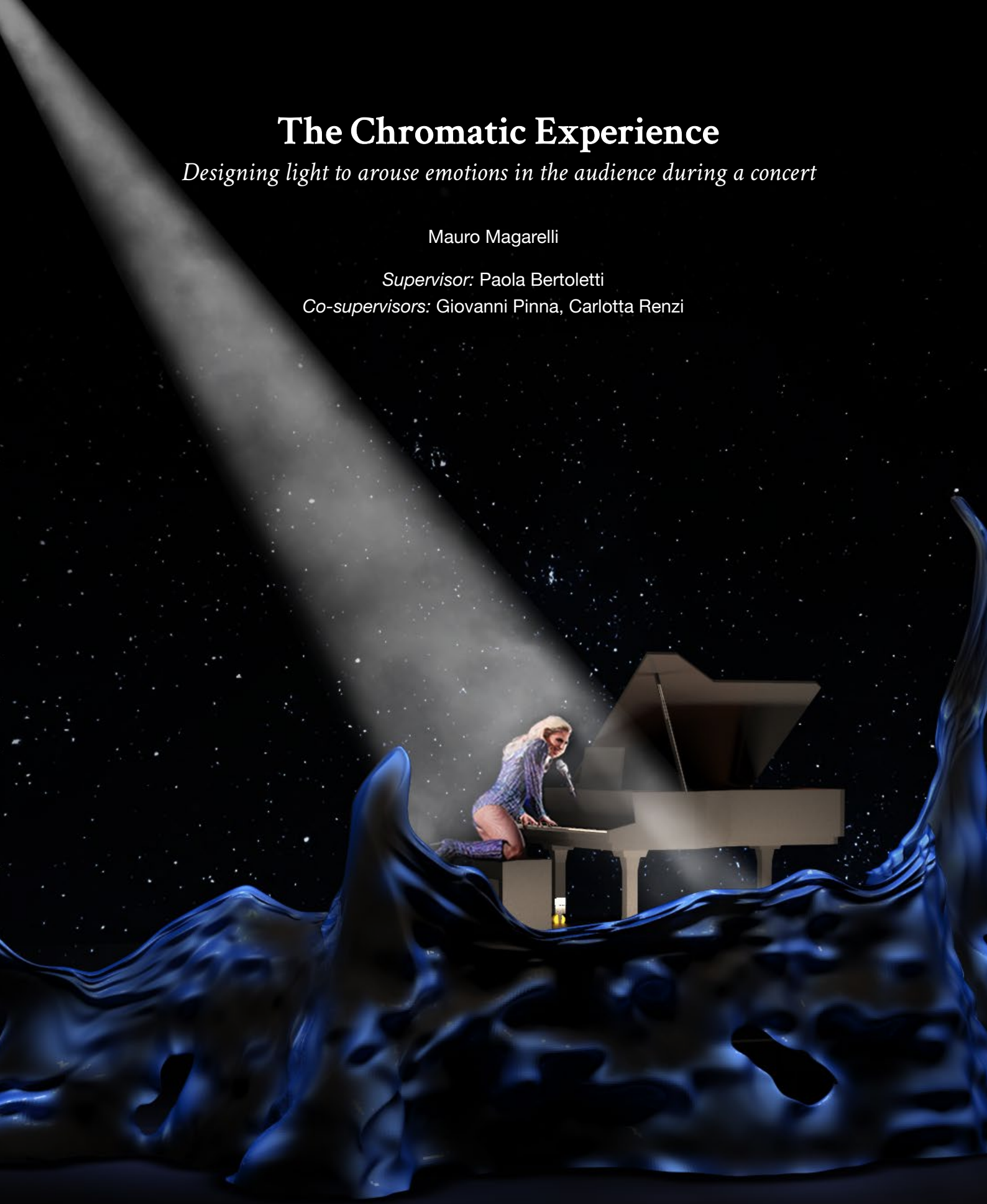
The Chromatic Experience

Designing light to arouse emotions in the audience during a concert

Mauro Magarelli

Supervisor: Paola Bertoletti
Co-supervisors: Giovanni Pinna, Carlotta Renzi



POLITECNICO
MILANO 1863

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Abstract

The proposed thesis explores the world of show lighting design. At the moment, the research about the relationship between show lighting and emotions is very thin, whereas the studies that investigate emotions in architectural lighting are much more developed. Therefore, this body of work tries to better outline to what extent the show lighting designer can actually design light to arouse feelings in people enhancing the overall emotional experience of the audience during a concert.
Being stage lighting extremely complex, this thesis focuses on two of its various attributes and their impact on people: color and movement. Indeed, variations in these two features of light can be easily grasped by the untrained eye of those in the crowd and can therefore generate emotions. The material put together by this research developed an analytical methodology that could be used by stage lighting designers to scientifically design lighting at concerts stimulating certain emotions in the audience. To give further consistence to the topic, this methodology has been discussed through interviews with stage lighting designers. On the one hand, they all firmly confirmed the emotional impact of show lighting on people. On the other hand, it does not appear clear to what extent lighting can be designed to arouse emotions. Indeed, some of them do not support the effectiveness of the scientific approach proposed. Others think it might works if some adjustments to it are made. Therefore, this research leaves the door opened to further exploration in this direction.
The knowledge developed is translated into a hypothetical concert to present Lady Gaga's latest album, Chromatica. I worked on the stage design, show design, and finally on the stage lighting design. Particularly, I applied the scientific methodology developed and other approaches (which emerged within the research) to design lighting for a few songs of the show.

Table of content

Table of content

This is the only image I found of me (and my best friend Francesca) on the internet. It was October 2nd 2012 and we were having huge fun at the "Born This Way Ball Tour", starring Lady Gaga.

Fig. 0

Introduction

Perhaps, despite I started my Masters' degree program in late 2018, the origin of this thesis dates back to October 2nd, 2012. I was just sixteen and that night I went to the very first concert of my life. Not only was it my first concert, but also it was the first time I saw Lady Gaga live, one of those artists who has had a huge impact on my life. What is more, that was also the first time I came to Milan still unaware that three years later I would have moved here to start a life-changing five-year journey at Politecnico di Milano. This thesis was probably meant to be.

That evening, my skin, my mind and my eyes witnessed something that was out of this world. The stage was an imposing automated castle that could open and close always revealing some new details. Lights were moving to the rythm of the artist's biggest tunes bathing both the audience and the castle with all the colors that human eye is able to perceive. I felt part of something huge. It was as if all the people in that arena were feeling the same emotions. We were thrilled when the artist entered the scene on a mechanical horse surrounded by a mysterious purple atmosphere. We were worried when the castle, all of a sudden, turned of an intense red which anticipated that something wicked was going to happen. And we got tears on our faces when she started singing her heart out while playing the piano. In that precise moment everything got dark. She was simply illuminated by a cone of light and by the smooth movement of people's smartphones torches. Unfortunately, mine was dead and I could not join them in

that harmonious dance of light, neither I could take pictures of that night. However, concerts give us something more than mere pictures to show to our friends the day after. They give us feelings and feelings turn into memories, those kind of memories that you will never forget. The next day, I woke up with a new ambition: sooner or later I would have created something similar to that.
From that moment on stage design, which comprises show design, scenic design, lighting design and much more, became one of my biggest interests. This is the reason behind my decision of developing this peculiar thesis. In addition, I wanted this body of work to be an opportunity and a challenge for me to learn something new, widening my skill set and expertise in another field of spatial design.

The historical period we are living in has affected significantly the industry of entertrainment. However, concerts and live events were one of the greatest opportunities for people to escape their everyday life and live a few hours of magic (hopefully, things will go back to normal soon). As a matter of fact, the atmosphere at concerts arouses feelings in the audience stimulating their imagination. Thereby, this thesis will investigate the emotional response of people during concerts. Actually, emotions in these situations are very intricate since they consist of a combined reaction to music, dancing, scenography, lighting and so on. Indeed, all these factors exert a psychological impact on the audience.
Particularly, this research will focus on those emotions that can be somehow evoked through light. Indeed, studies have proven that light affects our body and mind in every kind of activity we do. Therefore, it is appropriate to give for granted that light has an emotional impact on people during concerts as well.
Furthermore, light is what makes the scene and the performance visible during a concert in the first place. Indeed, it is because of light that the whole experience of a concert is much different from listening to music on the radio or on Spotify. Consequently, the professional figure of the lighting designer is absolutely essential. His ability of designing light will enhance the overall emotional experience of people during a live show.
To some extent, it can be said that shows are an art form. For that

reason, the aim of this research is not to reduce this artistic expression to a set of mathematics equations or scientific laws, considering that also psychologists have found how very difficult it is to measure aesthetic experiences objectively. However, it will explore whether a more analytical approach can be employed by show lighting designers (alongside their sensitivity and artistry) to develop a stage lighting design that enhances people's emotions, or not.
Specifically, the research will investigate two parameters of concert lighting, which are color and movement. That is because, amongst all the variables of light that can be controlled nowadays, changes in these two light parameters can be easily grasped by an untrained eye, and therefore evoke emotions. The following are the questions that I will answer with this work:

1. Do color and movement of light have an emotional impact on people during concerts?

2. To what extent can the stage lighting designer actually play with light color and light movement to arouse emotions in the audience during concerts?

Considering that the studies correlating emotions to stage lighting that have been developed so far are not many, this research will go through studies that are directly or indirectly related to lighting in different fields. For instance, chromotherapy, music-to-color association, psychology of architectural lighting and environmental cognition will be examined to see whether it is possible (or not) to develope a knowledge to apply in the field of stage lighting design. The deductions made from the analysis of these studies will be discussed with experts. Indeed, interviews with various stage lighting designers will be carried out in order to give more comprehensive and accurate answers to the aforementioned questions, filling those voids derived from the lack of studies.
Finally, the research results will be translated into a stage lighting design for a Lady Gaga's concert that I have purposefully designed for this occasion. Particularly, I have also worked on the show design and the scenic design in order to have a more complete project.

1

Stage lighting design: historical notes

1.1 The origin of theatrical lighting

The history of stage and theater lighting covers more than two thousand years, dating back to ancient Greece. In Greek theatre, lighting was only used with one purpose: visibility. It was primarily functional to make the actors clear to the audience. Therefore, the general illumination came from the sun. That is why their stages were built on hills facing it, to take proper advantage of its potential as lighting source. This strategic position of theaters also allowed to keep the sun, most of the times, out of people's eyes. However, considering the impossibility of controlling natural phenomena, the role of people's imagination during these ancient plays was essential for the lighting changes. Sometimes, the actors carried lanterns or torches to suggest a nocturnal setting for that scene (Jasper F. Donelan, 2014).

When theater arrived in Rome, some technical changes were made. Not only the shape was modified, but also some awnings of red, yellow and blue where stretched over the cavea[1] to protect the audience (Fig.1). As a result, sunlight was filtered coloring the actors and the audience (Theodore Fuchs, 1963). This is the very first record of colored light on a theatre. Yet, it was accidental and was not used to any advantage (Morton Johnson, 1964, 2).

1. "*The tiered semicircular seating space of an ancient theater",* Merriam-Webster dictionary https://www.merriam-webster.com/dictionary/cavea

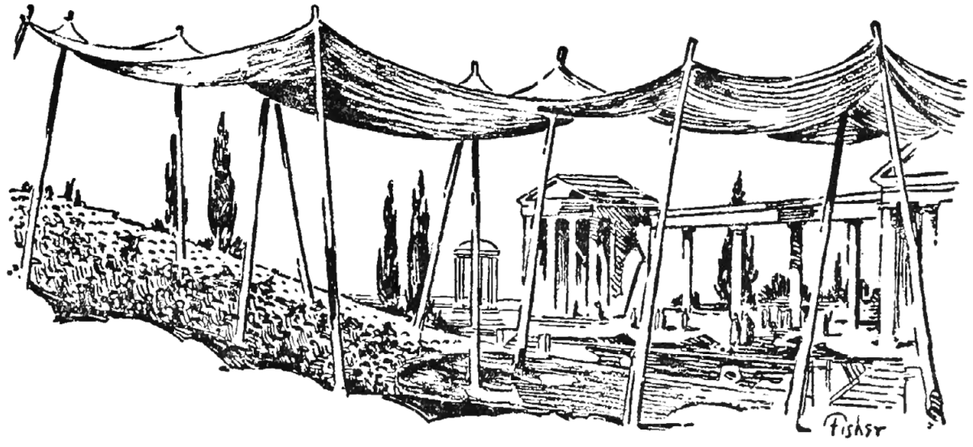


Fig. 1

1.2 The advent of indoor theaters

When the Roman Empire collapsed, the form of entertainment represented by theater started to fade as well. Only during the 11th century, when the Christian church arose all around Europe, theatrical representations started to be popular again as a mean to spread the new religion. Again, only general illumination was used in these productions. This was the moment in history when performances started to take place after the sunset and indoor theaters began to be built: sunlight could not be the primary source of lighting anymore. Fire turned out to be the only lighting opportunity for these productions (Morton Johnson, 1964, 3). Originally, either cressets, or crudely woven baskets of iron (Fig.2), mounted on poles, were filled with blazing pine knots and pitch, so that the audience was able to see the religious spectacles being staged (Boston Edison Company, 1929). Likewise, first examples of oil lamps with open floating wicks started to be used (Morton Johnson, 1964, 3).

1.3 The introduction of candles as primary lighting source

Later, candles finally arrived to light the stages. To obtain an effective result, thousands of them were required: they were placed either on chandeliers or footlights[2] and hundreds of them on the edge of the stage to light actors' faces (Fig.3). Even though the low level of technology achieved, this was the first time in the history of theater, light was used to add scary realism to the aspect of devils and angels, and also fireworks were used to represent the breath of monsters or dragons (Theodore Fuchs, 1963). Hence, by the 14th century, the idea of general illumination simply used to make the audience and the scene visible started to be abandoned in favor of a more artistic and unexpected use of it. In 1551, a major breakthrough was made in Italy. Architect Sebastiano Serlio, who was interested in theater design, was one of the firsts who suggested to place transparent glass bottles filled with a colored solution in front of the existing candles (Fig.4) to generate colored light (Boston Edison Company, 1929). Red wine was used for pink light, white wine was considered for amber light effects, and a more complex solution of aquavita, vernis, and sulphuric acid had to be prepared to obtain a blue light (Theodore Fuchs, 1963).

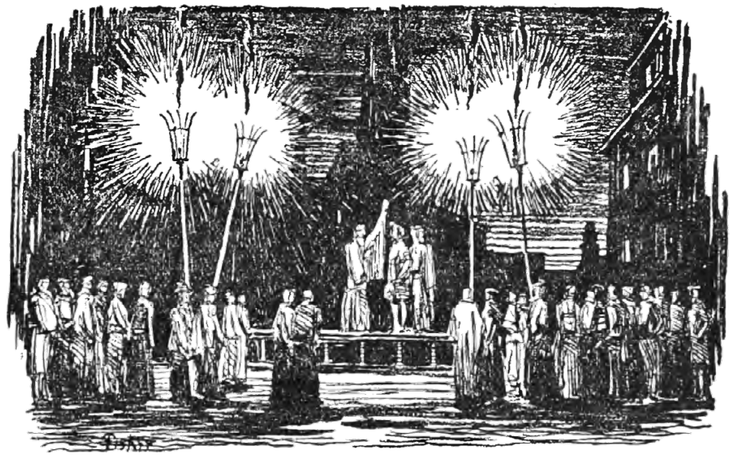


Fig. 2

2. "*A row of lights set across the front of a stage floor",* Merriam-Webster dictionary https://www.merriam-webster.com/dictionary/footlights

That was the first time that colored light effect could be achieved in theatre. However, the lighting remained the same throughout the play without changing from scene to scene considering the difficulties and time required to replace all the bottle with others of a different color (Morton Johnson, 1964, 4). A few decades later, other Italian technicians tried to substitute glass bottles with colored panes of glass. Nonetheless, they turned out to be much denser than the colored liquids, generating an insufficient illumination (Nicoll, 1946, 96). Further innovations came with another Italian architect, Nicola Sabbatini. Particularly, he designed a series of lighting innovations that made dimming possible for the first time. He created this effect by lowering metal cylinders on top of the candles without putting the flames out (Fig.5). Sabbatini also invented a rudimental technology that anticipated the modern spotlight[3]: he put a polished sink behind a light source so that the luminous flux would be directed to a precise portion of the stage (2019). However, the use of candles had a lot of issues. Firstly, they produced a lot of heat and reduced remarkably the amount of oxygen in the space making people faint. Secondly, during long performances, candles needed to be replaced causing a lot of intermissions. Finally, hot wax poured both on actors and on the

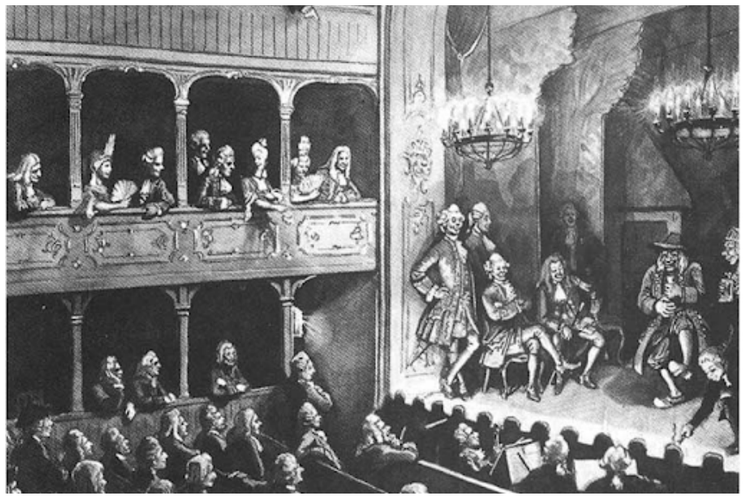


Fig. 3

3. *"A light designed to direct a narrow intense beam of light on a small area",* Merriam-Webster dictionary https://www.merriam-webster.com/dictionary/spotlight

audience being extremely dangerous.
At the end of the same century, huge improvement happened on the front of oil lamps thanks to Swiss physicist Aime Argand. He developed a new version of the traditional lamp that provided greater illumination in theater compared to what candles did. As a matter of fact, they had a more constant flame and therefore provided a brighter illumination. Yet, it was excessively expensive to maintain and replace them.

