PURPOSE 1

Stage lighting has multiple functions, including:

- **Selective visibility:** The ability to see what is occurring on stage. Any lighting design will be ineffective if the viewers cannot see the characters, unless this is the explicit intent.
- **Revelation of form:** Altering the perception of shapes onstage, particularly three-dimensional stage elements.
- **Focus:** Directing the audience's attention to an area of the stage or distracting them from another.
- **Mood:** Setting the tone of a scene. Harsh red light has a different effect than soft lavender light.
- **Location and time of day:** Establishing or altering position in time and space. Blues can suggest night time while orange and red can suggest a sunrise or sunset. Use of mechanical filters ("gobos") to project sky scenes, the Moon, etc.
- **Projection/stage elements:** Lighting may be used to project scenery or to act as scenery onstage.
- **Plot (script):** A lighting event may trigger or advance the action onstage and off.
- **Composition:** Lighting may be used to show only the areas of the stage which the designer wants the audience to see, and to "paint a picture".[4][5]
- **Effect:** In pop and rock concerts or DJ shows or raves, colored lights and lasers may be used as a visual effect.

Lighting design is an art form, and thus no one way is the "correct" way. There is a modern movement that states that the lighting design helps to create the environment in which the action takes place while supporting the style of the piece. "Mood" is arguable while the environment is essential.

1) Selective visiblity: The #1 function of light is to see, to illuminate, to make visible to the nake human eye. The audience should see only what the director wants them to see. Lighting will help to FOCUS the audiences' attention through (the eye) only to certain areas, performers, props and or a set piece which may be the main focus or the emphasis in that scene. The key purpose to "selective visibility" is that the audience is only viewing one thing at a time and not everything which may cause them to miss the importance of that scene. The lighting for a production can act as a camera, as it cuts to ONLY what the director wants the audience to see at any given moment.

2) Mood: (defining a mood: a mood is triggered by a particular stimulation or event). Therefore, lighting is intended to create moods and emotions in a scene that will only reinforce that particular moment, which may include the actor, actress, and special objects as its assisting reinforcements. The mood helps to direct the audiences' emotions so that they may feel what the director's motivation of the performer to portray and or convey, through words, actions, etc.

3) Composition and division: The entire stage is intended to have cohesiveness relative to the scene. The lighting is intended to emphasize the flow of the story. Therefore, the lighting helps to structure and form the scene and set. The composition of the light, forms and directs the eye which manipulates the thoughts of the mind and set the picture of that scene. The composition therefore creates the entire perspective and forms an overall perception by using light.

4) Revelation of form: The lighting is intended to make the performers, scenic elements and the props appear three dimensional against the other set pieces and the overall background. Revelation of forms uses light to allow the performer, set and or objects to be ENHANCED or accentuated. The enhancement can be in its natural form or in an abstract way (depending on the director's vision). To reveal the form of a character is to help accentuate (emphasize or to

intensify) its body (shapes, curves, non-curves) in order to be appealing, grotesque, taller, shorter, wider, the desired look. The purpose of revelation of form is to SHAPE an object with light.

5) Reinforcement: This function of lighting is to help the theme or purpose of the scene by using light that contribute to the overall feeling or mood. By reinforcing the theme the lighting is supporting what the scene is trying to convey to the audience.

1) Color: Color is the key to creating the mood or directing the emotion of a scene. The use of hues and saturation in the stage lighting helps to convey what is going on, about to happen, and or to redirect the emotions of the audience. * (In textbook the color is part of what creates Form - - the variety and contrasts in both intensity and color when it is used throughout a scene, found on page 15).

2) Intensity: This is the amount of light or brightness that is transmitted by the light. The intensity can range from a dim glow to an explosion of light. This is what gives theatrical lighting its dramatic effect and look. For example, think about you are trying to see a romantic mood on stage. In most theatre's for safety reasons using real candles is a no no. So the set a romantic seen you will not have the stage lighting at 100%, all bright, as that does not set the mood for romance. Using the light at 35-40% a lower intensity can more set the mood for a romantic scene. Especially, if you are using colors such as varying hues of pinks to light reds. * (In textbook the color is part of what creates Form - - the variety and contrasts in both intensity and color when it is used throughout a scene, found on page 15).

