
Stage Lighting Design

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1.01 - THE JOY OF LIGHTING DESIGN

1.) INTRODUCTION

One of the most rewarding professions today can be that of the lighting designer working in the arts. It can also be one of the most frustrating professions on the planet.

The lighting designer will never stop learning. Every production or project will present new challenges, new obstacles, new human dynamics and new problems to solve. There can and should be many failures along the way. This is part of the artistic process. The lighting designer shouldn't hesitate to make as many mistakes as possible - just don't make the same mistake twice.



There is great satisfaction in designing the lighting for a production that fulfills the needs of the playwright and also meets the objectives of the director and other designers. There is however far greater satisfaction in knowing that you have succeeded in your goals and objectives and that you have emotionally 'moved' an entire audience through the controlled and planned use of light.

Stage lighting is no longer a matter of simple illumination as it was less than 100 years ago. Today, the lighting designer is expected to be a master of art, science, history, psychology, communications, politics and sometimes even mind reading.

The stage designer quickly learns that things are not always what they appear to be. A director who asks for 'more light' on an actor, probably doesn't mean that at all. Instead he really just wants 'to see the actor better'. The designer might choose to reduce the lighting contrast around the actor, or simply ask the actor to tip his head up a bit. Both solutions solve the problem without 'adding more light'. So

the lighting designer also has to be a good listener, a careful interpreter and a skilled crafts person.

Ultimately the lighting designer must be an artist! He must understand style, composition, balance, esthetics and human emotions. He must also understand the science of light, optics, vision, the psychology of perception and lighting technology. Using these tools the lighting designer must learn to think, feel and create with his heart.

When it' s good lighting design you alone will know.
When it' s bad lighting design everyone will tell you!

1.02 - EVOLUTION OF LIGHTING DESIGN

1.) EARLY STAGE LIGHTING

Stage lighting design is probably as old as formalized theatre. The early Greeks built their theatres as open air spaces and orientated them in relation to the sun, so as to use natural light for stage lighting. They would present their plays at different times of day, to take advantage of the different types of natural lighting. This type of planning was in essence, early lighting design. The Theatre of Dionysus (Athens, about 330 BC) and the theatre at Epidaurus (finished about 340 BC) are examples of these early public theatre facilities.



Lighting for the theatre developed over the centuries, using both natural sources then artificial sources. The sun, candles, torches oil, gas, electric arc and lime lighting, all have had a place in early stage lighting. During the Renaissance period in Italy, many of the principals of modern lighting design, were firmly established.

2.) MODERN STAGE LIGHTING

Modern stage lighting design began to flourish with the development of the incandescent lamp in the late 1800' s. This invention allowed for the development of small, safe, portable lighting fixtures that could be easily placed anywhere around the stage, and then controlled by a remote electrical dimmer system. Previously during the gas lighting era, complex stage lighting did indeed exist however, it was limited by this awkward smelly technology, with its many inherent problems. During the gas lighting era, a great numbers of theatres were destroyed by fire.

During the early 1900' s as stage lighting continued to develop, certain parallel lighting industries began to evolve, borrowing many basic principals from the field of stage lighting design. The modern fields of display, photographic, film and television lighting design all have evolved and developed from the fundamental roots of early stage lighting design. Today stage lighting design is recognized as a field merging science with art.

3.) FUTURE STAGE LIGHTING

The future of stage lighting is tremendously exciting. After the electric filament lamp, stage lighting was revolutionized in the 1930' s by the development of the ellipsoidal reflector (Leko) fixture. The development of the SCR dimmer in the 1960' s provided another radical change. Now the automated lighting fixture (first introduced in the 1970' s) is revolutionizing the lighting industry again. New

technology has recently produced colors, never before seen in lighting design. New light sources are developing including; Xenon, Metal Halide, Fluorescent, Induction and Sulfur lamps. The use of fiber optics as a carrier of both ' light' and ' data' and the further development of liquid crystal projection technology are all part of the exciting future of entertainment lighting design.

Design software for the computer will continue to evolve and eventually allow the designer complete artistic ' interactive' control over his ' visual' technology. Lighting software now provides assistance with design, drawings and paperwork. Design software in the future will use both ' touch screen' and ' speech recognition' technology. Can the mental control of lighting systems be far away?