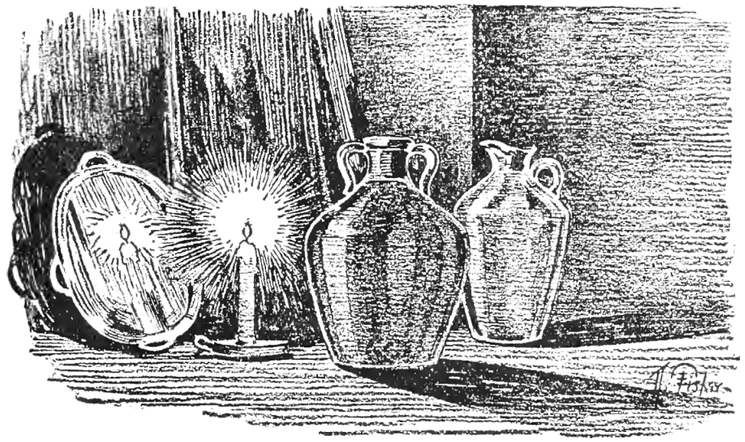


Fig. 4

1.4 Gas appearance and its huge impact on show design

At the end of the 18th century, William Murdock developed a process for distilling gas from coal, inventing a new form of illumination (Mitchell, 2020). Things changed considerably for theater lighting. It was 1781 when it was understood that gas could be produced in sufficient quantities to illuminate large spaces such as theaters. Frederick Albert Winsor realized the major advantage of open-flame gas burners over candles and he employed this new kind of technology to equip the stage of the Lyceum Theater in London at the beginning of the 19th century.

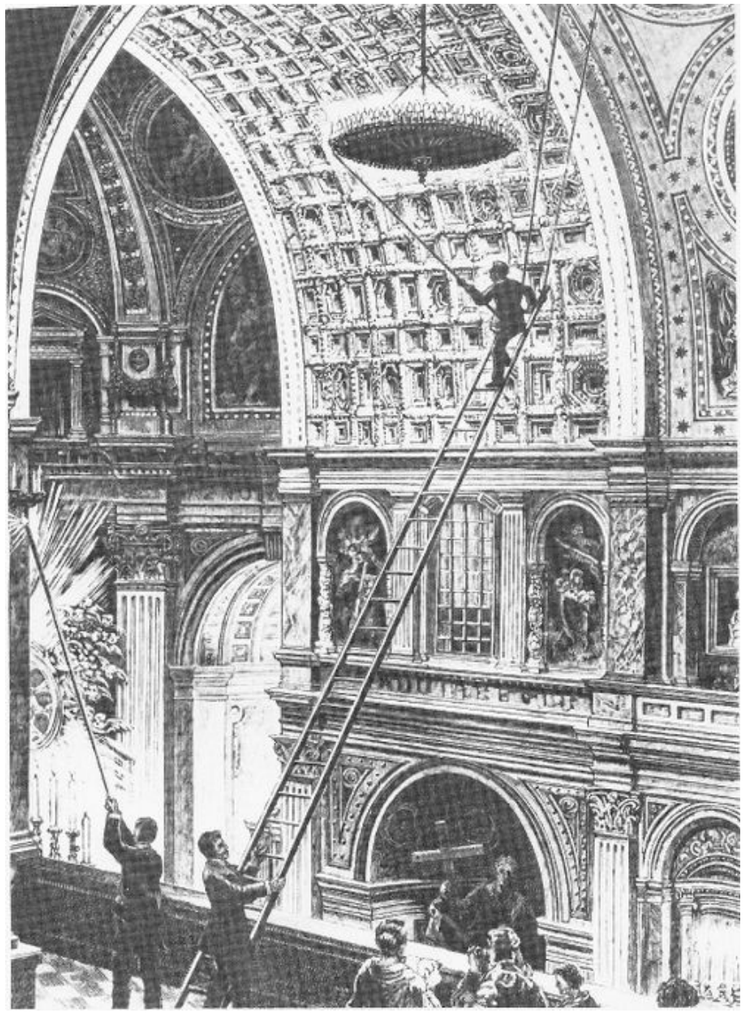


Fig. 5

The attempt was successful and a few years later this new lighting method was considered by the Chestnut Street Opera in Philadelphia that produced the gas with crude machinery in the basement of the building (Boston Edison Company, 1929). Gas systems had several positives, above all, its price which was a fourth of the cost of candles

or oil lamps. Furthermore, it became possible to control lights from a distance according to the amount of gas supplied to each set of lights. In addition, new lighting instruments started to be developed and light could come from different angles. Finally, dimming light started to become easier and easier. The impact this development had on stage design was enormous anticipating the modern idea of show design. Indeed, set designers had to take into account how painted scenic elements would appear with bright white or colored light hitting them. Moreover, actors could now move behind the proscenium arch and could still be visible by the audience. As a result the stage became much more dynamic than it used to be. Actors' makeup had to be thoughtful as well in order to react properly to the new intense quality of light. Nevertheless, gas lighting had some negatives too. In fact, several theaters were destroyed by huge fires (Fig.6 - Ringtheater fire, Wien, 1881) due to leaks in the gas system and, again, the amount of oxygen is the space suffered a lot (2019).

Fig. 6

1.5 "To be in the *limelight*"

The "limelight" was another precursor of the current spotlight. In 1816, British engineer Thomas Drummond invented this device that produced light by directing a sharp point of flame against a cylindrical block of lime. By heating this piece of lime to incandescence, a brilliant white light beam was produced (Darveau) (Fig.7). It is curious to trace the genesis of the expression "to be in the limelight" that has come to mean "to be at the center of attraction (Boston Edison Company, 1929).

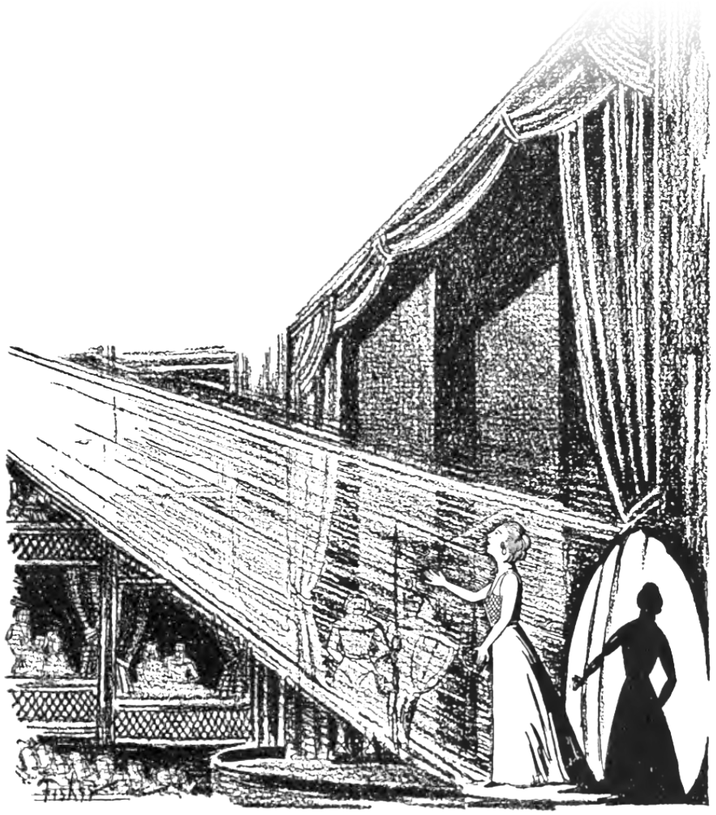


Fig. 7

Fig. 8

1.6 The invention of electricity

A major stride took place in 1808 when sir Humphry Davy introduced the electric carbon-arc lamp. Exploiting this technology, the Paris Opera developed the earliest electric arc effect to represent a beam of sunlight in 1846 (Gillette & Holmes). A decade later, the very first example of electric spotlight was invented. Indeed, during a production of the opera "Moses" again at the Paris Opera, the audience witnessed a new astonishing theatrical illusion. One of the actors appeared against a dark background wearing garments of such a sparkling white that everybody in the room was speechless (Fig.8). It was the first electrically operated spotlight that immediately became essential for every theatrical representation (Boston Edison Company, 1929). This spotlight consisted of a carbon arc and reflector placed in a hood, which included a lens and a shutter (Gillette & Holmes). The next great step in theater lighting happened when Thomas Edison invented the very first incandescent electric lamp in 1879 and one year later the Paris Opera introduced this new technology in their theater. The state-of-the-art technology was also exhibited in a small theater built for the Electrotechnical Exposition which took place in Munich in 1882.

The experiment was acclaimed worldwide and theaters from each corner of the world started to be converted to electrical light systems rather than gaslight (Gillette & Holmes). With this innovation, theaters slowly started to move into the twentieth century (Mitchell, 2020).

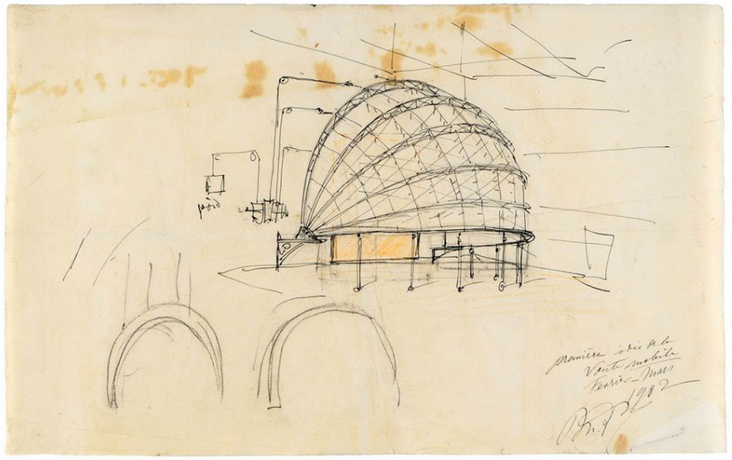


Fig. 9

1.7 The new relationship between light and scenic space

However, electric light bulbs were simply placed in the existing sockets of the antiquated gas burners, yet no new methods of lighting were developed (2019). They still did not comprehend the potential of this new revolutionary light as something movable, that could change throughout the performance to enhance its overall result. Amongst the firsts who started to consider light in a more sophisticate way, there were Spanish light artist Mariano Fortuny and two renowned scenographers: the Swiss Adolphe Appia and the British Edward Gordon Craig. Even though their intentions and objectives where different, they all agreed on going over the idea of painted scene in favor of a three dimensional scenic space (Filibeck, 2004). On the one hand,

Fortuny developed a sophisticated system of soft reflected light that simulated natural lighting accurately. Though, the entire mechanism was too bulky that a special theater needed to be built. Therefore, he developed a dome-shaped cyclorama that backed the stage area. It was a structure flooded with light that reproduced the sky giving the impression of infinite space. On the other hand, Appia and Craig thought of the scenic space as a cubic volume where they could create all those optical effects previously obtained with paint, simply with light (Gillette & Holmes). As a result, a new idea of light was in their mind. Light as something movable, expressive, a psychological element that is conceived together and in relationship to the stage. Moreover, Appia understood the expressive potential of shadows to create dramatic scenes. Shadows were no longer a mere absence of light, but became as important as light (Filibeck, 2004). In this respect, Robert Edmund Jones, an American scenic, lighting and costume designer amongst the most important of the last century, noted that stage lighting means

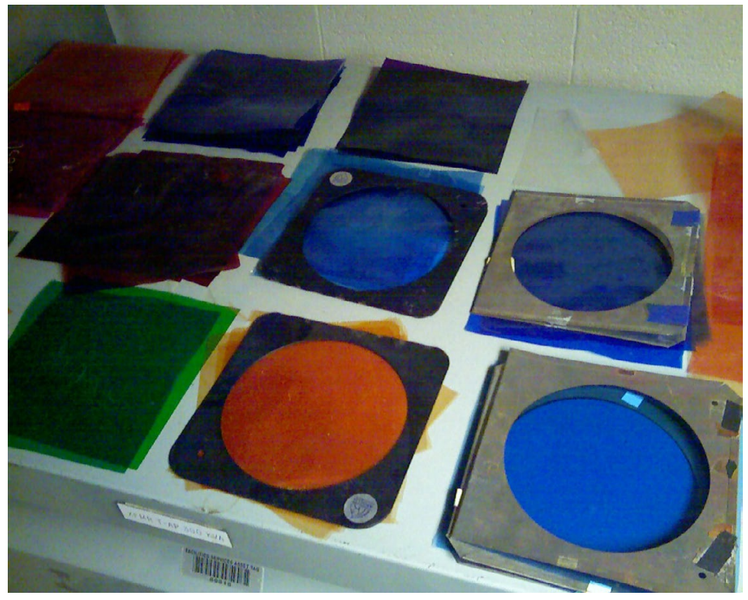


Fig. 10

directing light were you want and take it away from where you do not want it (Jacques, 2014). Gradually, technological improvements made lamps brighter and more durable. Metallic filaments replaced carbon and tungsten filament lamps appeared in 1911. This allowed lamps to be physically bigger and higher in efficiency (Gillette & Holmes). Finally, with the advent of electric lighting, colored filters to put in front of light sources gained much more importance. By the half of the 20th century, most performances took advantage of colored light and glass filters started to be substituted by gelatin (Fig.10) to give “white” light the appropriate color (Morton Johnson, 1964, 4).

Fig. 11

1.8 The influence of avant-guard movements on show lighting design

It is also essential to point out the influence Futurism, as well as Cubism and the other avant-guard movements, had on stage lighting. As a matter of fact, electric lighting was used to emphasize their grotesque creations. They left a huge legacy that is still visible in contemporary

productions (Boston Edison Company, 1929). In this respect, one of the most remarkable theatrical representations was staged by futurist artist Giacomo Balla in Rome in 1917. It was “Feu D’Artifice” (Fig. 11) with music by Igor Stravinsky. It was a 5-minute light show featuring some of the most important lighting ideas that later became popular. He basically overturned the relationship between scene and light: the latter is no longer subordinate to the former, but the other way around. Eventually, light obtained the leading role (Filibeck, 2004).

1.9 Projections: light creating magic

During the second decade of the twentieth century, a new technology started to be developed. Adolf Linnebach, a German inventor and engineer, invented the famous Linnebach Lantern, often called a “scene” projector (Gillette & Holmes). This turned out to be the very first use of projections on a stage (2012). The device consisted of strong light source placed inside a long case colored in black with an open side on which a painted glass slide is placed. When turned on, light is filtered by the pattern designed on the glass that is thus projected against a drop in front of the audience. Due to the fact that the device does not include any lens, the light source has to be strong and concentrated (Gillette & Holmes). Directors started to understand the added value projections could bring to a representation (Filibeck, 2004). In 1924, Erwin Piscator, a German Theater director who was influenced by the Dada movement, staged Fahnen (Flags) at the Volksbuehne in Berlin. This theatrical representation is mainly remembered for its revolutionary use of projections (2012). There is evidence he used three projection screens: one for each side of the proscenium and one floating above the acting scene. On these surfaces he visualized written commentaries or still pictures (Loup III, 1972, 97). However, the peak of the technical and expressive research on this front is represented by a multimedia installation called Lanterna Magika (Magic Lantern). It was displayed for the first time in 1958 at Czechoslovak pavilion during the Bruxelles International Exhibition (Fig.12) by Czech artist Josef Svoboda and his creative partner

Alfred Radok (Filibeck, 2004). With this experiment, they directly acknowledged and explored the relationship between live performers and projected images (Waltz, 2006, 572). Here, the idea of a still screen was lost in favor of a more dynamic scenography. Projections were cast on moving surfaces that could change their shape, disappear, rotate, lift or turn into transparent planes in order to transfer the action from the scene to the film and vice versa (Filibeck, 2004). Nowadays, projections are widely used both in theatre and in concerts to create breathtaking effects.

