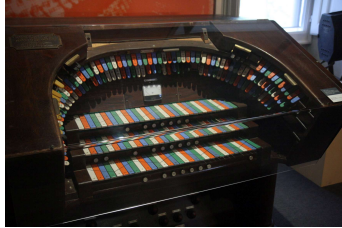
## Artist or technician?

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## Strand lighting console

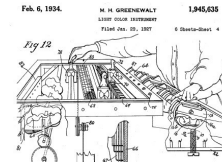
- Francis Reid



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## Color organ



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## Strand preset board

- 1955



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### Console

- Creative interpretation
- Design as a process
- Artist

### Preset

- Precise reproduction
- Design as a product
- Electrician



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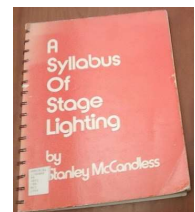
## The next step in thinking about lighting

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## McCANDLESS, STANLEY - (c 1900 - 1967)

- 'father' of modern stage lighting design.
- Books
  - "A Glossary of stage lighting"
  - "A method of lighting the Stage" (1st published, 1928),
  - "A Syllabus of Stage Lighting".



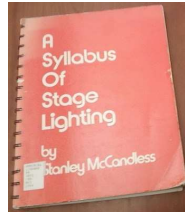
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## McCANDLESS, STANLEY - (c 1900 - 1967)

- 4 principles
  - Visibility (selective)
  - Naturalism
  - Composition
  - Atmosphere
- 4 steps
  - Lighting the acting area
  - Blending and toning the acting area
  - Lighting the background
  - Special effects

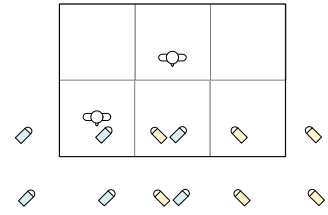


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## The method

- Grid of squares
- two fixtures - placed at 90 degrees to each other, and in a 45 degree frontal position to the actor.
- a 'warm' color from one side and a 'cool' color from the other.

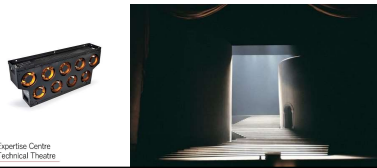


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## Josef Svoboda

- Light becomes an object
- Light makes space



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## Expo 58

- Lanterna magica

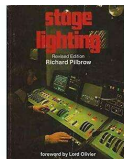


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## Richard Pilbrow

- Functions
  - Visibility
  - Revelation of form
  - Placing the action
  - Mood
  - Composition
  - Reinforcing the story

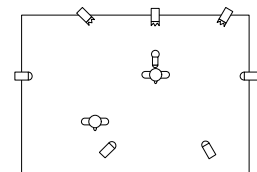


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## Richard Pilbrow

- Qualities of light
  - Intensity
  - Color
  - Distribution
  - movement



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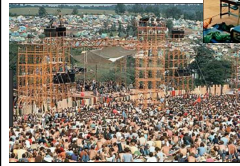
## The sixties

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## Woodstock

- 1969



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## The Who

- 1971



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## The Concert For Bangladesh

- 1 augustus 1971 werden in de Madison Square Garden in New York City



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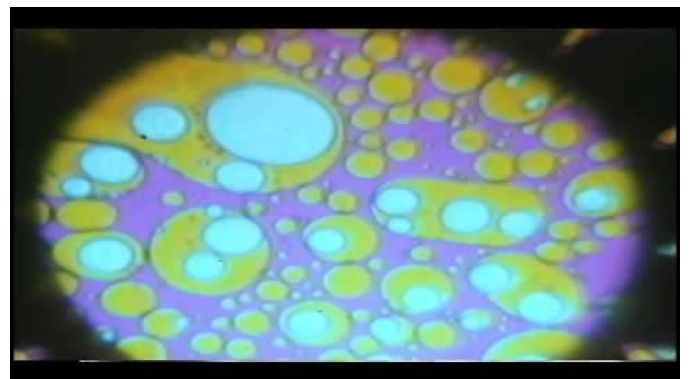
## Psychedelisch licht

### The Joshua Light Show - Liquid Loops (1969)



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## Conclusion

What happens when we change technology?

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Lighting is  
a language

Our voice is our equipment

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## Lighting is a language

- Lighting has become a means of expression
- It is about light
- Not about spotlights, dimmers or consoles

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We are early introducers

But late adapters

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## We are early introducers

- We are eager to test
- But critical to adapt

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Every technology  
needs a play garden

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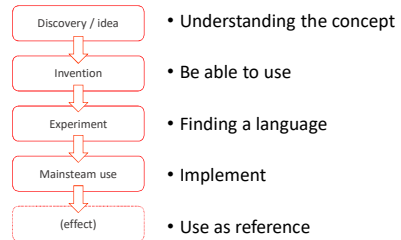
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- New technology
  - Needs experiment
  - Testing to the limits
- Example: moving lights

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## Phases of development



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We want more

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## We want more

- We don't want to loose possibilities
- We want extra tools

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Standards matter

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## Standards matter

- DMX
- USB
- Colour ?

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## It's all about quality

You stu...

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## It's all about quality

- Our quality standard about light is very high
  - Colour temperature
  - Colour
  - Dimming
  - Controllability
- We don't change if it doesn't meet our standards / needs
- Ex EcoDesign

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## Change is a slow process

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## Change is a slow process

- Opera - Professional theatre – amateur theatre
- Overlaps stay for a long time

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## We steel from other fields

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## And now ...

LED

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And now ...

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Video - image

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## Contact

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Thank you

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