"The play seems out for an infinite run.
Don' t mind a little thing like the actors fighting
The only thing I worry about is the sun.
We' ll be all right if nothing goes wrong with the lighting".
(It Bids Pretty Fair - from Steeple Bush - 1947)

1.03 - THE LIGHTING DESIGNER

1.) THE JOB, THE PROFESSION, THE LIFE

The stage lighting designer is traditionally responsible for the design and supervision of all aspects of lighting for a typical stage production. In the mid 1900' s lighting designers in Britain and America developed and refined the methods of modern lighting design for theatre, dance, and opera. It was only after the development of the electric filament lamp that these early pioneers were able to establish new foundations and standards in design. Whether working in a small community theatre or in a large opera hall, the lighting designer is (or should be) an important and respected member any modern production. This designer, collaborates with the director and with other designers (set and costume) to ensure that the production is properly and suitably illuminated in all respects, from inception to completion.



Producers and theatre managers have realized years ago, that they can spend ' millions' of dollars, on scenery, costumes, and performers and have it all wasted because of ' bad' lighting. Many commercial productions now make high demands of their lighting requirements and in this respect, the lighting designer has become an important and integral member of the theatre and entertainment industry. The lighting designer is often the last designer into the theatre, and everyone fully expects him to perform magic, miracles and to make the sets, costumes and actors... ' look fabulous' .

There were many individuals in the 1700' s and 1800' s whom contributed to the evolving art and science of stage lighting design. It wasn' t until the early 1950' s however until the role of the lighting designer as an artist was finally firmly established. Up until this time lighting was largely something to be taken care of by the technicians. Today, many thousands of lighting designers work around the world in many different entertainment industries.

Lighting designers today often tend to specialize in specific types of entertainment productions, each requiring slightly different working methods and techniques. Specialization may include lighting for; Theatre, Dance, Opera, Television, Theme Parks, Ice Shows, Outdoor Pageants, Trade Shows and Industrial or Corporate productions.

Some stage lighting designers may also specialize within a speciality. For example, it is not uncommon today to find a 'dance' lighting designer that may work only in the field of modern dance or a variety lighting designer that just works in the field of 'Rock' music.

Regardless of the lighting discipline, all lighting designers must have a full understanding of their tools and both the physical and psychological aspects of light. The basic principals of light, vision and design, apply regardless of the lighting design discipline.

The only real differences from one lighting industry to another are the methodology and equipment types involved. For example, display designers may use a 3"-150 watt fresnel, theatre designers may be at home with an 8"-2000 watt fresnel, and the television or film designer may be used to working with a 30"-10,000 watt fresnel. Further, the lighting designer must have knowledge and experience with the lighting methods, fixtures and hardware that are available to serve their particular lighting industry.

Everyone in theatre knows 2 jobs...their own...and lighting!

1.04 - OBJECTIVES OF STAGE LIGHTING

1.) OBJECTIVES OF STAGE LIGHTING

"Stage lighting may be defined as the use of light to create a sense of VISIBILITY, NATURALISM, COMPOSITION and MOOD, (or ATMOSPHERE)". So began a chapter in the 1933 text: 'A Syllabus of Stage Lighting' by Stanley McCandless. Most comprehensive lighting texts since, also tend to discuss the artistic objectives, (functions) of lighting, in these terms. McCandless recognized that these are 'overlapping' qualities and one does not exist independently of the others.



2.) VISIBILITY

VISIBILITY is often considered to be the most basic and fundamental function of stage lighting. What we don't see, we seldom clearly understand. Visibility is dependent on far more than just the intensity of light. Other factors such as; contrast, size, color and movement all can influence visibility. Distance, age and the condition of the eye also play important roles in visibility. "Good visibility is essentially selective. Its purpose is to reveal things selectively in terms of degrees of acuity". - (S. McCandless, 1933).

3.) NATURALISM (and MOTIVATION)

NATURALISM provides a sense of TIME and PLACE. Stage settings may be highly realistic or completely abstract, absurd, or stylized. If time of day is important or the place is realistic, then MOTIVATION is often provided by sunlight, moonlight, firelight, lamplight, or other naturalistic stage sources.

Style concepts include: naturalistic, unnaturalistic, realistic, surrealist, pointilistic, futuristic, minimalistic, impressionistic, expressionistic, expansionistic, abstract, modern, religious, romantic, Victorian, primitive, gothic, Elizabethan, Georgian and many, many more.