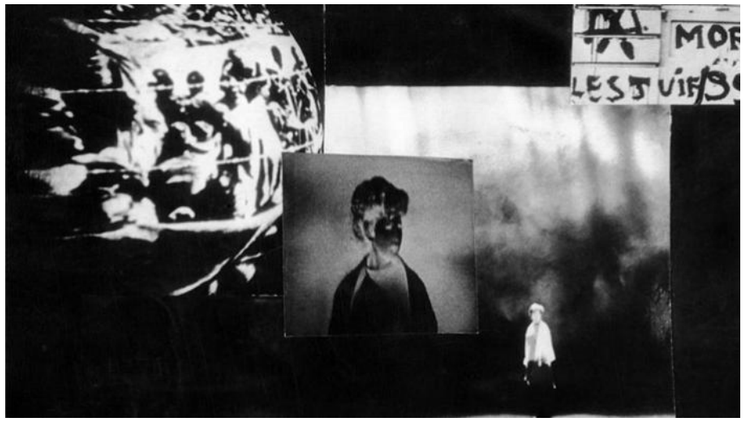


Fig. 12

1.10 Show lighting today

During the second half of the last century, technological innovation turned stage lighting into an art form in its own right (Battalini, 2018). Light devices started to became brighter, more flexible and more versatile. Nonetheless, the higher and higher complexity of these instruments made it very hard to control all of them. It was not just a matter of turning them on or off (2019). A major breakthrough occurred when the first light control console[4] was invented in 1975 by Tharon Musser. She introduced this computerized light board for the first

4. *"A lighting control console (also called a lightboard, lighting board, or lighting desk) is an electronic device used in theatrical lighting design to control multiple stage lights at once."*, Wikipedia https://en.wikipedia.org/wiki/Lighting_control_console

time in her lighting design for Micheal Bennett's Broadway musical A Chorus Line. This paved the way for the use of modern technology in lighting design (Owen, 1991). At that point, stage lighting designers could start creating complex lighting plots (2019) with the help of always upgraded lighting boards that can process faster, control more lights, and interface more easily with the user (Mitchell, 2020). These lighting desk communicate with dimmers and the other instruments through an electronic control protocol. At the moment, the most common one used in the entertainment industry is called DMX512. Yet, in order to meet the high demand of always increasing instrument complexity, newer protocols are being developed (2021).
Over the last two decades, amongst the most innovative developments in stage lighting there have been the invention of moving heads, that allow to create whatever kind of effect is needed, and the introduction of LED (light emitting diodes) as theatrical lights (Battalini, 2018). These instruments are energy efficient, cost-effective, produce very little heat and much more controllable (Mitchell, 2020). Another positive of LED lighting sources is that they give endless opportunities in terms of color choice. This allows to create the desired atmosphere at every event from small intimate theatrical representations to large scale rock concerts and beyond (Battalini, 2018).

Fig. 13

2

The role of the stage lighting designer: between creativity and technology

As stated in the previous chapter, it took more than 2000 years to develop the idea of stage lighting that we now give for granted. Nowadays, stage lighting is not a simple matter of illumination to make the performers and the scene visible to the audience anymore. At least, it is not just that. Today, stage lighting gives an added value to a live production turning a concert into something that pleases our eyes, as well as our ears.
It is about using light in order to enhance what is on the stage and create the right atmosphere for each moment of the show. In this regard, Ishoyor (2018) said:

> *"Having been and shot various concerts, it has been established that a concert's lighting can make or destroy that concert."*

Consequently, it can be assumed that the role of the stage lighting designer in any kind of production has gained a stronger and stronger relevance over the past decades. To some extent, their creativity and skill set represent the key for the success of a live performance. Indeed, the lighting designer can be considered as the one who defines the way in which the audience see a live performance. Although this might

sound bizarre considering that there are certainly other professionals such as creative directors, choreographers and so on who work on a show, it is a fact that people only see what is lit. And the lighting designer is the one in charge of defining what things to lit (and what to leave in the shadow) and how things get lit. Lighting designer Bradley King said (Mink, 2017):

> *We like to say [that] without lighting design, it's just radio.*

Thus, whether it is about a Shakespeare theatrical representation or a U2 world tour, there is always a creative mind that gets people through the story of the show revealing with light what they are seeing,

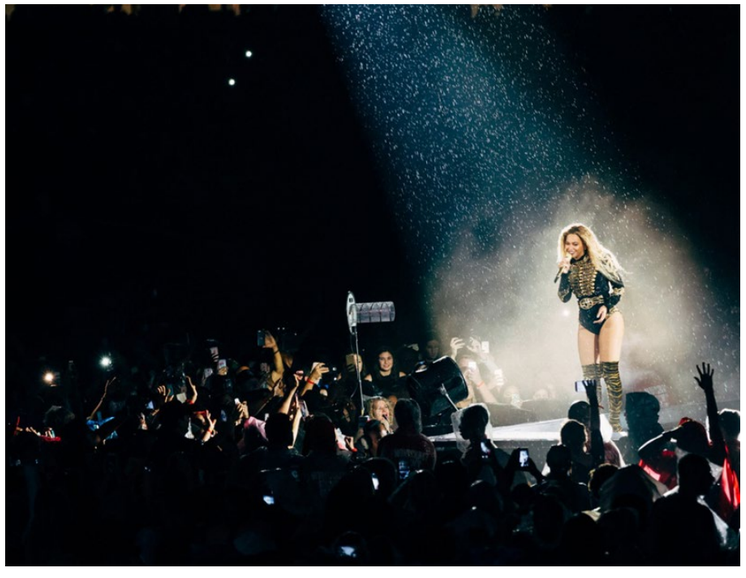


Fig. 14

Fig. 15

in a particular order and in a particular way (2021). The job can involve simply lighting a person or object (Fig.14 - Beyoncè, Formation World Tour), or be as complex as creating stunning visuals (Fig.15 - Armin van Buuren, Tomorrowland) that move to the rhythm of music (Schiller, 2019). This is strictly related to the atmosphere they are willing to evoke. As a matter of fact, stage lighting designers' decisions strongly affect the audience experience stimulating different emotions (2017). Appia himself, who in *Die Musik und die Inszenierung* (1899; "Music and Staging") established a hierarchy of considerations that have to be fulfilled in order to achieve his revolutionary idea of theatrical production, defines light as the element that unifies actors and scene into an artistic whole, evoking varied emotional responses from the audience (1999). Therefore, emotion appears to be narrowly connected to job of the show lighting designer.

However, even though it is clear that his role goes beyond purely analytical and logical decisions, it is essential to point out that everything he is now able to create is made possible thanks to the constant technological innovation. That is why, the lighting designer is very often defined as "technology in the service of art" (2021). Nowadays, more than ever, stage and theatrical lighting is the result of a well-balanced mixture of creativity and technology. Particularly,

the introduction on the market of intelligent or automated lighting controlled by lightboards allow for cutting-edge lighting capabilities that can significantly impact a stage production (2017). The lightboard, or light control console, is the electric device that manages to give shape to the lighting designer's creativity and ideas. This appliance enables the technicians (where the lighting designer cannot program) to control multiple lights at once (Battalini, 2018). Specifically, when it comes to automated lights, the console allows to control each of those parameters that make this kind of luminaries extremely versatile and multi-functional. Generally speaking, moving heads can be divided into three main categories: wash, spot/profile, and beam. Beam fixtures are those that feature the narrowest beam angle, they therefore cast a very dense and thin beam of light. Spot/profile and wash profile have

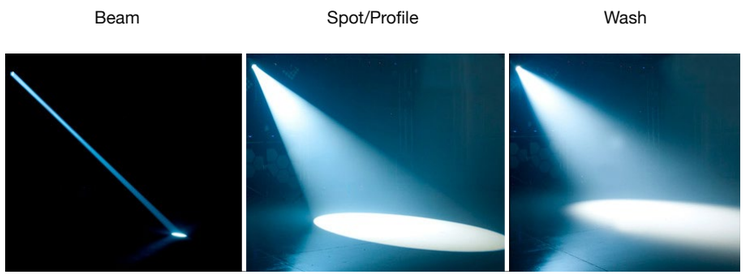


Fig. 16

a wider angle: the former (the difference between a spot and a profile is usually based on the manufacturer's naming convention) features a very sharp beam edge, whereas the latter has an extremely soft one and it does not come with accurate beam control options compared to a spot/profile or a beam. That is why wash fixtures are typically used to light large areas. Actually, a fourth category can be introduced: hybrid luminaries. Indeed, some lights include a mix of different styles of beam, wash, and spot/profile, designed to be highly versatile and multipurpose lights. Yet, they are not the strongest spot, wash, or beam when compared to those fixtures that have one primary function (Price & Dahl, 2019). As previously said, it is worth mentioning that nowadays automated light fixtures feature countless parameters that

the lighting designer can regulate in order to give the light beam the appearance that best fits what is in the designer's mind. For instance, by widening its focus and by softening its beam edge, a spot/profile lamp could be decently used to obtain a wash effect and so on. Just to mention a few of the most common features that can be controlled in a moving head, there are pan and tilt, used to control the fixture movements; there are gobos that give the opportunity to project an image or pattern by controlling the shape of the emitted light; there is the chance to change the color; there is the ability to zoom the light in or out; there is the option to soften the edge of the beam by using frosts; there is the possibility to regulate the light intensity by dimming it and so on. Controlling these parameters (and many more) is essential to unlock the true potential of these instruments (Nelson, 2017).

At this point, it is clear that the show lighting designer is in the middle between creativity and technology. It can be said that everything starts from his mind, from an idea that technology turns into something capable to evoke emotions in the audience.

The next chapters will try to investigate to what extent the designer can design certain aspects of light in order to emphasize the emotional response of the audience during a concert.

Particularly, the research will focus on two parameters of light: color and movement. That is because, amongst all the variables of light that can be controlled, changes in light color and movement can be easily grasped by an untrained eye.

3

The color of light

Color is the first attribute of light that this research aims to study. Steven Hall (2017) described it as one of the most impacting features of lighting on an audience and musician, sound and lighting designer Veslemøy Rustad Holseter noted that certain colors enhance the audience's experience compared to others (Whiteley, 2020). In addition, Ufana Ishoyor (2018) highlighted the fact that people at a concert already know the songs they are going to sing along to, but it is thanks to the atmosphere created by the color of lights that fans can connect emotionally to the environment. It comes by itself that, in order to improve the overall emotional result of a show, colors cannot be chosen accidentally, but every single choice has to be well thought out. In this regard, concert lighting designer Craig Rutherford said (2020):

> *"As lighting designers, we deal in currency of looks. A look is a particular moment on the stage, or more broadly, a sequence for a single song. Looks are everything the audience will see."*

the direct consequence is that considering the implications of a color scheme within a song is an essential part of generating a palette for that song.

This prompts the question, how does a show lighting designer decide which color to give to a song during a concert? There are not any written rules lighting designer follow when it comes to color choices. However, there are many factors that can inevitably affect them (Siniscalco, Rossi, & Pinna, 2019).

First and foremost, the taste and personal interpretation of the lighting designer whose experience has developed a sensitivity to these kind of choices.

In the second place, color selections might be related to the different stages of a show. This implies that the lighting designer can develop a sort of chromatic storytelling, where each module of the show follows a certain color palette giving the perception of "monochromatic" periods. Particularly, this helps people to move to the next compartment of the concert.

Another major aspect that has to be taken into account is the set design. Indeed, the materials used in the physical construction of the stage affect remarkably the light color choices.

Finally, it happens that the lighting designer has to cope with the will of the artist himself. Sometimes, the performer could have a personal chromatic vision of his songs and the designer has to be able to mediate these requests with his own vision of the show.

In addition, according to Craig Rutherford (2020), there are two approaches the lighting designer could use when designing the color palette for a show. The first one is following color associations. Indeed, every color has a cultural meaning and is linked to specific themes. This implies that, by using a certain color of light to a certain song, the topic they both share will be strengthened. The second approach is more shallow since it simply consists of reaching an aesthetically pleasing atmosphere following basic rules of color harmony (Fig. 17). Starting from a color wheel, charming color combinations can be defined (monochromatic colors, complementary, analogus, triadic, tetradic and so on).

As far as color is concerned, the research about how it affects people's mood during a concert is very thin. One of the very first experiments close to this field was "*The effect of red and blue lighting on audience response to a dramatic performance*" conducted in 1964 by Irene Claudette Morton Johnson at Montana State University (USA). The

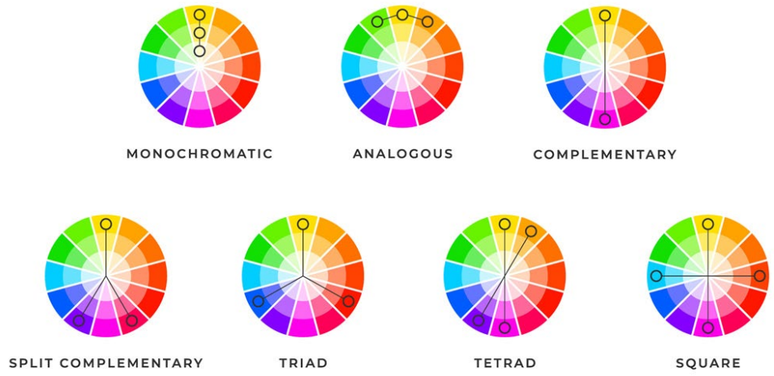
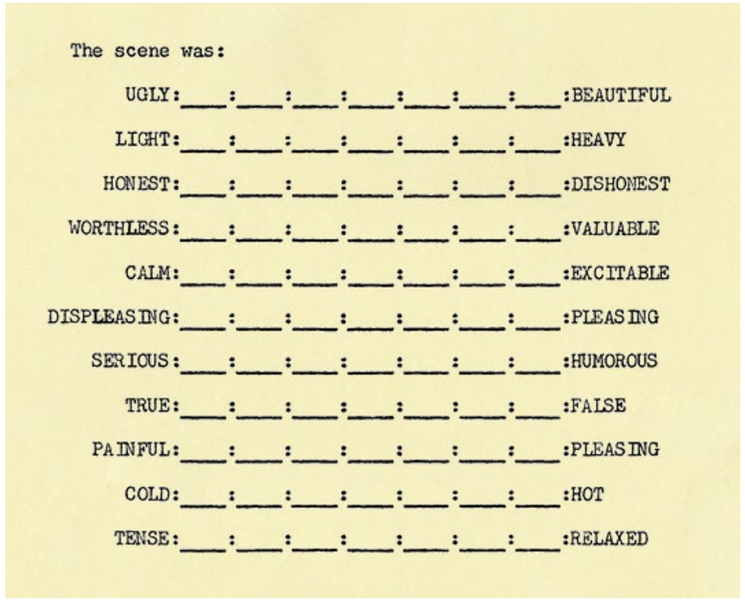


Fig. 17

subject of her study was not a concert but a theatrical representation without any kind of musical background,. Therefore, it is remarkably different from the purpose of this research. Nevertheless, it might still be worth mentioning the results she obtained as they could represent the basis for the development of this section of the thesis. Briefly, the experiment consisted of a scene from "*Shadow of a great rock*" by Dean Regenos repeated 16 times, always with a new audience. The stage lighting was always different: sometimes it was blue, sometimes it was red, and during the remaining trials it was white (warm yellow). At the end, involved subjects were given a scoring sheet on which they had to rate their emotional reaction to the scene they had assisted. This questionnaire was composed of eleven semantic differential associations such a ugly-beautiful, light-heavy, honest-dishonest, and so on (Fig.18). However, the responses she obtained were too varied and the data recorder did not show any scientifically significant results but only tendencies. For example, on the ugly-beautiful scale, people tended to prefer blue to red; on the calm-excitable scale blue appeared to be slightly calmer than red whereas on the cold-hot scale red was remarkably hotter than blue. The other scales did not show any substantial information. The unsuccessful output of this


The scene was:

UGLY:___:___:___:___:___:___:___:BEAUTIFUL

LIGHT:___:___:___:___:___:___:___:HEAVY

HONEST:___:___:___:___:___:___:___:DISHONEST

WORTHLESS:___:___:___:___:___:___:___:VALUABLE

CALM:___:___:___:___:___:___:___:EXCITABLE

DISPLEASING:___:___:___:___:___:___:___:PLEASING

SERIOUS:___:___:___:___:___:___:___:HUMOROUS

TRUE:___:___:___:___:___:___:___:FALSE

PAINFUL:___:___:___:___:___:___:___:PLEASING

COLD:___:___:___:___:___:___:___:HOT

TENSE:___:___:___:___:___:___:___:RELAXED

Fig. 18

study could be due to two main reasons. Firstly, the small amount of people involved, eleven for each trial that is not wide enough to lead to comprehensive considerations. Secondly, the semantic differential scale used to assess one's emotional response was too vague and not universally objective. Indeed, people could interpret differently the idea behind words such as ugly, beautiful, calm, excitable and so on, and that is according to their personal background, culture and experiences. Although the results were not as compelling as expected, M. Johnson still pointed out that colored light does seem to have some effect on the audience during a performance. From this experiment, it can be inferred that colored light might have an emotional impact on the audience during a concert as well and this is what this chapter will investigate.