Equilibrium (Gun Kata Scene)
https://www.youtube.com/watch?v=TLXUn_s8nM4

Imogen Heap - Hide and Seek
https://www.youtube.com/watch?v=UYIAfiVGluk

3) Distribution: The physical location of where the instruments are placed. This also relates to how many instruments are being hung, the type of instrument used and the instruments beam size. The location of the instrument placement is important to how the light will illuminate an object. So placing the light at an appropriate angle and location will effect the way it cast light on to the object, helping to shape the object and create more drama or less drama (depends on what is needed).

4) Movement: All of these other properties can be intensified or diminshed with the introduction of movement. Movement implies that a CHANGE is taking place either sublty or quickly. We now also use moving (automated, intelligent lights) to create a feeling of excitement in a dance club of concert setting. However, movement allows the eye to be redirected or move around affecting the physical senses through the eye and allowing the light to set the mood (be it excitement, drama, comedy, tradegy or horror!).

Qualities in Lighting[edit]

Intensity[edit]

An example of a rig including moving head, generic and LED fixtures at 'The Tuesday Club'

Intensity is measured in lux, lumens and foot-candles. The intensity of a luminaire (lighting instrument or fixture) depends on a number of factors including its lamp power, the design of the instrument (and its efficiency), optical obstructions such as colour gels or mechanical filters, the distance to the area to be lit and the beam or field angle of the fixture, the colour and material to be lit, and the relative contrasts to other regions of illumination.[7]

Colour[edit]

Colour temperature is measured in Kelvin. A light's apparent colour is determined by its lamp colour, the colour of any gels in the optical path, its power level, and the colour of the material it lights.[7]

A tungsten lamp's colour is typically controlled by inserting one or more gels (filters) into its optical path. In the simplest case, a single gel is inserted into the optical path to produce light of the same color. For example, a blue gel is used to create blue light. Custom colours are obtained by means of subtractive CMY colour mixing, by inserting combinations of cyan, magenta and yellow filters into the optical path of the lighting fixture. The inserted filters may have varying densities, with correspondingly varied percentages of transmission, that subtractively mix colours. This creates custom colours in a manner similar to ink jet printers, which mix varied densities of cyan, magenta and yellow inks. Manufacturers will sometimes include an additional green or amber ("CTO" colour correction) filter to extend the range (gamut) of subtractive colour mixing systems,

Lamp power also influences colour in tungsten lamps. As the lamp power is decreased, the tungsten filament in a bulb will tend to produce increasing percentages of orange light, as compared to the nearly white light emitted at full power. This is known as *amber drift* or *amber shift*. Thus a 1000-watt instrument at 50 percent power will emit a higher percentage of orange light than a 500-watt instrument operating at full power.[8]

LED fixtures create colour through additive colour mixing with red, green, blue, and in some cases amber, LEDs at different intensities. This type of color mixing is often used with borderlights and cyclorama lights.[9]

Direction[edit]

Main article: Gobo (lighting)

A gobo of this shape in a fixture with a red gel would produce a pattern like the one shown to the right.

Direction refers to the shape, quality and evenness of a lamp's output. The pattern of light an instrument makes is largely determined by three factors. The first are the specifics of the lamp, reflector and lens assembly. Different mounting positions for the lamp (axial, base up, base down), different sizes and shapes of reflector and the nature of the lens (or lenses) being used can all affect the pattern of light. Secondly, the specifics of how the lamp is focused affect its pattern. In *ellipsoidal reflector spotlights (ERS)* or *profile spotlights*, there are two beams of light emitted from the lamp. When the cones of both intersect at the throw distance (the distance to the stage), the lamp has a sharply defined 'hard' edge. When the two cones do not intersect at that distance, the edge is fuzzy and 'soft'. Depending on which beam (direct or reflected) is outside the other, the pattern may be 'thin and soft' or 'fat and soft.' Lastly, a gobo or break up pattern may be applied to ERSs and similar instruments. This is typically a thin sheet of metal with a shape cut into it. It is inserted into the instrument near its aperture. Gobos, or templates, come in many shapes, but often include leaves, waves, stars and similar patterns.[10]

Focus, position, and hanging[edit]

Many stage lights hang on a batten focused in several directions

Focus is a term usually used to describe where an instrument is pointed. The final focus should place the "hot spot" of the beam at the actor's head level when standing at the centre of the instrument's assigned "focus area" on the stage. Position refers to the location of an instrument in the theater's fly system or on permanent pipes in front-of-house locations. Hanging is the act of placing the instrument in its assigned position.[11]

Moving lights hanging on a truss, ready for rigging and chain motors.