4.) COMPOSITION

COMPOSITION refers to the overall pictorial aspect of the stage, as influenced by the lighting. Composition also deals with the FORM of an object. A stage scene may be broadly flooded with soft, even lighting, revealing every object equally, or it may be illuminated by highly localized lighting on the actors only - or anything in between. So, composition in lighting must reveal actors, objects and scenery in proportion to their importance, by building a visual picture.

Composition concepts include: balanced, unbalanced, symmetrical, asymmetrical, simple, complex, abstract, geometric, fragmented, symbolic, dynamic, linear, random, crude, horizontal, vertical, diagonal, and many more.

5.) MOOD (and ATMOSPHERE)

MOOD considers the basic psychological reactions of the audience. If other lighting elements have been properly applied, the result is a specific MOOD, created by the lighting design. Lighting can cause an audience to feel a wide range of different emotions. Feelings of ' happy, sad, content, horrified, excited, (and often ' bored'), all depend on a wide number of psychological and physiological factors. This is also true in respect to how the audience interprets naturalistic or atmospheric moods, such as sunny, cloudy, rainy, lightning, etc. The stage lighting designer rapidly learns that: "Things are not what they are, things are what they appear to be." (author).

1.05 - QUALITIES OF LIGHT

1.) QUALITIES OF LIGHT

Any study of lighting design must include a thorough understanding of both the PHYSICAL and the PSYCHOLOGICAL properties of light.

Knowledge of the behavior and properties of light can help explain vision and human perception. The lighting designer is especially interested in how the properties of light affect the eye/brain process and cause feelings and emotions.



An understanding of the physical properties of light can also help explain optics, lenses, color theory, lighting and projection equipment and much more. The laws and applications of reflection, refraction and absorption are encountered and used every day by the stage lighting designer and these concepts must be thoroughly understood both in theory and in practice.

These basic qualities of light are; INTENSITY, FORM, COLOR, DIRECTION and MOVEMENT. These are the lighting designer' s tools.

Almost all visual images can be described, discussed and analyzed in these terms - both physically and psychologically. There is an excellent classroom exercise that usually starts with an analysis of reproduction paintings from the ' Old Masters' . Student learn to discuss the qualities of light, using such terms as intensity, brightness, direction, color, form, and distribution. These terms are used to discuss the painting in detail from one small area to another. In addition the painting as a whole is discussed in respect to overall lighting impact, style, mood, composition, emotional content and other qualities. (This exercise is sometimes known as the ' postcard' exercise as often this is the source of the reproduction paintings. The author has many in his collection.)

The experienced lighting designer also frequently relies on the qualities of light to help communicate his lighting concept to others. Example: The stage was brightly bathed in a deep blue wash. Slowly, the amber sun softly rose above the horizon gently illuminating the stage in a golden glow. Cool, textured and uncertain light slowly starts to grow and creep throughout every corner of the stage. Soon a low dominating warmth from stage right becomes evident, balanced by a diminishing and cooling of other general light. As darkness falls, the entire stage grows shadowy and covered with sharp defined leaf projections. The blue wash unnoticeably reappears as a shaft of sharp silvery moonlight slips across the stage.

1.06 - INTENSITY and BRIGHTNESS

1.) INTENSITY - (and BRIGHTNESS)

INTENSITY typically refers to the 'strength' of a light source. Intensity of a source exists independent of its distance. Intensity is measured in candela (The old term was candlepower).

ILLUMINATION refers to amount of light falling on a surface. The old term for illuminance was 'illumination'. Illuminance is measured by a light meter (corrected for the curve of the human eye) in footcandles or lux (metric). Typical stage lighting illuminance levels may range from 25 to 200 footcandles or more. The eye has an incredible power of accommodation and can comfortably adjust to illuminance levels in nature from 1 to 10,000 footcandles, or more.



BRIGHTNESS refers to the visual sensation caused by a light source when it interacts with an object and then the eye. Brightness depends on the intensity of the source, on the distance to the object and on the reflective properties of the object. The footlambert is the unit of brightness.

Example: In theatre when we change the dimmer setting of a lighting fixture, we are changing the output INTENSITY of the source. This results in a change of ILLUMINANCE (light falling on the stage) that is perceived by the eye as a change in BRIGHTNESS.