The study will start with the analysis of the human physiological/ psychological response to colors as well as the symbolic/cultural one in order to understand to what extent the knowledge developed

on these fronts can be used to design the color of light at concerts to purposefully impact the audience. Furthermore, color will be discussed in relation to music. This is because, being lighting for concerts the subject of this research, music cannot be left out. Some studies revealed that there is an actual connection between these two elements, supporting the idea that the color of light actually can be designed according to a specific song.

Further discussion about the relationhip between the color of light and emotions will be discussed in chapter 5 where interviews with actual show lighting designer will bring out a more authentic point of view.

3.1 The human physiological/psychological response to color

Light creates more than mere visual effects. It has been proven that it also has physiological and psychological effects that can impact the health and wellbeing of people. From a biological point of view, it can improve or disrupt our sleep by stabilizing our circadian rhythms, whereas psychologically it can help to decrease depression and increase one's cognitive performance (2020). Not by chance, a space's lighting is often used to evoke specific moods and trigger emotional responses (Whiteley, 2020). Specifically, different colors of light affect human beings a lot on both fronts. Over the time, many studies have been conducted to analyze the impact colors have on our body leading into the discipline of *chromotherapy*. Before deepening this subject, it is critical to explain what light and color are. Light is an electromagnetic radiation, which can be simply described as energy and color is the result of the interaction between this energy and matter. This produces a wavelength that can have different frequency and carry different quantities of energy. According to these values, each wavelengths correspond to a distinct color. The human eye is sensitive to electromagnetic radiation with wavelengths comprises between 380 and 780 nm. This short segment is called the

visible spectrum (Fig.19) (Azeemi & Raza, 2005). The visible spectrum (colors) is the core of chromotherapy, a very ancient discipline, which refers to it to cure diseases. Chromotherapy falls under the category of Complementary and Alternative Medicine System (CAMS) and it is still considered to be a myth by many even though there are reliable scientific studies that confirmed its huge functionality and its minimal or non-existent side effects (Gul, Nadeem & Aslam, 2015).

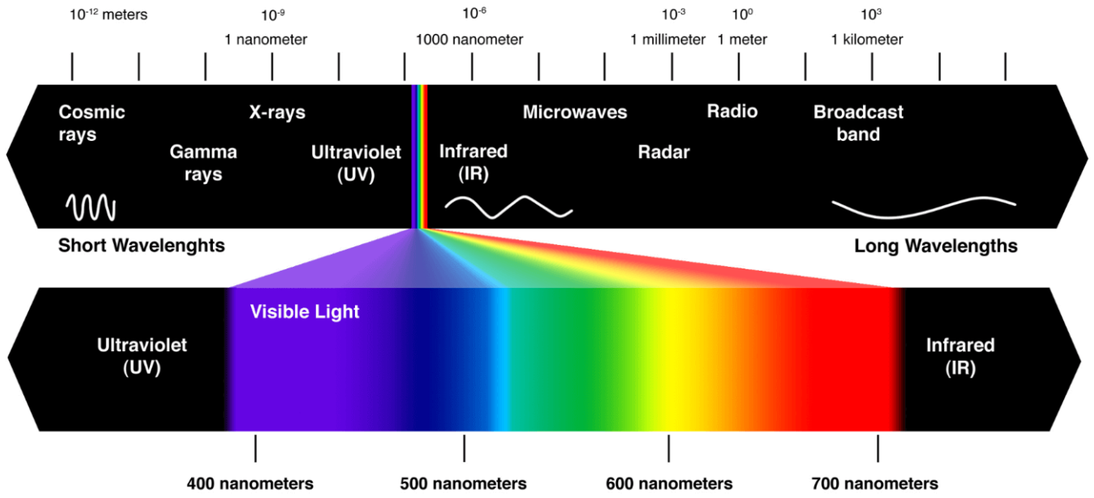


Fig. 19

The starting idea is that every living being is surrounded by light (energy) that affects its health conditions (Azeemi, 1999) and, considering that color is light, it can be assumed that the human body is composed of colors. The body is generated by colors, it is stimulated by them and colors are responsible for its proper functioning (Hassan, 2000). Indeed, previous studies (Azeemi, Raza, & Yasinzai, 2009 and Dray, 2017) which were carried out in this regard, determined that each organ is associated to a particular color that affects the human body

by producing physiological and/or psychological effects. Particularly, each of our organs vibrates with a certain energy harmonizing with the corresponding frequencies of colors. Specifically, for every organs there is an energetic level at which the organ works best. However, it might happen that some parts of the body depart from these expected habitual vibrations (Azeemi & Raza, 2005) and this actively demonstrates that they are experiencing a deficiency or excess of a color (Gul, Nadeem & Aslam, 2015). Any deviation from that vibratory rate results in pathologies, whereas restoring the appropriate energy levels to the physical organs results in a healed body (Klotsche, 1993). To bring these values back to normal, sunlight or artificial lights are used (Gul, Nadeem & Aslam, 2015). As a matter of fact, colors with their peculiar vibrations, when combined with a light source and selectively applied to damaged organs or life systems, provide the necessary healing energy the body requires both on a physical and psychological level (Fig.20).

Precisely, colors generate electrical impulses and magnetic currents that activate the biochemical and hormonal processes in the human body, the stimulants or sedatives necessary to balance the entire system and its organs (Azeemi & Raza, 2005). Consequently, it can be said that body pathologies can be treated by chromotherapy (O'Connor, 2011) and various studies have proven the effectiveness of color on some body diseases. By way of illustration, red was successfully used to cure breast cancer and hematoma; a combination of various light colors was used to heal hepatitis B; hyperthyroidism with blue and violet light; leishmaniasis with blue and red; and much more could be said about this (Gul, Nadeem & Aslam, 2015). As far as psychological effects of colors are concerned it emerged that colors are really beneficial for man on that front as well (Mayer & Bhikha, 2014). For instance, it is used to heal Post Traumatic Stress Disorder [PTSD], a severe psychological traumatic condition that consists of series of painful and uncontrolled flashback in the patient (Gul, Nadeem & Aslam, 2015). This was achieved by applying yellow laser light at a sensitive part of the ear. After just one minute of exposure the negative memories disappeared altogether and at the same time negative emotions decreased as well (Asis, Yoshizumi, & Luz, 2012). In addition, green light is satisfactorily used to cure mental pathologies

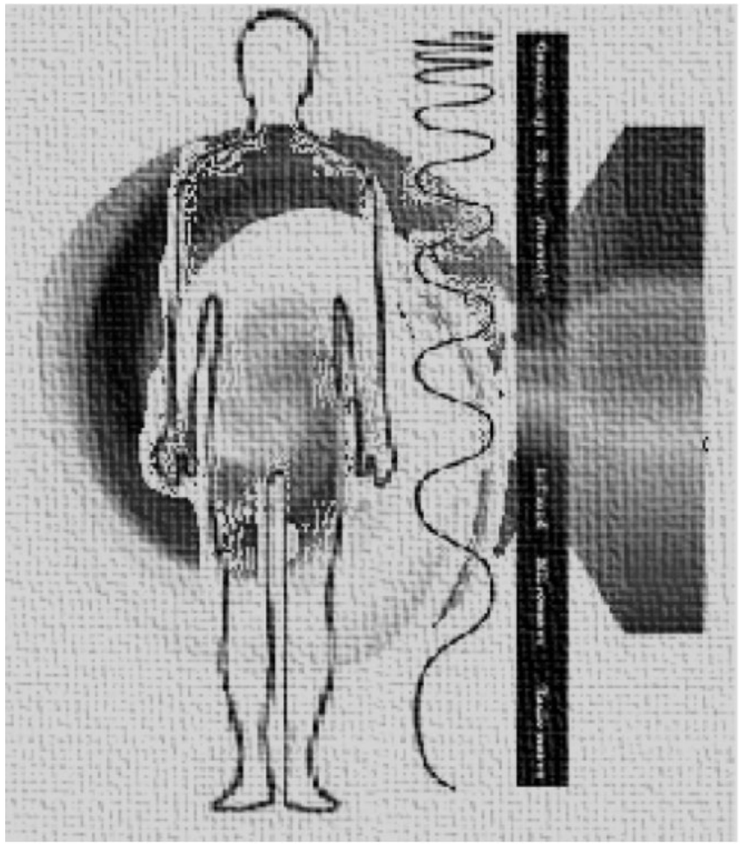


Fig. 20

such as depression and stress (Gul, Nadeem & Aslam, 2015).
Chromotherapy is definitely much more than just these examples mentioned. However, deepening this knowledge would move to another direction compared to the intention and objectives of this research. Indeed, when it comes to concerts, light is not used to heal any ailments but to arouse emotions in the audience. In addition, concert lighting is usually very dynamic and variable in terms of intensity, speed, color and much more. This implies not only that the radiation is not constantly directed to a specific body portion of one random person in the audience, but also that the exposure to that radiation is not long enough (to heal whatever kind of pathology).
From this point of view, chromotherapy is not much relevant to this research. Yet, this discipline also defines some more general aspects for each color that, on the contrary, could be considered useful for the purpose of this work.
For instance, *red* is a “very warm” energy. It has a stimulatory effect that leads to excitement by increasing blood pressure, breathing and heart beats.
Orange has a “warm” energy, since it derives from red, but they do not share the same level of excitement. However, it still has a cheerful and energetic effect on people increasing happiness, enthusiasm and optimism. It relaxes muscles, stimulates the heart rate and helps lungs to expand.
Yellow, again, is associated with “warm” energy but it is much lighter than red. Consequently, it is more suggestive than stimulating. It increases alertness and leads to joy, conscious lucidity and extroversion.
Green has a “neutral” energy since it is in the middle between cold and warm colors. As a result, it leads to balance, not by chance it is considered to be the therapeutic color par excellence. It restores the general well-being of one’s body reducing stress and anxiety. It is the most restful color for the human eye.
Blue corresponds to a “cold” energy and it works the other way around compared to red. In fact, it induces calm and relaxation by decreasing blood pressure, breathing and heart beat.
Indigo, which again features “cold” energy, expands one’s comprehension and purifies blood. It favorites intuition.
Finally, *violet* is part of those colors that spread “cold” energy as well. It is the most energetic wavelengths out of the visible spectrum. It increases the production of white blood cells and, similarly to blue, reduces the heart beat favoring brain microcirculation (2020).

3.2 The symbolic/cultural response to color

Using specific colors is one of the easiest ways to set the mood on stage. Colors convey emotions, and this is the core of the psychology of color. There are two main typologies of association when it comes to the communicative properties of color: they can be either natural or cultural. Natural associations are universally shared as we all tend to perceive colors in the world and directly label them. For instance, light blue is generally related to the sky or to the sea for most individuals whereas green reminds people of grass and plants (Fig.21) (Bell, 2013). As far as cultural associations are concerned, things are a bit more intricate as culture is not universal. Indeed, author and color consultant J. Morton stated on her website Color Matters (2011) that we all perceive colors differently as a consequence of our own social and cultural conditioning. Particularly, because of their use throughout popular culture, certain colors are more likely to evoke particular emotions and concepts than others. According to Craig Rutherford (2020), when a lighting designer starts developing the color palette for a concert he has to take into account the audience he is designing for and their culture.
The meaning of some colors has stayed constant throughout history, whereas others have changed notably. However, for the objective of

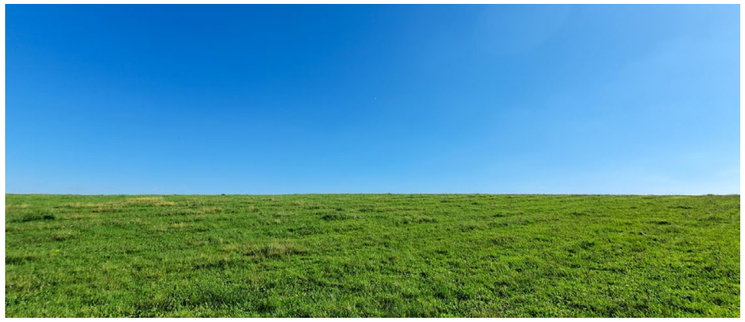


Fig. 21

this research, only the current meanings will be discussed regardless of their historical variations.
Red is a very intense color, so are its related meanings. It usually stands for erotic feelings such as love, passion, warmth, desire and to indicate danger (high-voltage signs, traffic lights, stop signs are all red) (Fig.22a, 22b). It is also associated with energy, excitement, power, battle, aggression and blood. Its meaning is considerably different in Eastern cultures where it represents wedding, even though in recent times, due to the Westernization process, brides are starting to wear white dresses.

Fig. 22a

Fig. 22b

Yellow is one of the most vibrant colors of the visible spectrum. That is why it is connected to happiness, joy, optimism, idealism. However, according to certain context it can also acquire shades of sickness, jealousy and betrayal. Particularly, this color is extremely important to the Hindu religion where it represents knowledge and learning.
Being the mix of red and yellow, *orange* combines the energy of the former and the happiness of the latter. It stands for fire, energy, enthusiasm, attraction, pride and ambition. In Ireland, it has a strong political and religious significance.
Western culture associates *green* to safety, opposite to red. Not by chance it is the color of free passage in road traffic. It is also the color of good luck, health and hope. It also has some negative significance such as envy and jealousy. In the United States it recalls the idea of money (dollars are green), in China it is associated with infidelity and in Ireland with religion.
Blue (as well as its lighter hues) is the expression of tranquility and

calmness. It also suggests harmony, confidence, trust and stability. Nonetheless, in specific situations it indicates sadness and depression. In the Middle East, protection is its first semantic attribute.
Purple combines the stability of blue and the energy of red. Together with the idea of magic and mystery, in Western countries it is strongly associated to royalty, nobility and luxury. Allegedly, this association is the result of the high unavailability of purple dyes back in the ancient world with the exception of Tyrian purple (Fig.23), also known as Phoenician purple. This particular color was obtained with much difficulty from rare species of sea snails that are found in the eastern Mediterranean Sea. Once manufactured, it was generally reserved to nobles and royals.

Fig. 23

Magenta represents spirituality and femininity.
White is considered to be the color of perfection par excellence. As opposed to black, white usually has a positive connotation. Indeed, it suggests purity, innocence, elegance, winter and marriage. However, in the Japanese and Chinese cultures it assumes negative shades: it represents death, misfortune and funeral.
Finally, *black* is the color of sadness, unhappiness, mystery and, only in Western cultures, death (Rickard, 2018). Black might appear out of

place when speaking about lighting design. However, it is the color that people commonly associate to shadows, and shadows have to be considered as important as light, since they can be a useful tool to set the mood on the stage.
Craig Rutherford (2020) said that color associations can be one of the methods the lighting designer can follow when designing a color palette for a show to reinforce the theme of a song. However, he underlines how these are associations only. Indeed, colors themselves do not have any intrinsic meaning. For instance, yellow is the color of gold, but it can be associated to bananas or rubber duckies as well. That is why they always derive their significance from the context or situation. This means that, in order to be successful in communicating the idea behind a particular color during a song, a plausible context needs to be given. Indeed, the lighting designer cannot assume that his personal color association will work across cultural lines, particularly if there is no context.

3.3 Music and color: two stimuli connected by emotions

The show lighting designer could be defined as an avant-guard painter (Dawood, 2019). Indeed, he literally paints music in the atmosphere using light trying to give a visual appearance to something that exists just for our ears. It is well established the music conveys emotions and, the previous pages have shown that human beings do have an emotional response to colors as well. Over time, researchers have tried to pinpoint systematic connections between music and color. Reportedly, the most direct link comes from the phenomenon of music-to-color synesthesia (Ward et al.). Synesthesia is a neurological condition in which information that is supposed to simply stimulate one of a person's senses, stimulates several of them. Those who experience this condition are called synesthetes (Watson, 2018). As

far as color and music are concerned, there is a small minority of people who see colors while listening to music. Among them, there are also some renowned artists such as Kandinsky (Fig.24, *Composition 8*, 1923) and Klee (Cytowic & Eagleman). However, nonsynesthetic people have music-to-color associations as well but they do not actually see colors while hearing music. In this regard, many studies have been conducted providing evidence that many non-arbitrary correspondences do exist between auditory and visual stimulus in nonsynesthetes (Lindborg & Friberg).