In addition to these, certain modern instruments are automated, referring to motorized movement of either the entire fixture body or the movement of a mirror placed in front of its outermost lens. These fixtures and the more traditional follow spots add direction and motion to the relevant characteristics of light. Automated fixtures fall into either the "moving head" or "moving mirror/scanner" category. Scanners have a body which contains the lamp, circuit boards, transformer, and effects (color, gobo, iris etc.) devices. A mirror is panned and tilted in the desired position by pan and tilt motors, thereby causing the light beam to move. Moving head fixtures have the effects and lamp assembly inside the head with transformers and other electronics in the base or external ballast. There are advantages and disadvantages to both. Scanners are typically faster and less costly than moving head units but have a narrower range of movement. Moving head fixtures have a much larger range of movement as well as a more natural inertial movement but are typically more expensive.[12]

The above characteristics are not always static, and it is frequently the variation in these characteristics that is used in achieving the goals of lighting.

Stanley McCandless was perhaps the first to define controllable qualities of light used in theater. In *A Method for Lighting the Stage*, McCandless discusses *color*, *distribution*, *intensity* and *movement* as the qualities that can be manipulated by a lighting designer to achieve the desired visual, emotional and thematic look on stage. The McCandless Method, outlined in that book, is widely embraced today. The method involves lighting an object on the stage from three angles — 2 lights at 45 degrees to the left and right, and one at 90 degrees (perpendicular to the front of the object).[13][14]

An alternative formulation is by Jody Briggs, who calls them *Variable of Light*: Angle, Color, Intensity, Distance, Texture, Edge-quality, Size, and Shape.[15]

EVOLUTION

Lighting Equipment

General Illumination: *Candle - Oil Lamp - Gas - Electric*

Specific Illumination: *Lime Light - Arc Light - Electric Spotlight*

General Illumination

General illumination provides a diffuse, shadow less, wash of light over the entire stage space.

- **Candle**

- **Italy - 1580-1618:** Candles are introduced in both the academic (*Teatro Olimpico*) and court (*Teatro Farnese*) theatres.
- **England - 1600s:** Used in the *private* (indoor) *theatres* and Ingo Jones' (1573-1652) *Court Masques* .
- **1660s:** Reintroduced during the English Restoration.
- **Mounting Positions:** *Chandeliers* over both the stage and the house, *Front edge* of the stage (footlights), and "*Ladders*" between each pair of side wings.

- **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.
- **Gas**
  - **1816:** The world's first gas stage-lighting system is installed at the *Chestnut Street Theatre* in Philadelphia.
  - **1817:** Gas-lighting systems are installed in London's two legitimate houses: *Drury Lane* and *Covent Garden*.
  - **1820s:** Gas light is in experimental use in most countries of the Western World.
  - **1840s:** Gas lighting is widely adapted and the *gas table* (control board) makes its appearance.
  - **1880s:** The incandescent mantle (the *Auer burner*) is introduced producing a much brighter and safer light.
  - **Mounting Positions:** *Footlights*, *Border Lights* (horizontal "strip lights" hung between each pair of scenic borders), and *Wing Lights* (vertical "strip lights" between each pair of scenic wings). For example in the late **1850s**, the stage of the *Royal Theatre* in Stockholm was illuminated with 562 burners:
    - 66 in the *Foot Lights*,
    - 8 sets of *Wing Lights* with 9 gas jets each, and
    - 8 *Border Lights* with 44 burners per position.
- **Electric**
  - **1878:** British inventor Joseph Wilson Swan (1829-1914) patents the worlds first incandescent electric lamp.
  - **1879:** Thomas Edison (1847-1931) receives the American patent for his incandescent lamp.
  - **1881:** London's *Savoy Theatre* (the home of the Gilbert and Sullivan Operettas) installs the world's first electric lighting system-- 824- 16 candle power *Swan lamps* were used to light the stage and an additional 334 lights illuminated the auditorium. As *Savoy* producer, Richard D'Oyly Carte, 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.
  - **1882:** The first American installation of electric lights is at Boston's *Bijou's Theatre*.
  - **1890s:** By the end of the 19th century most "modern" theatres have switched from gas lights to the much safer electric lights.
  - **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. See the illustration below.