VISIBILITY depends on many factors, not just the intensity of a source or the brightness of an object. Color, contrast, distance, movement and the conditions of the eye and visual system all play an important role towards visibility.

The stage lighting designer is more concerned with the brightness of an object than the intensity of its light source. He soon learns that objects of higher brightness generally draw attention on stage. Light attracts! Conversely, darkness conceals - but may also put the audience to sleep. One of the prime jobs of the lighting designer is to actually keep the audience awake. This is not as funny as you may think when you consider what we do to an average audience member. Usually late, after dinner and a few drinks we seat the audience in comfortable chairs - and then turn off all the lights! The lighting designer must use the power of light to keep the audience awake and direct their attention to the stage by providing proper visibility, interest and selective focus.

1.07 - FORM and DISTRIBUTION

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Light
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object
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sense

of FORM. The eye is able to recognize objects in terms of shape, size and position. Our binocular vision assists with this process by providing DEPTH.

"By means of controlling the distribution of light and creating patterns and compositions of light and shade, it is possible to produce sensations on the retina that will be interpreted as forms in space." (A Syllabus of Stage Lighting, S. McCandless 1964).

Form as applied to light is rather complex. It is everything that intensity, color, movement and direction are not. Yet form is caused and influenced by these other qualities of light. Form has to do with the DISTRIBUTION of light or how light strikes a surface and reveals an object. We typically discuss form in terms of clarity and recognition of shapes.

Form and distribution can be discussed on two levels.

First, we can discuss form as applied to the stage setting in respect to how objects appear. A stage might be evenly, softly and flatly illuminated from a low front angle. Alternately, the same stage might be unevenly dappled with tight circular pools from a high overhead angle.

We can also discuss form as applied to the light produced by a stage lighting fixture. (Example: "The fixture produced a sharply defined square shaped beam with a very wide dispersion angle".)

Form becomes much more complex when you consider that an image projector can be used as a stage lighting fixtures. As a result of this technology the light produced from the ' fixture' can take absolutely any shape, form or distribution.

As in nature, stage light sources may produce either soft diffused shadowless light or hard shadow producing light, - or anything in between. The edge of a lighting beam may also range from a soft almost invisible edge to a hard, sharply defined edge. A beam of light may also have a broken, uneven distribution, as in the case of a gobo or template pattern projection.

1.08 - COLOR

1.) COLOR

All light is colored. White light is simply a mixture of all visible wavelengths (colors). The human eye is most sensitive to light in the yellow-green portion of the visual spectrum (about 550 nanometers), than it is to red or blue at the ends of the spectrum.



Color is usually discussed in terms of HUE, VALUE and CHROMA.

HUE is the classification of a color that the eye sees as red, green amber, etc. VALUE indicates lightness or darkness of a color. CHROMA indicates the purity or saturation of the color.

The PRIMARY colors of light are RED, GREEN and BLUE. These three colors can mix together to produce any other color, including white. (The primary colors of pigments are RED, YELLOW and BLUE.)

The SECONDARY colors of light are formed when any 2 primary colors are combined. The 3 secondary colors are MAGENTA (red & blue), YELLOW (red & green) and CYAN (blue and green).

THE COMPLEMENTARY colors are any combination of a primary and a secondary color that, mixed together make white light. Examples of complementary colors are. MAGENTA & GREEN, YELLOW & BLUE, and CYAN & RED).

When white light is passed through a color filter only the wavelengths corresponding to the color are transmitted. All other wavelengths are absorbed. This is referred to as SUBTRACTIVE filtering.

When 2 or more colored beams of light combine to illuminate a surface, they mix together through ADDITIVE mixing.

Stage lighting fixtures produce colored light using high temperature plastic filters. There are more than 100 different colors available from several manufacturers. These filters ' pass' or TRANSMIT their own color and ' block' or ABSORB all others.

Sometimes glass filters are also used. Conventional glass filters generally come in a limited range of colors however they are useful for high temperature applications or where prolonged life of the filter is required. A new generation of ' dichroic' glass filters are also sometimes used for entertainment lighting applications where ' vibrant' colors are needed that will not fade over time. Dichroic filters are made with thin film technology, tuned to specific wavelengths. These filters transmit a specific color and REFLECT all others. (Unlike conventional filters that absorb not reflect unwanted wavelengths.)