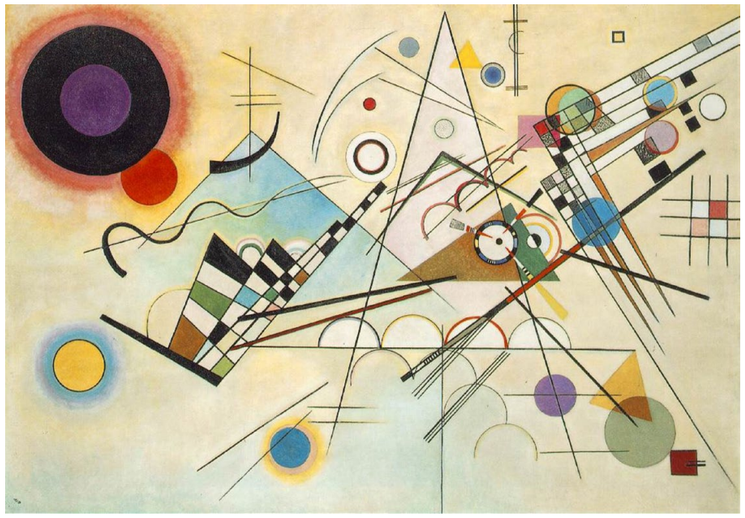


Fig. 24

3.3.1 *"What is the color of that music performance?"* - R. Bresin, 2005

In 2005, Bresin run a test to determine a graphical non verbal representation of expressivity in music using color as index of emotion. The subjects involved had to determine how well each of the 24 colors presented corresponded to each of 2 classical songs performed with twelve different emotional intentions (such as happiness, love, pride, anger and so on) and played with 3 different instruments (piano, guitar and saxophone). In total, they assisted 72 performances (2 x 12 x 3). The color palette was developed by sampling parameters in HSL color space (Hue, Saturation, Lightness). He used 8 colors (red, orange, yellow, green, cyan, blue, violet, and magenta) and their bright and dark versions, for a total of 8 x 3 colors (Fig. 25).

Color	Hue	Saturation	Brightness
red	0	1	1
dark red	0	1	0.5
light red	0	0.5	1
orange	0.083	1	1
dark orange	0.083	1	0.5
light orange	0.083	0.5	1
yellow	0.166	1	1
dark yellow	0.166	1	0.5
light yellow	0.166	0.5	1
green	0.333	1	1
dark green	0.333	1	0.5
light green	0.333	0.5	1
cyan	0.5	1	1
dark cyan	0.5	1	0.5
light cyan	0.5	0.5	1
blue	0.666	1	1
dark blue	0.666	1	0.5
light blue	0.666	0.5	1
violet	0.749	1	1
dark violet	0.749	1	0.5
light violet	0.749	0.5	1
magenta	0.833	1	1
dark magenta	0.833	1	0.5
light magenta	0.833	0.5	1

Fig. 25

Bresin examined the results obtained and noticed some correlations between the emotional intentions and the ratings of HSL color

parameters. Particularly, he discovered that positive emotions (music in minor mode[5]) were associated with brighter colors (high lightness value), whereas negative emotions (music in major mode[6]) with darker colors (low lightness value). Despite this was not the first study on this topic, it is considered by Lindborg and Friberg (2015) as one of the firsts that led to reliable results thanks to the methodology involved. However, Bresin himself pointed out a limitation of his study. Indeed, it emerged that the results were excessively influenced by the timbral qualities of the different instruments. Furthermore, Lindborg and Friberg (2015) underlined that the color space used (HSL) is a simple transformation of RGB color space. Therefore, its dimensions are perceptually confounded for the human eye and many statistical operations are not justifiable on HSL values.

3.3.2 *"Music–color associations are mediated by emotion"* - Palmer et al., 2013

Further consistence to this studies was given by Palmer and collaborators in 2013.
The two most plausible hypotheses related to music-to-color association in nonsynesthetes are (i) *direct link* and (ii) *emotional mediation*. According to the former (i), there are direct associations between the perceived properties of musical sounds and visual colors (e.g., Caivano, 1994; Pridmore, 1992; Wells, 1980). Particularly, Caivano (1994) found direct connections between the octave-based musical scale and the hue of a color, loudness and luminosity and finally timbre and saturation.
Nonetheless, Palmer's research output gave more substance to the (ii) emotional mediation hypothesis. This suggests that color and music are connected indirectly through common emotional associations (Barbiere et al.). During the experiment, participants were meant to listen to 18 50s-samples of orchestral music that featured different tempo (slow/medium/fast) and mode (major/minor). Meanwhile, they were visualizing a 37-color array and were asked to select the five colors they believed were most consistent with the music and

5. sad-sounding music
6. happy-sounding music

then the five colors that did not get along with it. The color palette features 37 colors of the Berkeley Color Project (Schloss et al.) (Fig. 26). It consists of four unique hues (red/green/blue/yellow), plus four intermediate hues (orange/ chartreuse/cyan/purple). These 8 hues are proposed 4 times. Firstly, they are maximally saturated (S). Secondly, they are muted (M) with colors being halfway between each S-color and neutral-gray. Thirdly, they are light (L) with colors being halfway between each S-color and white. Finally, they are dark (D) with colors being halfway between each S-color and black. They also included black, white, and 3 nuances of gray to balance the composition.

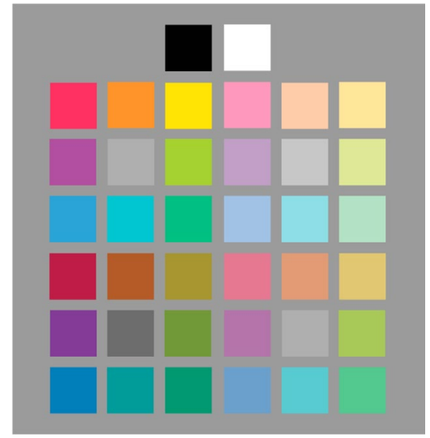


Fig. 26

The selected subjects were both from US and from Mexico. The results showed significant associations between music and colors. Specifically, more saturated, lighter and yellower colors were matched with faster music in the major mode. Conversely, slower music in the minor mode was paired with more desaturated, darker colors verging to bluish hues. Additional experiments gave strong support and demonstrated the emotional association hypothesis. It follows that, people tend to link music to color based on shared emotional content. For instance, happy-sounding music would be matched with

happy-looking colors and so on. Finally it is significant to report that the Mexican data were almost the same as the US data. This finding implies that some degree of universalization across different cultures is guaranteed. Yet, the strength of this generalization is uncertain due to the fact that Mexicans still have wide exposure to Western music (Whiteford et al., 2018).

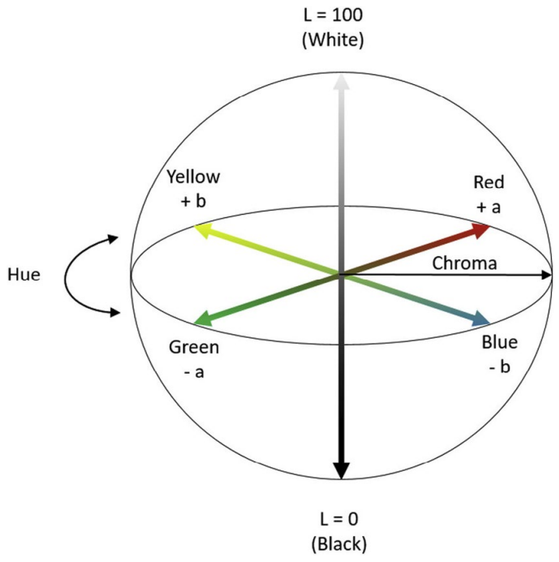


Fig. 27

3.3.3 *"Colour Association with Music Is Mediated by Emotion: Evidence from an Experiment Using a CIE Lab Interface and Interviews"* - Lindborg & Friberg, 2015

Most of the studies carried out on this front, had some limitations as far as colors are concerned. In the first place, the number of color options was usually very small and never covered the huge amount of colors human eyes can perceive. Moreover, the tests always presented color schemes in parallel or in Mondrian-style patterns and subjects had to choose one by clicking on it. However, this method has some negatives. The first one is that the distribution of the color patches might cause spatial bias. The other is that the concurrent presentation causes contrast effect (Whittle, 2003) and the appearance of a color patch is influenced by nearby patches (Hansen et al., 2009).

A solution to this problem was given by Lindborg and Friberg in 2015. They designed a totally new response interface that provides a broad selection of colors. In addition, they used the CIE Lab color space (Fig.27) that is designed to approximate human vision (Hoffmann). This color representation model consists of three orthogonal dimensions: L* (Lightness, dark-to-bright), a* (green-to-red), and b* (blue-to yellow). The researchers were also interested to include the size of the color patch since a correlation between visual size and the loudness of music extracts emerged from previous studies (Lipscomb & Kim, 2004). However, results related to this fourth parameter will not be considered for the aim of this research since the size of color patches do not relate to any lighting feature.

To fulfill these requirements, on the screen users were presented with a single color patch whose aspect could be constantly manipulated using a tablet and a joystick (Fig.28). Subjects were also provided with a pen they used to move on the tablet: particularly, the (x, y) contact

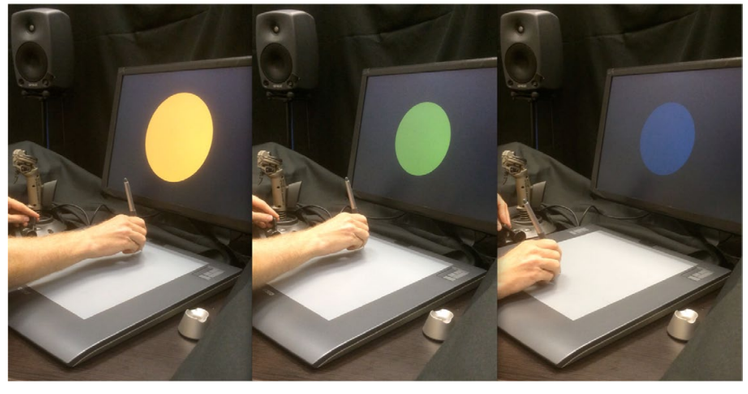


Fig. 28

point is mapped to a point (a*, b*) in CIE Lab color space. The pressure of the pen on the tablet increased the size of the color patch and by moving the joystick changes in color Lightness happened. Thanks to this method, users could choose between 98,553 different colors without any kind of spatial bias, any incongruousness with human perception and any contrast effect. Specifically, 19 participants were presented with 27 music excerpts (Eerola & Vuoskoski, 2010) derived from movies they were predominantly unfamiliar with and they were asked to assign a color to each of these tunes. The study associated these songs both with discrete emotion (Anger, Fear, Happy, Sad, Tender) and, for one of first times as far as this kind of studies are concerned, with dimensional emotions (Valence, Energy, Tension) that range from low to high values. The introduction of dimensional emotions gives this study more reliability compared to the previous ones. Indeed, whether discrete emotions might be intended differently by people of varied cultures and different backgrounds, dimensional emotions rely on ideas that are globally understood.

As regards discrete emotions, data obtained indicate that happy-sounding music was linked to much lighter (L* = 58.1) colors than Anger, Fear and Sad music. In addition, these extracts were associated with more yellow (b* = 31.4) colors than Tender, Fear, and Sad music. Likewise, Anger music tended to be matched with more yellow colors (b* = 22.5) than Tender and Sad music, and with much more red (a* = 27.5) music than Tender (Fig.29). No other discrete emotion difference showed compelling results. This outcome confirmed previous studies that considered discrete emotions.

As far as dimensional emotions are concerned, noteworthy data resulted. Most notably, low-valence music (which people perceive as unpleasant) was primarily matched with reddish (a* = 39.5) and yellowish (b* = 18.8) color patches. Low-energy music (which people

	Anger	*Fear*	*Happy*	*Sad*	*Tender*
Lightness	43.2	37.2	58.1	40.8	50.0
a*	27.5	15.1	14.4	9.1	5.6
b*	22.5	2.2	31.4	-6.7	-11.2

Fig. 29

	Valence		*Energy*		*Tension*	
	low	*high*	*low*	*high*	*low*	*high*
Lightness	41.1	53.5	46.5	60.5	54.9	34.5
a*	39.5	10.7	-9.6	8.7	7.7	-9.2
b*	18.8	-5.4	-2.3	17.9	7.6	-1.4

Fig. 30

perceive as either relaxing or dull) was associated with darker color patches (L* = 46.5) tending to blue (b*= -2.3). Finally, low-tension music (which people perceive as easy-going) was linked to lighter colors (L* = 54.9) (Fig.30).

By comparing discrete emotions and dimensional emotions outcomes (Fig.31) some considerations can be made. Especially, unpleasant music (see low valence value) similarly to Anger music tends to dark red colors. The correlation gets even stronger when it comes to low and high energy. Indeed, by associating these dimensional emotions to the discrete emotions that were matched with the same colors, it derives that low energy music corresponds to Sad music (both tend primarily to blue, followed by green), whereas high energy music is linked to Happy music (both tend primarily to yellow, followed by red). In contrast, evidence shows that there is not a strong correspondence between dimensional emotion tension and discrete emotions.

3.3.4 *"Color, Music, and Emotion: Bach to the Blues"* - Palmer et al., 2018

The most recent and complete study in this field was carried out again by Palmer and collaborators in 2018. Specifically, this new test explored extremely larger and more varied samples. Indeed, people had to listen to 34 musical excerpts that covered 34 different genres (which were never mentioned to users) such as Arabic, Blues, Salsa, Country, Heavy metal and so on. Again, people were asked to match

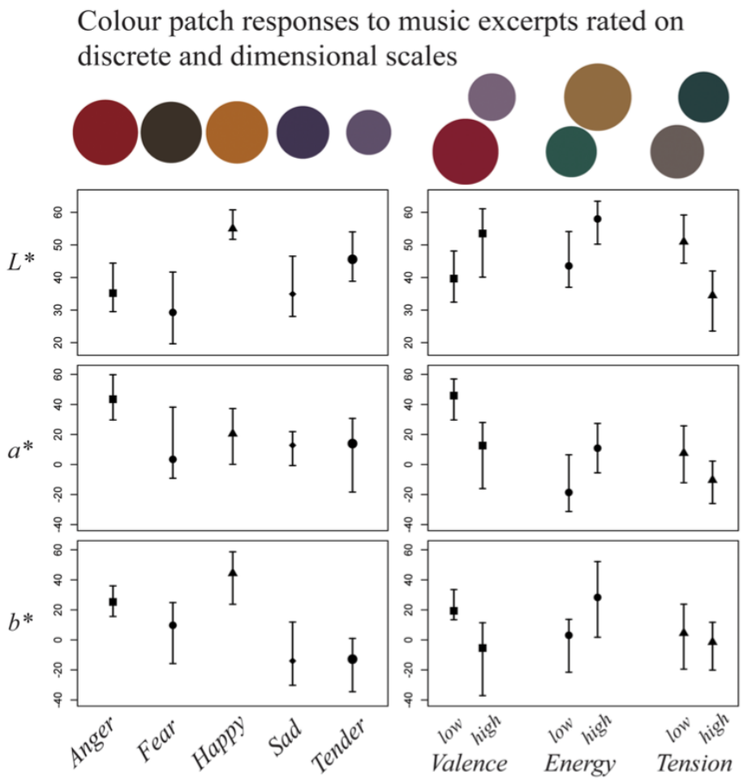


Fig. 31

3 colors (in 2013 they were 5, but they figured out 3 were enough) out of the 37-color scheme of the Berkeley Color Project (Fig.26) (Schloss et al., 2011) to the fragments of songs they were most consistent with and 3 colors they were least consistent with. This new experiment was much more detailed compared to the previous one developed by the same authors (Palmer et al., 2013). Indeed, this time it investigated both the direct link hypothesis and the emotional mediation hypothesis (see

par. 3.3.2). Both hypotheses were confirmed. Yet, the study proved that music-to-color associations are primarily mediated by emotions (music -> emotion -> color) rather than direct (music -> color). They used a more conclusive methodology than previously employed (Whiteford, Schloss, Helwig, & Palmer, 2018) based on just two dimensional emotions: (i) arousal (or activation), which comprehends the concepts of energy and tension used by Lindborg and Friberg in 2015, and (ii) valence (or pleasure) (e.g., Mehrabian & Russell, 1974; Russell, 1980; Russell & Barrett, 1999). Particularly, the music-emotion ratings (music weights, Fig.33a) and the color-emotion rating (color weights, Fig.33b) were performed independently (this means that each song and each color were given a value for arousal and a value for valence in order to be placed on Russell's two-dimensional emotion model (Fig.32).

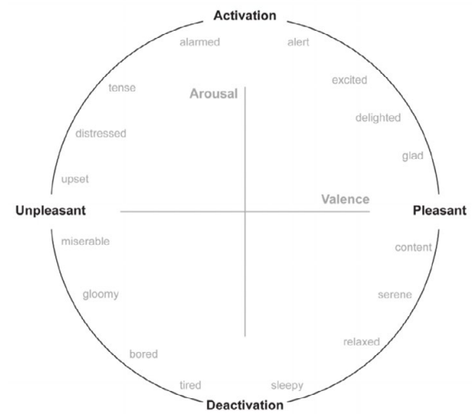


Fig. 32

Likewise, discrete emotions (happy/sad, calm/agitated, appealing/disgusting and so on, which were used during the first part of this experiment) were evaluated as well following the same process (emotion weights, Fig.33c). It resulted that dimensional emotions of colors and music were very similar. For instance, by weaving Fig.33a, Fig.33b and Fig.33c , it emerges that happy-sounding music (very high

valence value and high arousal value) corresponds to highly saturated colors tending to yellowish and reddish nuances and Salsa is the music genre that covers the same range of values as far as valence and arousal are concerned. In contrast, sad and serious-sounding music (very low valence value and low arousal value) makes up for more desaturated colors tending to green and blue. Not by chance, on the front of music-emotion ratings these values oscillate among Piano, Blues and Smooth Jazz music (Whiteford, Schloss, Helwig, & Palmer, 2018). Finally, the importance of this study does not primarily lie on the discovery of new correlations between color and music, but on the strength of the deeper approach they used that confirmed the results of previous studies with extremely high reliability.