- **Mounting Positions:** The same as with gas-lighting: *Footlights*, *Borderlights* and *Winglights*. When the new *Stockholm Opera House* opened in **1898**, the stage was illuminated with a three color (white, red, and green) lighting system using 544- 25 candle power lamps per color-- a total of 1632 lights.
  - 40 lamps per color in the *Foot Lights*,
  - 9 *Border Lights* with 40 lamps per color.
  - 9 sets of *Wing Lights* with 8 lamps per color, and

The Romans moved pageants into the Great Halls.

1545:

Sabastiano Serlio -- colored light liquids in bottles (red wine, saffron (yellow), ammonium chloride in a copper vessel (blue).
Brightly-polished barber basin and a round bottle as a lens
3 qualities of light: distribution, intensity, color

1550:

Leone de Somi - full illumination for happy scenes, but tragedy much darker (candles, crude oil lamps, torches, and cressets (hanging lamps).
Stagehands walked around and snipped wicks, the audience was lit
Candles were of tallow and fat

1573:

Inigo Jones (or click here) (English - stage designer) returns from Italy with knowledge of the Proscenium Arch and footlights, and comes up with ideas for masques

1580:

Teatro Olimpico is the first permanent theatre in Italy

1618:

Teatro Farnese (see illustration in text) in Parma - the first theatre with a permanent proscenium arch and curtains

1628:

Joseph Furstenbach
Footlights (floats) and sidelights

1638:

Nicola ***Sabbatini*** - writes book on theatre - suggests system of dimmers lowering metal cylinders over the candles
Giacomo da Vignola - ideal lighting angle is along the diagonal of a cube
(1930's - Stanley ***McCandless*** writes it in book)
17th century (1600's)
Paris - many chandeliers
Gas becomes used

1783:

Candles ruled the day till the invention in 1783 in France of the kerosene lamp with adjustable wick
Followed closely with a glass chimney - could make individual float lights
Used for 100 years

1791:

Illuminating gas produced in quantity - William Murdock - each building could produce its own
However, gas required constant attention and wasn't easy to control

1803:

Limelight

Invented by Henry Drummond - heating a piece of lime with a flame of oxygen and hydrogen (for a followspot or to indicate sunlight). A green-ish tint.

Was used as the first spotlight in Paris Opera houses

1845:

Drury Lane Theatre is the first to use gas in England)

1809:

Electric Arc -- discovered by Sir ***Humphry Davy*** (or here)-- took 90 years to be fully accepted.

1816:

First fully gaslighted theatre -- ***Chestnut Street Theatre*** in Philadelphia

Greater control of and more brightness (colorsilk cloth or woven cotton).

Increased heat and many fires caused, and had gas smell and green-ish tint.

1878-1898:

Henry Irving (and click here) (England) initiated lighting rehearsals, transparent lacquers of colored class to limelight with electricity to incandescents, footlights of different colors and broken into sections, and wanted to dim the house lights

Electricity!

1841:

First incandescent lamp patent - Edison - not practical

1846:

The first electric carbon arcs used as spotlights at the Paris opera - inefficient -- not a serious threat to limelight

1879:

The Jablachkoff candle - the first useful lightbulb - "electric candle" - used at Paris Hippodrome - a carbon arc (invented 40-50 years earlier, but limelight was too ingrained, even well into the 1920's.

The first practical electric spotlight

1881:

Savoy Theatre in England - the first completely electric theatre

1882:

A big push - electric theatre at the exposition in Munich, Germany -- with a saltwater dimmer to control the new power source - went like wildfire...