1.09 - DIRECTION and MOVEMENT

1.) DIRECTION

The direction of light is one of the most important attributes in stage lighting design. All light has direction. A bare candle radiates light in all directions. A spotlight radiates light in a very specific direction. In nature most light comes from the sky, from above. In theatre lighting this is also generally true as most lighting positions are above the stage or audience.



Low front lighting is often considered to be ' flat' . Very high lighting angles may cause shadows on the actor' s faces. Lighting from more than one direction can add ' plasticity' and dimension to an actor. Lighting from the ' balcony rail' can fill i

shadows on the actor' s face however this position can also cause shadows on upstage backdrops or scenery. Very low lighting angles have always been associated with rather unnatural lighting and are usually used for effect lighting only. Footlights, once common in many theatres are seldom used today. Clearly the lighting designer must chose the direction of light very carefully.

In theatre, like in nature the ' floor' reflects some light from below, usually filling in shadows. The color and reflective qualities of a stage floor are very important and for this reason should always be selected with assistance from the lighting designer.

Interestingly enough, the property of DIRECTION was not really considered by McCandless as one of the ' qualities of light' in his ' Syllabus of Stage Lighting, 1964' He did however discuss (briefl importance of direction in respect to plasticity of objects and the actual ' position' of the light source

2.) MOVEMENT

Movement in light is generally taken to mean any change in INTENSITY, COLOR, FORM or DIRECTION. Dynamic changes in all of these qualities take place in nature on a regular basis. Movement may also include the physical movement of a source, such as; a search light, police beacon, color wheel, special optical effect, moving projections, mirror ball, etc.

Movement may be rapid or very subtle, slow and imperceivable. Such may be the case of a designer that provides a slow shift in sunlight from one side of the stage to the other throughout the duration of a play. The audience may not notice the shift, however they often may ' feel' the result of the change emotionally. A sunrise or sunset might also change so slowly that the movement in light is imperceivable and the audience may only feel the result and not actually see it.

Up until recently movement was probably the least utilized quality of light, by the stage lighting designer. This all changed in the 1980' s when the automated lighting fixture was born. The modern automated fixture can now move physically - directing it' s beam from one part of the stage to another. In addition the automated fixture can ' move' from one color or effect wheel to another, at any speed. The changes and combinations of intensity, form, distribution, color and movement are endless.

1.10 - THE LANGUAGE OF LIGHT

1.) REPRESENTING LIGHT WITHOUT LIGHT

The lighting designer must be able to visualize images from nowhere. He must be able to see the final lighting in his mind, scene by scene, long before the production is born. Lighting design is just the process of ' reverse engineering' this mental ima and putting it into practice.

The lighting designer must learn to discuss and represent visual images with words, renderings and references to art, period, history and style. This is an important part of the design and communication process. As lighting design is usually a collaborative process it is imperative that the designer learn to explain his proposed design to others to insure that his visual image is appropriate and properly realized.



It is very important to learn to use the terms of VISIBILITY, NATURALISM, COMPOSITION,

MOOD, BRIGHTNESS, FORM, COLOR, DISTRIBUTION, MOVEMENT and DIRECTION.

These terms and concepts form the basis of any lighting designer' s verbal vocabulary and they must be fully mastered and understood.

Lighting qualities such as luminescent, opalescent, translucent, transparent, phosphorescent, fluorescent as well as surface qualities such as, spectral, reflective, refractive, matte, and diffuse should also form part of any lighting designer' s understanding and vocabulary.

2.) OTHER COMMUNICATION TOOLS

A collection of reproduction ' paintings' can be an excellent design tool, teaching tool and communication tool. Many of the ' Old Masters' produced work with incredible attention to lighting detail. Some noteworthy examples include: Claude Lorraine, Claude Monet, Edouard Manet, Johannes Vermeer, Jan Steen, Leonardo de Vinci, Edgar Degas, Georges de La Tour, Rembrandt, Renoir and others. Using artwork and a process of ' show and tell' it is possible to easily identify and discuss a great number of different lighting qualities, styles, moods and emotions.

The lighting designer may also produce sketches or renderings, or use CAD (computer aided design) programs to assist in the process of discussing light. Although far from perfect, many new CAD programs do provide photo realistic imaging with very accurate and specific lighting. As a design aid these tools may prove useful, however all rely on the designer first having a complete verbal vocabulary of the objectives of lighting and the qualities of light.

Stage Lighting Design