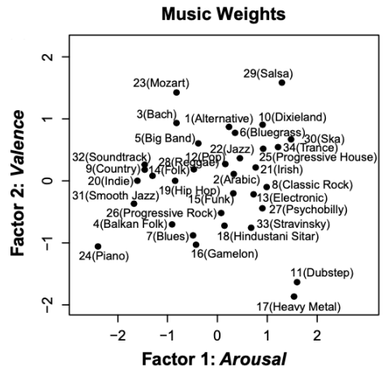


Fig. 33a

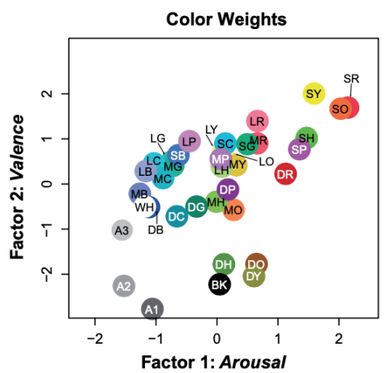


Fig. 33b

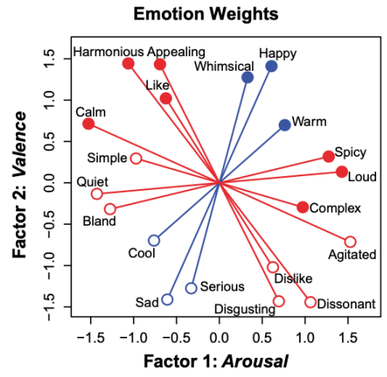


Fig. 33c

3.4 Music, color and show lighting design: an automatic light regulation system

It is clear that a connection between colors, music and emotions does exist. This prompts the question, can these studies be applied to the show lighting design? An answer that could match this question arrives from Taiwan where a group of researchers (Hsiao, Chen, & Lee, 2017) developed an automatic lighting regulation methodology based on music emotions to trigger particular feelings and affect the excitement level of the audience of a club. Substantially, they used statistical methods to develop algorithms that pair music to colors according to shared dimensional emotions. Indeed, both elements were described on a two dimensional emotional structure, based on arousal and valence. Particularly, when it comes to emotions, this approach results convenient for a computational model instead of using an endless list of discrete emotions. According to this pairing, the regulation system converts a digital signal to a DMX signal, and finally produces the full colored beam of light. In addition, the algorithm developed a list of average color spectrum for each music genre (Fig.34)

As anticipated, this automatic lighting regulation methodology was designed for club lighting that works with a *music-to-light* controller. It means that light features automatically change to the rhythm of music. This is extremely different from what happens in the stage

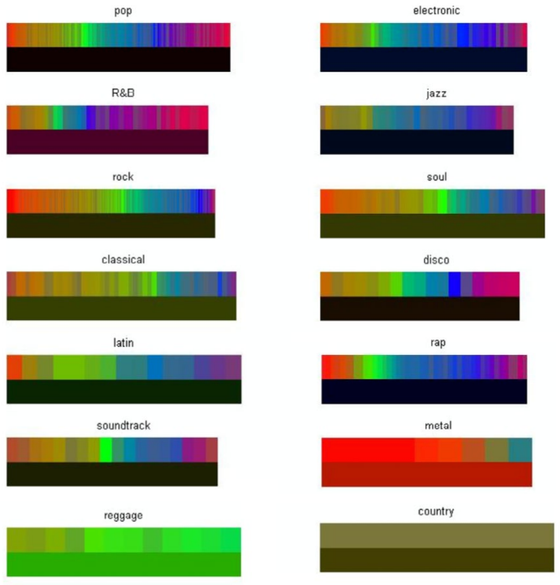


Fig. 34

lighting design process where programmers define each and every parameter and movement of each single lighting fixture to obtain an elaborate result. Yet, the aspect of this project that is relevant for the development of this thesis and gives support to it, is that the connection between music, emotion and color was translated for the first time into a luminous output that was meant to enhance the experience of people dancing to a certain song.

3.5 Results

Lighting designers and people who work at concerts have confirmed that color enhances the overall emotional reaction of people during a live show (Steven Hall, 2017; Ishoyor, 2018; Whiteley, 2020; and others). It is also clear that there are many elements that drive the lighting

designer's choices of colors such as his sensitivity developed during years of experience, the materials of the set design or, sometimes, the will of the artist. Moreover, Craig Rutherford (2020) suggests that when pairing light to music it can be done either trying to obtain an aesthetically pleasing result or following colors associations. This implies that, to reinforce the emotional response to a song, it should be matched with colors that share similar meanings to that song. However, this might be tricky since the meaning of colors changes across cultures.

The research highlighted a series of studies (Bresin, 2005; Palmer et al., 2013; Lindborg & Friberg, 2015; Palmer et al., 2018) that discovered an existing emotional association between music and colors. And, considering that light has to be paired with music at concerts, it is legit to think that these studies can be applied to stage lighting design to improve the emotional reaction of people. This deduction is also strengthened by a study (Hsiao, Chen, & Lee, 2017) that developed an automatic light regulation system for club lighting that matched the color of light to music according to their shared emotional intent. Particularly, Palmer (2018) considered Russell's emotional model as a proper way to effectively show the correlation between colors and music based on dimensional emotions (valence and arousal). Generally, it emerged that happy-sounding music, which is very high both in valence and arousal, corresponds to highly saturated colors (oscillating between yellow, orange and red). Conversely, sad and serious-sounding music, which tends to low values of both valence and arousal, corresponds to more desaturated colors (moving between green and blue). In addition, by weaving this result with the physiological/psychological response of human body to color (chromotherapy), it follows that happy-sounding music would be matched with those colors that increase the heart rate and blood pressure, whereas sad and serious-sounding music would be matched with those colors that decrease the heart rate and blood pressure. This suggests that, by following music to color association when designing light, the show lighting designer can actually trigger a reaction in people arousing emotions.

These results will be better discussed through interviews with show lighting designers in chapter 5, right after investigating people's emotional response to the second aspect of light: its movement.

4

The movement of light

The second attribute of light that this research aims to investigate is its movement. In the previous chapter many studies were illustrated showing that the research about how colors affect our emotions is terribly wide. Although those studies are not directly related to stage lighting, we can somehow transpose them into this field. When it comes to the movement of light, the same could not be said. Indeed, the scientific research about the human responses to production lighting is scarce, at the very least, with incoherent results. However, it is a fact that stage lighting designers use moving lights to effectively pair the songs, creating the proper atmosphere, and matching the "right" emotions at the right moment (McDonough, 2018). In this regard, Ben Stowe, a production designer working for Church Production, said (2018):

> *"[...] the ability to direct and move a focused light in time can reach people on a profoundly different level."*

Before digging into this topic, it is important to specify that when I refer to the motion of lights in this chapter, I also include the movement that can be obtained by playing around with some other features of moving heads (not only to tilt and pan) such as their intensity, rotating gobos

(Fig. 35), rotating prism and so on. As far as the intensity is concerned, movement can be generated by dimming light with different speeds. For instance, if dimming is extremely fast, then it somehow results in an exciting strobe effect. In contrast, if it is slow, it will create a calming and smooth dance of lights. This, despite the actual movement of the lighting fixtures.

Fig. 35

Ufana Ishoyor (2018) clearly pointed out that there are certain preferences that the show lighting designer unconsciously makes while designing the movement of lights during concerts. By way of illustration, if the artist is going to perform hip hop or rock, it is better to utilize bright, flashing lights that move to the beat of the music. He says "*this is like putting fuel into burning flames*" directly suggesting that the movement of light does enhance and affect the experience of people during a concert intensifying their emotions. In contrast, if the music is slow, it should be paired with still light in order to induce calm in the audience. Finally, as far as solo performances are regarded,

it is most preferably to use a still spot light that creates a magical effect sending people's attention to the artist performing. Indeed, in this regard Stowe (2018) said:

> *"Just because you have a light that moves doesn't mean you have to move it."*

It follows that those productions that employ moving lights can play with them (or not) in order to attract more or less attention.

4.1 Psychological effect of moving lights

An instructional manual for how to design light at concerts does not exist. That is why most of the time it is an artistic intuition that guides designers in their creative process. However, understanding the response of our mind to visual sensory information can demonstrate why the motion of lights affects people so much (McDonough, 2018) adding a huge value to a production. In addition, it can help designers to design it with a more "scientific" approach. In this regard, Professor David Jacques, Head of Stage Design at the Department of Theatre Arts at California State University (Long Beach), said (2017): "*When lighting moves there is clearly a different response — a psychological effect."*

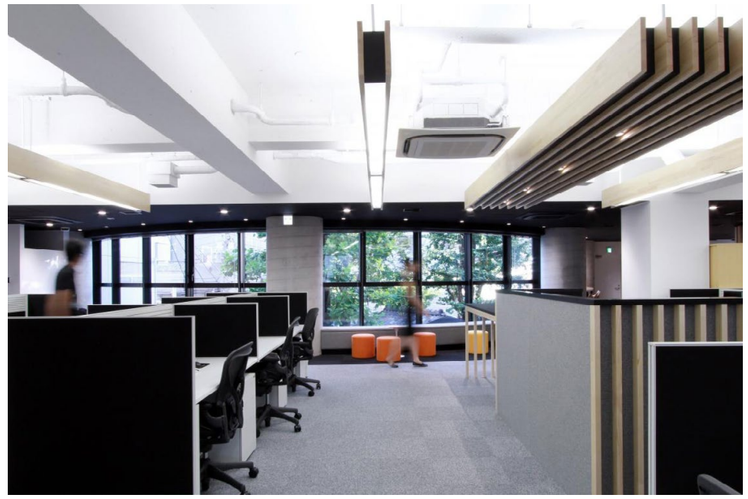
Human responses to light movements and changes are tied to the perception we have of the surrounding environment. According to Fuchs in "The ecology of the brain" (2018), our brain is an organ that mediates between the environment and the body intended as perceptive and receptive unit. Particularly, there are some built-in reactions to visual and audio stimuli that have developed throughout ages. For example, fast movements in the environment make us to

be more alert in preparation of something unexpected that could be dangerous. In contrast, slower motions make us feel at ease and able to rest. This theory works for every kind of environment and situation. This suggests that people will react differently whether the movement of lights during a concert is fast or slow.
As anticipated, the information that is needed to understand how the human mind reacts to stage lighting is too thin to elaborate an accurate discourse. However, at the moment science provides some clues that, although developed for other purposes, might be relatable to the field of investigation of this research. Particularly, architectural lighting has developed a remarkable literature on the psychological impacts of lighting. In addition, useful insights come from an analysis Robert Davis, director of Product Innovation & Marketing at LiteControl, made in 2013 where he examined lighting beyond considerations of task performance. Indeed, he explored how lighting can help generate excitement in an environment or situation, which is very close to stage lighting (McDonough, 2018).

4.1.1 Psychological impact of lighting in architecture

Lighting is considered one of the most important services in every kind of architecture. Indeed, it is essential for it to be designed properly in order to let people carry out their activities with effectiveness, efficiency and comfort (So & Leung, 1998).
Many studies and experiments have demonstrated the influence light has on the perception people have of spaces and how it affects one's behavior (DiLouie, 2014). For instance, a research (Taylor & Socov, 1974) illustrated that subjects tend to move toward light. Particularly, users were asked to enter a room by going around a space divider. When the left side was darker, they tended to go right. In contrast, when brightness was increased on the left, more people tended to go left. It is clear that light exerts a potent psychological impact on people

(Bernecker, 2013). In this respect, it is not possible not mentioning the work of John Flynn and his colleagues whose wide body of work documented and understood the full range of human psychological impacts of lighting (Davis, 2013).



Lighting in offices should always be colw white because it makes people more productive compared to warm white lighting.

Fig. 36

Notably, Flynn (1979) analyzed people's reactions to light by determining which of a range of subjective impressions related to architectural settings were affected by changes in the lighting stimulus. He noticed that some of these impressions such as spaciousness, visual clarity, privacy, pleasantness, relaxation and complexity were affected significantly by lighting changes. By linking lighting to these impressions, he somehow demonstrated that the former remarkably affects human experience beside being a simple enabler of task performance (Davis, 2013). What is more, he investigated which were the attributes of light whose changes produced those reactions. It is a matter of stimulus and response. He established four of these features that he defines as "lighting modes" (or approaches). These modes

consist of dimensional values that oscillate between two extremes. They are: *bright/dim, uniform/non-uniform*, *central/perimeter*, and *warm/cool*. Changing the lighting stimulus along these dimensions will determine an alteration in the human response in terms of the subjective impression considered which, as a consequence, is reinforced (Flynn et al., 1979). Basically, these lighting modes are the main parameters of lighting that designers should manipulate to generate the environment they have in their minds. For instance, these studies imply that a bright and uniform lighting design of a space will affect the subjective impression of visual clarity (DiLouie, 2014) or that a non-uniform and warm-tone lighting on the perimeter surfaces of a space will reinforce the feeling of relaxation (Davis, 2013).
A great deal of designers has actually found that the link between the four lighting modes and people's subjective impressions can be a useful characterization of the stimulus and reactions to that lighting design that goes beyond the simple fulfillment of a visual task. This is the reason why Flynn's work can be considered relevant to this research.

4.1.2 Psychological impact of lighting beyond considerations of task performance

The deduction that changes of the visual stimulus in one's environment determine a foreseeable response goes much further with Robert Davis (2013). Indeed, he is the very first one who intentionally tried to understand and examine lighting design that goes beyond considerations of task performance (McDonough, 2018). In his white paper, Lighting Psychology: Cognitive and Emotional Responses to Lighting he matched up various psychological theories (including the aforementioned studies by Flynn) to provide insights on how lighting designs are perceived in those contexts where light has to create excitement. Particularly, being well-aware that the existing research about the human response to lighting design is limited to the visual task performance, he looked outside the industry of lighting to the wider

fields of environmental cognition and human emotional response as these still relate to light (Reiff, 2020). His aim was to investigate these fields in order to find connections that help to build up a framework for a more holistic view of lighting's effects on people in varied situations. Among the studies he went through, there is the work of Rachel Kaplan and Stephen Kaplan (1989) who attempted to define which are the factors that drive human preference for certain environments. They say that when people find themselves in a new environment, their primary objective is to make sense of it looking for cognitive matches for that environment in their memory. An environment that has a high degree of familiarity determines a pleasant and comfortable reaction (it is easy to make sense of it). In contrast, an environment that people perceive as unusual would normally generate a feeling of disconcert (it is hard to make sense of it). The factor that relates to our ability to make sense of the surrounding is defined coherence. Kaplan and Kaplan research was mainly focused on outdoor environments. Yet, they acknowledged that coherence is somehow linked to lighting effects as well. Indeed, they (quoted in the Davis paper) found that: *"It is also important that a change in texture or brightness in the visual array is associated with something important going on in the scene. In other words, something that draws one's attention within the scene should turn out to be an important object or boundary . . . If what draws one's attention and what is worth looking at turn out to be different properties, then the scene lacks coherence."* This means that if an alteration in brightness that is not linked to anything essential in the visual scene occurs, coherence (and thereby a person's preference for the space) will decrease because it will be harder for people to make sense of the space. However, sometimes it happens that new environments determine the "wow" factor. Indeed, in this case the peculiarity and unfamiliarity of that environment were stimulating and thrilling. In contrast, it can happen that the high familiarity of an environment leads to low preference. This is because together with our desire to make sense of our surrounding in determining our preference, there is a second factor: complexity. Finally, it can be said that one's preference for an environment is determined by different levels of coherence and complexity (Fig.37).
Another work that Davis took into account is that of James Russell, an

	LOW Preference	HIGH Preference
LOW Familiarity	That's weird	I've never seen anything like that before! Wow! That's neat!
HIGH Familiarity	That old stuff again	No place like home

Fig. 37

American psychologist whose research is focused on human emotional responses. This author has already been mentioned in paragraph 3.3.4. He developed a model to describe emotions along two dimensions: pleasure (or valence) and arousal. Dimensional emotions are thought to be universally comprehensible compared to discrete emotions and therefore more reliable (Harmon-Jones, Harmon-Jones, & Summerell, 2017). Russell's method has been employed in varied applications (from advertising studies to experiments in childhood) considering its effectiveness. When it comes to the cognitive response to environments, he says that our behavioral response to an environment is determined by the primary emotional responses to it. Particularly, the emotional response is a combination of values of pleasure and arousal that places the environment in one of the four quadrant of the model. Therefore, the words that people use to define the surrounding represent this combination. For instance, a "stimulating" space is both arousing and pleasant, a "tense" one is arousing yet a bit low in valence, an environment that is low both on arousal and pleasure will be perceived as "dreary", and so on.
Now, the question is whether these studies can provide (or not) some instruments to better investigate stage lighting design.