As technology develops and advances at a more rapid rate, so did development of more effective lighting equipment

Edison - first practical lightbulb

Incandescent to tungsten -halogen lamps

Lacquer to gels.

Electric lighting went from the marquee to the outer lobby to the inner lobby to the house to the stage

Lighting instruments can be broadly separated into two categories: *floodlights*, which illuminate a wide area, and *spotlights* (sometimes known as *profiles*), which produce a narrower, more controllable light beam. The distinction has to do with the characteristics of the light produced by the instrument. Spotlights produce a potentially tightly focused light, while floodlights produce a much more diffuse light. Instruments that fall somewhere in the middle of the spectrum can be classified as either a spot or a flood, depending on the type of instrument and how it is used.[3]

Floodlights[edit]

PAR lights[edit]

PAR 64.

Main article: Parabolic aluminized reflector light

Parabolic Aluminized Reflector lights, or **PAR lights**, or **PAR cans**, are used when a substantial amount of flat lighting is required for a scene. A PAR can is a sealed beam PAR lamp housed in a simple can-like unit. Like an old-fashioned automotive headlight, the reflector is integral to the lamp and the beam spread of the unit is not adjustable except by changing the lamp. PAR lamps are widely used in architectural lighting and may often be found at hardware stores. PAR lights have seen heavy use in rock and roll shows, especially those with smaller budgets, due to their low cost, light weight, easy maintenance, high durability, and high output.[4] They are often used in combination with smoke or haze machines which make the path of the beam visible. They are also often used as top, back, or side lights in the theatre and for special effects.
All PAR lamps except those with narrow or very narrow lenses produce an intense oval pool of light, some with fixed focus and soft edges.[4] In order to adjust the orientation of the oval, the lamp must be rotated.[5] The number associated with a PAR light (e.g.: Par 64, Par 36, Par 16) indicates the diameter of the lamp in eighths of an inch.[6]
Four different beam angles can be obtained on the PAR-64. The beam angle is determined by the lamp. Lamps come in "very narrow" (6° x 12°), "narrow" (7° x 14°), "medium" (12° x 28°), and "wide" (24° x 48°). Each angle has two numerical values since the beams are elliptical rather than circular. PAR 16s are often referred to as "birdies.
PAR-bars are aluminum pipes with par cans permanently attached and circuited through the pipe. Par-bars with 4 instruments are often referred to as *4-bars*, and par-bars with 6 instruments are referred to as *6-bars*.
In 1995 Electronic Theatre Controls (ETC) introduced the Source Four PAR as an alternative to PAR cans [7][8] . The Source Four PAR uses a lamp separate from the lens and reflector assemblies.

Strip lights[edit]

Cyc or strip lights.

Main article: Striplight
See also: Cyclorama (theater)
Strip lights, also known as **cyclorama** or **cyc lights** (thus named because they are effective for lighting the cyclorama, a curtain at the back of the stage), **border lights**, and **codas** (by the brand name), are long housings typically containing multiple lamps arranged along the length of the instrument and emitting light perpendicular to its length. Lamps are often covered with gels of multiple colors (often red, green, and blue, which, in theory, allow almost any color to be mixed) with each color controlled by a separate electrical dimmer circuit. Many striplights use round pieces

of glass (called *roundels*) rather than plastic gels for color. Roundels can sustain heavy use for a long time without fading and are often found in more permanent installations.[9]

Scoop lights[edit]

A scoop light.

Main article: Scoop (theater)

Scoop lights or **scoops** are circular fixtures that do not have any lenses. They have an ellipsoidal reflector at the back of the fixture that directs the light out of the fixture. Since they do not have any sort of lens system they are cheaper than other fixtures.[10] However, the light cannot be focused at all (even PARs allow more control than scoops). Scoops are most often used to flood the stage with light from above, or to light backdrops.[11] Scoops can have gels affixed. Occasionally they are used as work lights (see below).

House lights and worklights[edit]

House lights

Work lights

"House lights" redirects here. For the song by Chuck Berry, see Rock It (Chuck Berry album).

House lights provide light on the theater's seats and aisles for the audience before and after performances and during intermissions. They are generally incandescent lights, however fluorescent lights or scoops may be used in some instances. House lights are often controlled by dimmers, but are sometimes on simple switches. **Worklights** provide general lighting backstage or in the house, and are often fluorescent fixtures. Work lights are almost always non-dimmed. House and work lights are usually off during performances but are occasionally included in the lighting design to establish focus or emphasize plot elements. When the house lights are not on a dimmer, the switch is usually under the control of the stage manager.[12]

LED stage lights[edit]

Main article: LED stage lighting

A front view of a Stagebar LED striplight

LED stage lighting instruments are stage lighting instruments that use light-emitting diodes (LEDs) as a light source. LED instruments are an alternative to traditional stage lighting instruments which use halogen lamp or high-intensity discharge lamps. Like other LED instruments, they have high light output with lower power consumption. Most LED fixtures use three or more colors (usually red, green, and blue) which can be mixed to hypothetically create any color.

Types[edit]

LED stage lights come in four main types. PAR cans, spotlights, striplights,[13] and "moving head" types. In LED PAR cans, a round printed circuit board with LEDs mounted on is used in place of a PAR lamp. Moving head types can either be a bank of LEDs mounted on a yoke or more conventional moving head lights with the bulb replaced with an LED bank.

Uses[edit]

LED lighting instruments used on Radiohead's 2008 tour.

LED instruments can and have been used to replace any conventional lighting fixture, and some shows, such as Radiohead's recent tour, have used only LED lighting instruments.[14] Most shows use LEDs only for lighting cycloramas, or as top, side, or back light due to their low throw distance. They can also be used as *audience blinders* (lights pointed directly at the audience from a low angle).

Spotlights[edit]

A **spotlight** is general term for any lighting instrument used in theater to create a pool of light on the stage.[15] There are many different types of spotlights which break down into three general areas:

- Fresnel lanterns or Fresnels (US) are small fixtures giving a soft-edged spot or pool of light. Their name comes from the distinctive ridged Fresnel lens used on the front.
- Profile spots (UK) or ellipsoidal reflector spotlights (US) tend to be longer fixtures containing convex lenses and having a *gate* at their focal point which enables the insertion of *gobos* or *irises* to shape the beam of light. They give a hard-edged beam most often associated in

the public mind with "spotlights". Large versions are operated by a technician as a 'followspot' to follow performers on the stage. The term Profile Spot used in the UK refers to a focussing spotlight which may, or may not use the ellipsoidal reflector design, this design was not common in the UK until the 1970s and many UK and European manufacturers have still to adopt this design instead preferring a twin PC lens design.

- Pebble Convex lanterns (or "PCs") are similar to Fresnels, but use a plano-convex lens with a pebbled effect on the planar (flat) side, resulting in less "spill" outside the main beam.[16] They are used much more widely in Europe than North America.[17]

Fresnel lantern[edit]

Fresnel with lens open to show stepped lens. There is no lamp in the instrument.

Left-Snoot Right-Barn Door

Main article: Fresnel lantern

A **Fresnel lantern** (UK), or simply **Fresnel** (US), employs a Fresnel lens to wash light over an area of the stage. The lens is named after French physicist Augustin-Jean Fresnel, and consequently pronounced with a silent "s". The distinctive lens has a 'stepped' appearance instead of the 'full' or 'smooth' appearance of those used in other lanterns. The resulting beam of light is wide and soft-edged, creating soft shadows, and is commonly used for back light, top light, and side light.
Another method of controlling the spread of light is to use either a top hat (also referred to as a snoot), which generally limits the light coming out, or a barn door, whose flaps work as though they were shutters on an ERS (shown on the right). These methods limit light output and keep excess light from spilling into the eyes of audience members or where it is not desired.
Fresnels use a spherical reflector, with the lamp at the focus point. The lamp and reflector remain a fixed unit inside the housing, and are moved forward and back to focus the light. This is accomplished using a slider on the bottom or side of the lantern, or using a worm track. At very tight focus, the lanterns are the least efficient, as the least light can escape the housing. Therefore Fresnels are not good for tight focus on small areas. They are most often used at medium distances from the stage for area lighting.[18]
In 1999, ETC introduced a new lighting fixture, the Source Four PARNel, which combined the design of the PAR fixture with that of the Fresnel. The fixture is more versatile, allowing for a flood or a softer spot.[7]