4.2 Results

Now, the question is whether these studies can provide (or not) some instruments to better investigate stage lighting design. It is confirmed that the movement of light affects people's emotional response (McDonough, 2018; Ben Stowe, 2018; Fuchs, 2018; and others) but it is still not clear how. Flynn's studies related to the psychology of lighting in architecture highlighted four modes which are light parameters whose changes will determine an emotional reaction in people. It is legit to think that these four modes (bright/dim, uniform/non-uniform, central/perimeter, warm/cool) work for stage lighting design a well, with the exception of warm/cool that could, however, be generally substituted with color (but this topic relates to the previous chapter). However, most of the subjective impressions (spaciousness, visual clarity, privacy, pleasantness, relaxation and complexity) defined by Flynn do not really match the environment of a concert. Therefore, further studies should be developed to investigate proper subjective impressions for such environments.
The study by the Kaplans, although appears to be highly relatable to the world of concerts in general, particularly because of *complexity* (the unfamiliarity that makes an environment thrilling and exciting), does not seem to be useful for stage lighting design. In contrast, Russell's emotional model seems to be highly helpful in this regard. Indeed, it can be said that by rating music according to arousal and pleasure, light movements can be regulated accordingly. Particularly, as far as arousal is concerned, it is legit to suppose that music high in arousal should be paired with high energy movement of lights. In contrast, music that is low in arousal should be met with low energy movement of lights (or no movement at all). In contrast, it is not clear how changes in pleasure (valence) could affect the movement.
It is essential to underscore how these are just deductions that have to be filtered through the eye of experts. That is why the next chapter will be about interviews with actual stage lighting designers.

5

Interviews with stage lighting designers

The considerations that have been made so far seem to bring in the direction that show lighting can actually be designed to arouse emotion in the audience during a concert. However, this knowledge is the result of investigation in various field, some of them not even properly related to the stage lighting design field. Therefore, it is important to discuss it with those who do this for a living: stage lighting designers. Particularly, the interviews were carried out not only to discuss the results of this research, but also to understand each designer's point of view on the relationship between lighting and emotions. The interview consisted of an introduction (question 0) about each designer's career and 6 questions related to the topic this research aims to investigate. Specifically, on the last question, each interviewee was shown Russell's method and how it relates to colors and movement, which are the two aspect of show lighting that have been analyzed in this study. Here follows the structure of the interview:

0. ***How long have you been working as a stage lighting designer and who are the artists you worked with / enjoyed working with the most?***

1. ***What do you think about show lighting and emotions? Do lights actually arouse emotions in the audience during a concert?***

2. ***Given for granted that light evokes emotions in people, when you design lights at concerts, do you take into account people's emotional response? Or, do you design simply to achieve an aesthetically pleasant result?***

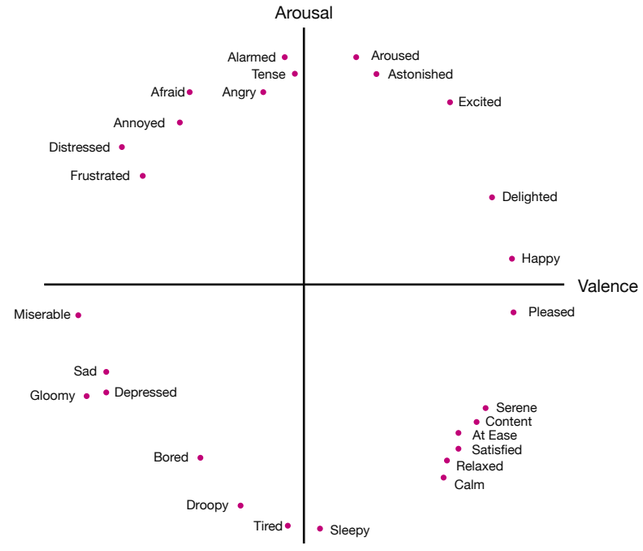
3. ***If you design lighting taking into account people's emotions, which are light's features that have a the strongest emotional impact on them?***

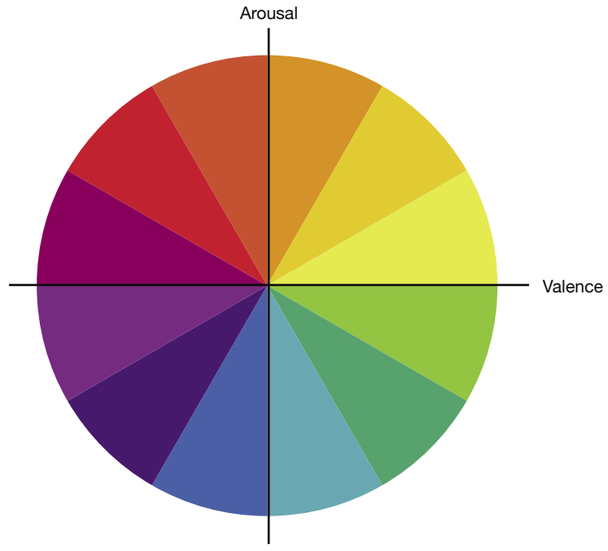
4. ***In your projects, what is the importance of color and movement of light?***

5. ***In your projects, have you ever given importance to the meaning and symbolism of colors as well as their specific physiological and psychological effects on people?***

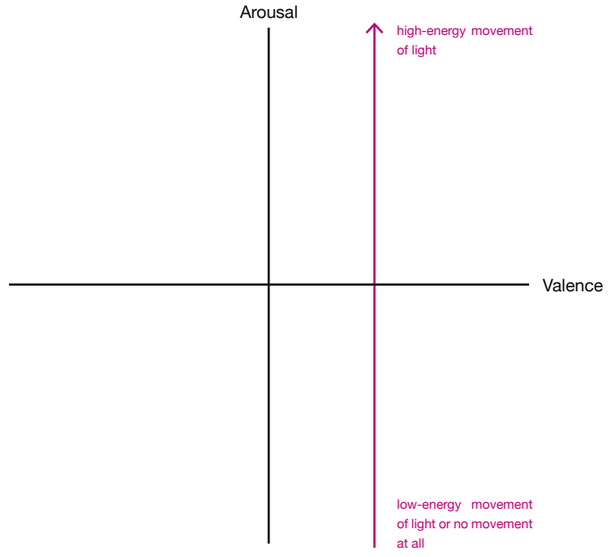
6. ***Do you think that Russell's method could actually be used to design lighting at concerts with the aim to strengthen people's emotional response to music?*** (the following graphs are shown)

Russell's emotional model allows to "measure" emotions according to the two dimensional axes of Arousal and Valence. Music emotions can therefore be placed on this graph accordingly.





Russell's emotional model can be used to "measure" colors as well. It follows that reddish colors tend to be those with the highest level og energy (hight arousal). In contrast bue-ish colors correspond to low arousal. Yellow-ish and green-ish colors are the most pleasent ones, whereas purple-ish colors are the least pleasent.



As far as the movement of lights is concerned, Russell's emotional model appears to be useful only in relation to the level of energy (arousal) of music, whereas no deductions can be made related to its valence. It can therefore be said that high energy music should be matched with high energy movements of light and viceversa.

The subjects involved cover various range of working contexts and different experience in order to have wider answers. They are: Giovanni Pinna (30 years of experience), Carlotta Renzi (4 years of experience), Mamo Pozzoli (30 years of experience), Jo Campana (23 years of experience) and finally Jacopo Ricci (4 years of experience).

Interview with GIOVANNI PINNA

0. ***How long have you been working as a stage lighting designer and who are the artists you worked with / enjoyed working with the most?***

I started working professionally in the late '80s, in '86 to be precise. But my very first light projects date back to the early '90s, between '92 and '94. The biggest projects started to arrive in '96.
So, we have a long list of artists... The first one I worked with was Ramazzotti. Then there are Zucchero, Milva, Ornella Vanoni, Vasco Rossi, Mia Martini, Marco Masini, Antonello Venditti, Pino Daniele, Adriano Celentano, Gianluca Grignani, James Taylor, Ryuichi Sakamoto, I worked with Negrita for many years, Elio e le Storie Tese, Patty Pravo, Mango, Planet Funk, Irene Grandi, Emma Marrone and many others. Among the artists with whom I have preferred to work there is definitely Vasco Rossi. I have been collaborating with him for 30 years without any interruption. I haven't missed one of his shows since 1991, he is one of the artists I am most fond of. Not only for personal reasons but also because he is a giant artist in terms of production. This means that you have an unlimited budget, so in terms of materials and lighting quantities you can't ask for anything better, it's working at the highest Italian level. Moreover, with Vasco I have always enjoyed absolute independence in terms of choices, creativity and scope. In recent years, I have also loved working with Tiziano Ferro. He is a very demanding professional who is extremely interested in our work. It is very important when the lighting designer and the artist get along. I'm also very fond of those memories that tie me to the last three De Andrè tours. I feel immensely lucky and grateful for those experiences, both professionally and humanly it was an incredible experience. However, it must be said that in general every artist leaves something behind, both humanly and professionally.

1. ***What do you think about show lighting and emotions? Do lights actually arouse emotions in the audience during a concert?***

Absolutely. Clearly, we always have to think about the fundamental aspect of a show, which is that lighting is always tied to the music. We, as lighting designers, are the ones who translate what the audience hears into visions. So absolutely there is an emotional impact. And we can say very simply, that in some special moments of the show, during some particular songs, the lighting event, that stuff you make happen with the lights, accentuates a lot the emotional impact and therefore the emotional reaction of the audience. It's clear that something very strong visually translates into an emotional reaction. If you are in a stadium, for example, with an explosion of lights, which is clearly connected to a particular musical moment and that you as a lighting designer interpret, you are generating a very strong reaction from the audience, both vocally and emotionally. So knowing how to arouse emotions in the audience with respect to what they listen to is fundamental in our work. Although sometimes it's a subconscious job to program the light with an emotional purpose, it is only during the

show [that] I realize the effect they have on the audience. The famous "wow" effect, which you get when you propose for the first time during the show something visually very impactful, absolutely translates into an emotional reaction from the audience.

2. ***Given for granted that light evokes emotions in people, when you design lights at concerts, do you take into account people's emotional response? Or, do you design simply to achieve an aesthetically pleasant result?***

Here I would untie the project discourse from the emotional discourse. By saying that, I mean that the project is necessary to create the lighting system. I certainly have strong visions on the aesthetic side when I design a lighting system by positioning the lights in the stage and I think about what will come out of it. But I would unlink it from the emotional side of the final result, because I take care of that later, during the realization phase. Everything that concerns the emotional sphere, not only that of the audience but also my own personal sphere, emerges at a later moment, when the lighting system is assembled and working, and I start planning the scenes of the show. It is there that I realize the kind of emotional impact I am making as opposed to a simply aesthetic one. I wouldn't link emotionality to design, but to the realization phase, which is the creative phase.

3. ***If you design lighting taking into account people's emotions, which are light's features that have a the strongest emotional impact on them?***

In my opinion, it's important to do this in relation to the context in which you are working. In a theater, for example, I can certainly have a strong emotional impact even in a situation of absolute selectivity. So, simply turning on a spotlight on the singer, with a very particular cut, with a very long fade. It is a very delicate beam of light that generates a very strong impact. On the other hand, in a stadium, where there are thousands of light sources and when there are very strong and powerful moments, you tend to emphasize them through the movement of the lights. Here you can see the visual strength of that scene and how impactful it is on the audience. There's no rule or one specific feature that generates the biggest emotional impact, to answer the question literally. Location absolutely does have a huge impact, though. Also, again, it's never tied to the project that much, because I take it for granted that if I design the lights for a live show, I'm going to generate emotion in the audience. Whether I have 10 lights or 100 my purpose is always the same, which is to excite the audience, translating what the audience hears into vision. Obviously, I have to give my support in the emotional impact on the audience using lights. Sometimes the use of a single light can be very impactful on the audience, as well as many lights. It's a matter of choice and vision. A single spotlight is a very strong sign, as it is a unique and selective sign on stage, it has the power to emote a lot. That doesn't take away from the fact that these are things created no matter what project you're working in. The possibilities are endless, and it's at the stage of making [programming phase] that those more purely emotional components come out.

4. ***In your projects, what is the importance of color and movement of light?***

Let's start from movement. Clearly, in recent years there are no productions without moving heads, so movement is an absolutely critical part of a show. This doesn't take away from the fact that you can do shows with lots of motorized lights without ever letting the audience see any movement. Therefore, you want to use the infinite possibilities of positioning of a spotlight without ever showing it moving from side to side. The movement exists but it is always when the moving head is off. But at the same time, the viewer unconsciously doesn't know that you have 10 lights and you have done 100 different scenes, he probably thinks you have 100. However, the audience doesn't have to know that. By the way, what did the transition from fixed headlights with a single pointing throughout the show to the motorized headlight introduce? This brought both the ability to vary the look of your show in infinite ways, but it also brought in the dynamic running component, which is that during the show, on sight, I can move my lights and create a strong, fast or even slow dynamic effect. It follows that the

involvement from the audience is greater. For example, if I have 10 motorized lights that I suddenly raise towards the audience and then I make them move amongst the audience, perhaps during the chorus of the song, clearly the audience is involved not only by the musical emotion of that precise moment but also by the luminous involvement of the movement that brings the audience to be part of the show. So movement is absolutely a key factor. Sometimes I also use it simply to give extra dynamism to scenes and create transitions from one scene to another. Technology gives us endless possibilities, then it's up to the lighting designer to exploit it and manage it in the right way to achieve what you want in the show. Being able to move and being able to reach a space [that of the audience] that wasn't even reachable before, gives us an immense tool in the making and also in getting the audience excited. Also, turning on and off on different depth planes, or from different points, generates a lot of dynamism both emotionally and visually. All of these are possibilities that smart lights give us. But something can be done using conventional ones as well. There are so many extra parameters with which the lighting designer must enrich his ideas. Never let the amount of technology overwhelm you.

Color, on the other hand, is a very important aspect. Here it is always linked to the personal choices and taste of a lighting designer too. First of all, when I started working there were conventional lights and if you wanted to color them you had to physically put a gelatin in front of the light that remained there for the entire show. The choices, which were always tied to one's own taste and imagination were very limited. Technology arrived, CMY and then RGB mixing. And here we are again in front of the management of infinity for which you have to make choices. Since we are talking about choices, for my taste I don't like to use many colors together so you'll never see in my shows more than two colors, 3 at most for a song but where the third is a complementary of one of the two. Then there may be times when I use multicolor effects, but it's clearly a particular moment during the show where I feel that stuff can work, like the dynamic rainbow effect. But the choices of color for certain songs, or for certain moments of the show are always very personal. One feels the music as his own, and to me it comes automatically when I think of a song, I already think of the colors it will be, or at least the dominant one. Then there are

exceptions, like when you work in stadiums where in the summertime you start with daylight, so almost automatically I start with white to have a strong and bright visual impact and I go on like that for three or four pieces without having the problem of having other colors or being monotonous using white. It's a choice. You can do an all-white show just fine without any problem. You have to have ideas, you have to create what I call a "chromatic path" during the show. I never get hung up on doing a hot dominant piece and a cold dominant piece the next. No, absolutely not. There can be two three or four hot-color pieces without any problem. It's really all about how I feel about the moment and the song. Also the color is absolutely a super personal choice and very much tied to the taste and interpretation of the lighting designer. To date, there are no limits.

5. ***In your projects, have you ever given importance to the meaning and symbolism of colors as well as their specific physiological and psychological effects on people?***

So, color symbologies are always present. For example, during Vasco's last tour he played "Tango della Gelosia" and, not by chance that piece was red. Being didactic can sometimes seem obvious, but it must be said that it works, and there is no doubt that it works very well and helps in the realization. On the other hand, as far as thinking in advance about the effect on people's psyche is concerned, I have honestly never evaluated it. Let's say that with the experience developed over the years I know perfectly well that with certain choices I will have certain emotional responses from the audience. These will absolutely have reactions. But I don't think about it a priori, I have never done it. On the other hand, thinking about the meaning of course, this often guides the choices. But this is more related to how you feel about things and then it is your emotional reaction to that song that leads you to associate the color. On average though, I don't create an idea tied to symbolism, or even effects on the psyche, before actually going to program it. These are studies that I normally don't take into consideration when creating a show.

6. ***Do you think that Russell's method could actually be used to design lighting at concerts with the aim to strengthen people's emotional response to music?***

I don't know actually, I'm not skeptical about using the model. But when I create, I don't think I would ever go to confront a model like that, maybe I would do it for fun when the show is over, after the fact. But honestly I don't think it can be a system or a methodology to be applied in advance to the realization of a show. In fact, I would find it almost a way to cage the system. However, it would be interesting to compare the finished show with what emerges from Russell's chart. Comparing the two. There is a truthful and very interesting basis for it, but I don't think anyone in my line of work would consider it in making their own show.