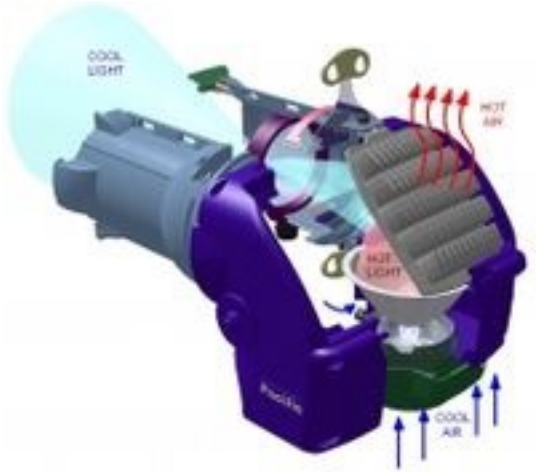
Ellipsoidal Reflector Spotlight[edit]

ETC Source Four ERS.

Main article: Ellipsoidal reflector spotlight

The **ellipsoidal reflector spotlight** (**ERS**), also known as **profile** (after its ability to project the silhouette or profile of anything put in the gate) (UK) and **Découpe** (French), is the most abundant instrument type currently in theatrical use. The flexibility of the ERS allows it to fulfill the bulk of lighting roles in the theater. They are sometimes known as a *profile spotlight* (in Europe) or by their brand names, especially the *Source Four* (a popular lantern from ETC) and 2 the *Leko* (short for *Lekolite*, from Strand lighting).[19]

The major components of an ERS light are the casing in which the internal parts are mounted, an ellipsoidal reflector located in the back of the casing, a lamp mounted to position the filament at the rear focal point of the ellipsoid, a dual plano-convex lens (two plano-convex lenses facing each other in the barrel), and at the front, a gel frame to hold the color gel. The light from the lamp is efficiently gathered by the ellipsoidal reflector and sent forward through the gate, shutters and lens system.



A diagram of a Selecon Performance Lighting Pacific Zoomspot.

ERS or profile lanterns have many useful features. One of the most useful are the metal shutters at the focal plane of the lens to shape the beam of light. The original shape of the beam is round, but with the use of the shutters one can limit the beam to avoid obstacles or parts of the set that should not be illuminated in a specific look. Another feature is a gate, also in the focal plane, for sliding in gobos (also known as *templates* or *deckles*). These have patterns cut into them, much like a stencil. These patterns are projected onto the stage. An iris can be also be inserted in this position to make the beam smaller in diameter, reducing the light cast without the sharp edges of the shutters. ERS instruments from ETC, Altman, Selecon, and a variety of others have interchangeable lens tubes (or *barrels*) which can both create a very sharp or very soft beam as

well as alter the beam spread. The barrel sizes can range from a narrow, long distance 5- or 10-degree spot to a broad and short-distance 50- or even 90-degree. The first 90-degree profile lantern was developed by Selecon Performance Lighting as part of their "Pacific" range of products. Since its introduction many other manufacturers have introduced their own 90-degree barrels.[20] ERS instruments allow many different lens tubes to be used with the same body. This makes them more versatile, since a venue can purchase varying degrees of barrels without buying as many instruments. Many manufacturers also produce zoom lenses which offer the ability to change the beam angle. Some zoom ranges have a poorer optical quality making them difficult to use in sharp focus.

Field angle[edit]

The field angle of an instrument is the angle of the beam of light where it reaches 10% of the intensity of the center of the beam. Most manufacturers now use field angle to indicate the spread that the fixture has. However, older fixtures are described by the *width of the lens* x *focal length of the instrument*. For example, a 6x9 ellipsoidal would have a 6" lens and a focal length of 9" (creating an approximately 37° beam angle). This nomenclature was used because traditionally a larger lens directly equated with more light output. This is no longer necessarily true, so most manufacturers now identify their fixtures by beam angle and light output. As the field angle narrows, the instrument can either be used further from the stage to create a similarly-sized beam as a closer, larger instrument, or it can be used from the same distance to create a smaller beam.[21]

Beam projector[edit]

Main article: Beam projector

A beam projector is a lensless instrument with very little beam spread.[22] It uses two reflectors. The primary reflector is a parabolic reflector and the secondary reflector is a spherical reflector. The parabolic reflector directs the light into nearly parallel beams, and the spherical reflector is placed in front of the lamp to reflect light from the lamp back to the parabolic reflector, which reduces spill. The result is an intense shaft of light that cannot be easily controlled or modified. The beam projector no longer is used to the extent that it once was, as newer fixtures and PAR lamps have created easier ways to produce the effect.[23]

Followspot[edit]

Followspot

Main article: Followspot

The **followspot** (also called a *spotlight*, *trackspot*, *lime* (uk), or *dome*) is a lighting instrument that is moved during a performance by an operator or by DMX control to provide emphasis or extra illumination and usually to follow a specific performer moving around the stage. Follow spots are commonly used in musical theater and opera to highlight the stars of a performance, but may be used in dramas well. They are also used in sports venues, as well as many other applications.[24] These lighting instruments come in a variety of sizes with light sources ranging from low power incandescent light bulbs to very powerful xenon arc lamps. Carbon arc lamp spots were common until the 1990s, using the arc between carbon rods as their light source. These follow spots required special installations that include high volume ventilation due to the hazardous fumes produced by the carbon arc. The current generation, xenon, has extremely high internal pressure in the lamp and thus has its own safety concerns.[25]

Followspots contain a variety of operator-controlled optical mechanisms. They may include mechanical shutters, which allow the light to be doused without turning off the lamp, lenses to control and focus beam width, and internal color gels, often in a color magazine.

Intelligent lights[edit]

The MAC500 by Martin.

A Legend 330 SR Spot from CHAUVET Professional

Main article: Intelligent lighting

Moving lights (or *intelligent fixtures*) began to gain widespread acceptance in the concert industry in the early 1980s. As the digital age progressed, the cost of these fixtures reduced, and they are increasingly used in many major theatrical productions.[*citation needed*]

Their principal feature is the ability to remotely control the movement and characteristics of the output beam of light. This is achieved by either moving a mirror which reflects the beam, or by moving the entire fixture, which can pan and tilt by means of a motorized yoke. Usually they also contain other controls to shape, texture and color the light, such as gobo or dichroic wheels. This ability to precisely, and repeatedly set the position of the fixture allows one light to perform many functions, lighting multiple different areas in different ways. They can also move 'live' (with the lamp on), to achieve many of the effects used in modern productions.

The majority of intelligent fixtures employ arc lamps as a light source, and therefore use a variety of mechanical methods to achieve the effect of dimming. Some fixtures employ standard halogen lamps. Mechanically, stepper motors connected to various internal optical devices (such as gobos and color wheels) manipulate the light before it escapes the fixture's front lens.

Today's market includes such moving (intelligent) lighting manufacturers like Vari*Lite (owned by Philips), Martin Professional, Clay Paky, CHAUVET Professional, Elation Professional, Mega Lite, Ayrton, among others.

Discharge fixtures are seeing competitive advantages from the LED industry take place, and many companies are now offering an LED-based intelligent lighting fixture across all arenas of intelligent

lighting genre, from wash fixtures to spot fixtures, beam-type fixtures and hybrid units that incorporate two or all of these types.

Moving light programs are often much more complex than that of stationary instruments. While it is possible to operate them with any console that uses the DMX512 Protocol, many lighting board operators find a console dedicated to moving light operation to be much more efficient. Oftentimes there will be encoder wheels which will control the Pan, Tilt, Focus, Zoom, Color, and Effects. Many people find visualization software (such as WYSWIG, VectorWorks, and others) to be helpful when programming while other people prefer a hard tactile control.

Intelligent lights are used heavily in shows in very large venues, like events in stadiums, where it is very difficult to reach lighting trusses for manual focusing. Although the fixtures may not be moved during the run of the show, they are focused remotely.