Interview with CARLOTTA RENZI

0. ***How long have you been working as a stage lighting designer and who are the artists you worked with / enjoyed working with the most?***

I've been working for about 3 years, 4 if you count the years when I was working my way up the ladder pulling cables and learning in the meantime. And that's an important moment since without knowing how to attach the cables you risk to blow everything up. My names will certainly not be up to the level of my colleagues interviewed as my career is much shorter, but among those I have enjoyed working with the most there are definitely the Bud Spencer Blues Explosion. I really like their genre and they are very nice people who put you at ease. I have also collaborated with Pancreas and Rkomi. Specifically, Rkomi's show was the one for which I participated the most in terms of show design.

1. ***What do you think about show lighting and emotions? Do lights actually arouse emotions in the audience during a concert?***

Absolutely, the lights definitely have an emotional impact on the audience. In my opinion, there are actually 3 factors that generate emotions in an audience during a concert and therefore should be taken into account. The first is definitely the lighting, then we find the stage design, that is the actual structure of the stage. Finally, there is the way you go about revealing the stage, a time sequence that tends to bring the audience more and more into your project. Slowly unveiling your secret tricks, you don't light up the stage all at once with the first song, but you go slowly unveiling everything, to arrive at a final climax that allowed you to keep the audience's attention from beginning to end.

2. ***Given for granted that light evokes emotions in people, when you design lights at concerts, do you take into account people's emotional response? Or, do you design simply to achieve an aesthetically pleasant result?***

Sometimes the two coincide in my opinion, I mean that there are certainly some particular movements or effects, or dimming that in my opinion can, on their own excite the viewer in some way. However, often it is the combination of the aesthetics of the whole show that makes it spectacular and exciting. So, for me the aesthetic and the emotional aspect are closely linked, even if you really have to take into account the rhythm of a song and its phases. Studying which are the most emotional phases of a song helps you a lot to understand how to translate those emotional phases into a lighting design so that the whole stage itself becomes an expression of that song in such a way that the viewer gets excited. That's kind of how I look at it.

3. ***If you design lighting taking into account people's emotions, which are light's features that have a the strongest emotional impact on them?***

The first thing that comes to mind is darkness. I mean the tense moment before an explosion. In my opinion this is one of the most emotional

moments. The moment before the drop, you have to hold back all the things you want to do in order to explode right after with a 0 to 100 sprint that elicits particular emotion from the audience. People after a moment of darkness expect there to be an explosion, and the moment you as a lighting designer go to emphasize this tension through light, you get more emotion. Another thing that generates emotion is color and its alternation with white with its various color temperatures and brightness levels.

4. ***In your projects, what is the importance of color and movement of light?***

They mean a lot, they represent almost everything I would say. Let's say that the third most important thing, besides color and movement, is the position of the fixture itself. Yes, the position of the fixture does a lot, but it is also true that now there are moving heads with which you can have infinite layouts. In my opinion color and movement are what make a concert a concert. Color makes an emotion more perceptible to you. A red, for example, tends to be darker than a bright white or fuchsia and so different emotions result.

5. ***In your projects, have you ever given importance to the meaning and symbolism of colors as well as their specific physiological and psychological effects on people?***

So, I would say to you in the abstract, yes, and that is something I pay a lot of attention to. However, I would also say that in my opinion it's important but it can't always be taken into account as a parameter. For example, there are some genres, such as trap, that no matter what color you make it, it's always the same because the emotion of the music is always constant. So, as a maxim, I would say yes, as a reality I think that they are always things to evaluate even in relation to the artists for whom you are designing. Some of my colleagues have found themselves designing the color of light for concerts on the basis of certain requests made by the artist, who had very clear ideas of color

for his songs. On the other hand, there are those situations where you design for artists who play mostly sad songs. There you are inclined to associate colors like blue, but if you use it for the whole show you risk getting a result that is a bit heavy for the viewer for example. So you have to put more weights on the scales. As far as the effects on the psyche on the person instead, I have to admit that I'm one of the biggest proponents of this theory in my studio. I'm a big believer in it. But it's not always given the right importance.

6. ***Do you think that Russell's method could actually be used to design lighting at concerts with the aim to strengthen people's emotional response to music?***

So, I would tell you in general that this is already the case. For example, for movement in my opinion is already more or less like that, and by movement of course we don't mean only the physical movement of the moving head. Especially in the case of high-energy songs [high arousal] the movement can also be given by strobe effects, shutters and so on. All those effects that can give you the impression of sudden movement, but in fact it is not. Instead for sad, depressed and calm songs, use slower movements or even a slower rotation of the gobo. While on a more rhythmic song we can think of using the same movement of the gobo but with a much greater speed. Regarding the color, I feel like telling you that all the more exciting songs, with more passion, let's say, we go to use colors that are brighter, except for the red that could in my opinion be used even for depressed songs. Indeed, the brightness of red is very low, unless you have a lot of light fixtures and a lot of haze. So, being darker, I would use it for sad songs as well. In general as a model it can work, as a rough model, as a general first approach explanation, but then you have to take into account also, for each artist, the symbolic approach. For example, a colleague of mine worked for Gemitaiz and considering [that] he talks mostly about weed, many songs are green. So put the artist alongside his value as a chromatic symbolism. I wouldn't see a rainbow effect on a Bocelli concert, but I would see it very well on Lady Gaga, where indeed the fact of putting rainbow effects goes to emphasize her support to LGBTQ+ communities.

Interview with MAMO POZZOLI

0. ***How long have you been working as a stage lighting designer and who are the artists you worked with / enjoyed working with the most?***

Let's say from about thirty years at least. I mean, I started like many of my generation with very operational jobs, starting from the theater, arriving to my first concerts. I started by unloading vans, pushing trunks, connecting cables and I did my apprenticeship that way. My first jobs were as an electrician, a machinist and so on. My training took place mainly in the theater, which was a great school for me. I was born in 1965 and I would say that my first jobs were at the end of the '80s. I then moved on to the musical environment because each of us has a history and therefore a personal background that is not necessarily linked to an academic education, especially as far as we are veterans in the field. At our time, there was no university to study these things, the field of work was the only real school in those days. So, I combined my first experiences as a theatrical technician, my studies in architecture, I am an architect, plus I was also a musician, I was part of that scene of the first wave of Italian rock in the 80s. Combining these

3 areas, my profession has come out. I never thought I would become a show lighting designer as I aimed to be an architect. However, my studies in architecture have been fundamental for my path. So, at the end of the '80s I started working as a lighting technician for some musical groups. I started with historical groups of the time such as After Hours and Marlene Kuntz and from there I grew up arriving in the 2000s to more and more important tours. My path is very similar to that of Giovanni Pinna and Joe Campana, all those of our generation have followed in some way these steps. At the same time, I kept a foot in the extra-musical field, so all those corporate events related to the entertainment industry, fashion and conventions. I haven't worked in the theatrical field for years. In addition, when the situations allow it, I deal with all the integrated design, starting from the stage, arriving to the lights, passing through the show design, coordination of visuals, etc.. Obviously, the more productions grow, the more there is a need for a pyramidal structure and therefore different professionals. Today, whoever is a show designer is unlikely to also deal with lighting, it would be too heavy to manage.

I have worked with several artists from all over the Italian scene including Antonacci, Gianna Nannini, Giorgia, Elisa for many years, Cremonini, Mengoni, Emma and many others. Each artist is a different world. In the beginning, I was practically the one who chose the artists to collaborate with because we got there through word of mouth. My first real tour was in 1994 with Marlene Kuntz, whose first record, Catartica, was a crazy record that turned Italian music around for many reasons. And there I was mainly a show designer. My contact was direct with them, we were friends. Now everything is filtered through agencies, so the personal relationship with the artist still exists on a human level but not on a working level. Previously, you had to build your professional path by yourself with direct contacts, whereas now the mechanism is completely different. But every artist leaves you with his own baggage, regardless of the size of the artist or the production. To tell you the truth, I have had the greatest satisfaction in small fields.

1. ***What do you think about show lighting and emotions? Do lights actually arouse emotions in the audience during a concert?***

The answer is mandatory, of course it is. Also because without lights you cannot see the show. Before answering this question in an appropriate way, we must emphasize how the experience of a concert is different from listening to a CD or, if we want to bring the speech to the present day, to a streaming concert. Both the CD and a streaming concert are basically mono sensory experiences. Because in the case of a CD only the hearing is involved, in the case of streaming concerts the sight is also involved, but in any case in smaller quantity than during a live concert. If you think of a concert, this is really one of the most multisensory experiences you can do. This is because in addition to sight and hearing, which are closely related, there is also the touch that is somehow involved by the heat, caused by us, lighting designers, with our light fixtures, but also by contact with other people. Then, if you think about it, even the scents of live music are something that you can't find anywhere else and that make the concert a multisensory experience. Going back to the question, it is obvious that lights are such an impactful part of this emotional flow that they cannot be ignored not only from a visual point of view. Especially years ago when there were still so many incandescent lights, there was a significant flow of heat that came from the stage and was part of the show. So, the viewer was impacted both visually and physically. Even now there are bands like ACDC or Iron Maiden who will never switch to full LEDs because they want to keep that warmth from the past. So yes, the emotional impact is given in my opinion by four factors. The intensity of the light, the type of source, the direction of the beam and the color.

2. ***Given for granted that light evokes emotions in people, when you design lights at concerts, do you take into account people's emotional response? Or, do you design simply to achieve an aesthetically pleasant result?***

The question is very interesting because it doesn't really have a univocal answer. I would tell you that both aspects are always present and sometimes one prevails, sometimes the other prevails. So, in my opinion whoever answers that there is only the emotional aspect

is wrong. That's because many times we, as designers, think from the purely aesthetic side and the consideration of what could be the emotional impact comes later, because first we must satisfy the aesthetic picture. Vice versa sometimes you think about the emotional impact you want to get from the audience and you think later about the graphic layout you need to create to get that impact. So sometimes one prevails, sometimes the other, but never together. It's very difficult to go and design a setting where these two aspects coexist in the designer's mind. I always feel unbalanced on one side or the other and then find the right mix. For example, if you think of an image that has a very strong emotional impact, which can be a typical glaring backlight, then you have to figure out how this situation can be handled on an aesthetic level since it's not enough to point the lights at the audience. But you have to define the four factors mentioned above. On the aesthetic side, you don't think about the fact that there is an audience watching you. You think about your personal satisfaction first. That's how I think, it's a bit selfish our work because you have to be self-centered when you design. First of all, I have to like my project, then I make sure that I bring the public towards my taste while respecting the aesthetic universe of the artist you are designing for. So you have to find a sort of common thread between you and the artist that passes through your project. In order to make the public enter into this conceptual path of yours, you have to apply some aesthetic expedients to make them understand what your reasoning has been. So in the result you are always in the middle between aesthetics and emotion, but in the creative process I personally am always unbalanced on one side or the other.

3. ***If you design lighting taking into account people's emotions, which are light's features that have a the strongest emotional impact on them?***

Yes, I'll reiterate the four points I gave you earlier. They are light intensity, source type, beam direction and color. However, the conceptual aspect and the operational aspect on the console are both fundamental aspects of defining and producing your ideas. The

moment I go to program, I have to have in mind what is the conceptual aspect that I want to convey. And, the conceptual aspect, comes from the project I did before that took into consideration either the emotional aspect or the aesthetic aspect. You have to be able to do a reading of a piece of music and then of the whole concert. In each piece there are at least 3 or 4 important moments. The piece is not monolithic, so the programming must follow this trend. The reading of the show is extremely choppy. That being said, you still have to create a vision by piloting the audience in listening and viewing the song. So, there are definitely more conceptual moments where the aesthetic part takes over. At the same time there are very physical moments where if you have an explosion as far as music is concerned, then you will aim to create emotional effects certainly more engaging than the aesthetic moments that are instead relegated to other moments, such as the beginning of the song and so on. Reading the piece of music is therefore fundamental to understand how to work on the characteristics of light to generate emotion.

4. ***In your projects, what is the importance of color and movement of light?***

So in my opinion this statement is correct but needs further explanation because it is too schematic. If you think about it, color management is movement. So I wouldn't separate color from movement completely. Also because movement refers to all those variations that are perceived by the eye. In a concert there are almost never static pictures. They are almost always dynamic pictures for the mere fact that intensities and colors may change. Even if no beam of light moves. So, at a first analysis, we can say that the movement is given by the intensity and modulation of the colors. Which, by the way, are my first two aspects among the four I was telling you about. Then there are more didactic movements, where we have a modulation of the direction but also of the typological characteristics of the lights. Because in addition to the use of gobos for example, which in my opinion are beginning to be used less and less to create dynamism, there are some graphic features that are increasingly impactful from the point of view of

reading the movement. These are the management of beam openings, up to the point of making very narrow paths. Up to, on the other hand, widening the opening angle of the light, obtaining very wide extensions. Something that until a few years ago could not be done. Then there is the classic movement, pan and tilt, and therefore extension in space. Also, the typologies interfere in the movement because there are graphic possibilities that have never existed before and that are linked to the ever closer integration between the world of lighting and the world of video. Many light sources today are in fact able to generate point effects within themselves, so they have their own internal dynamics that are part of a graphic world, no longer plastic, projected. You simply observe the light source but the beam does not serve to illuminate but to create movement and therefore what I call graphic emotions. Moreover, today we are beginning to manage some light sources through video signals even, so they enter the emotional flow generated by the images. So there is an increasingly close relationship between things. The issue is much more complex, that's why in my opinion we couldn't just talk about color and movement. Returning specifically to the question of movement we could speak paradoxically of a "static" movement and a dynamic one. The static one is obtained by keeping the lights still and changing intensity and color.

5. ***In your projects, have you ever given importance to the meaning and symbolism of colors as well as their specific physiological and psychological effects on people?***

The question is challenging... First of all I have to make a premise. When we talk about color we also talk about white. With white, a new world opens up for us, since it has so many dominant colors within it, so the use of white, in my opinion, is always an aspect that every designer must take into consideration, so much so that sometimes very extreme choices are made, as I have done in the past, not to use colors for the entire show, but only white in its warm and cold forms. This can be a very strong choice. I believe that even with white you can manage both the psychological and the symbolic direction. So, I can tell you that in my opinion it is not so necessary to take the relationship between color and symbolism to extremes because sometimes you can get the same thing only with white, which in its declinations, leads in both directions of the spectrum. Moreover, if associated with intensity, therefore with the regulation of intensity, you obtain an impacting world both symbolically and psychologically equivalent to that given by the exasperation of colors. Keep in mind that not all colors have a unique symbolic meaning in the world, just think that for one half of the world black is the color of mourning while for the other half white is. So, this should not be taken for granted. For example, in Italy in concerts we use very little yellow or green, because we come from a theatrical school where these colors are very difficult to match with the sets, with the face. Instead, abroad, especially in the Anglo-Saxon school, primary colors are used a lot, saturated colors, and white is used very little, compared to Italy. Having said that, there are two aspects of which you speak that I don't see as separate from each other. In my personal experience, the symbolic value is relative, the psychological impact is always much more important. I find the symbolic value too didactic: I make a love song warm, I make a nocturnal and melancholic song cold as a chromatic spectrum, the singer talks about a color in the lyrics of the song, so I make the lights that color. For me it doesn't work that way, I've never done it, I don't find it an interesting direction, it seems to me much more interesting to use color as a way of managing the emotional sphere. But this is a very theoretical discourse. In reality, when we go to program a show, very often the colors associated with a song are decided in the general layout of the concert where maybe by choice or you make blocks of songs with a dominant color and then move on to the next block with another dominant. Or sometimes we tend to alternate our perception, going from a song with warm tones to another where I prefer to use cold tones. This is how associations often arise. Apart from all the associations that you can make on a theoretical level, you then find a piece in the setlist at a time when the hypothesized color is not right for a number of reasons. So, this theory must always be compared with practice. Some things cannot be foreseen on a theoretical level, and therefore must be defined in the realization phase. The other thing is that when the association between song and color is triggered, perhaps even on the basis of theoretical reasoning made earlier, it is

difficult to get out of it. If you're working with an artist and it seems to you that a piece should be blue, you're always going to keep making it blue. Even if it's moved to another part of the concert, you're definitely not going to change it because of the rule of alternating warm tones-cold tones. Because then you make an emotional connection between you as lighting designer and that song. But to go back to the question, we can say that the reasoning behind the colors is always done first, but then you have to place it within the development of the show. There are no a priori solutions.

6. ***Do you think that Russell's method could actually be used to design lighting at concerts with the aim to strengthen people's emotional response to music?***

In my opinion the answer is no. This kind of interpretation I think is more applicable to a context that has been overtaken by events. Or rather, up to 10/15 years ago it was certainly valid, especially in a theatrical and dramaturgical context, where certainly this type of interpretation has a great value. In the live environment, especially on major productions, big shows, I don't think it's applicable anymore, if it ever was. But I don't think it's the right direction because this framework doesn't take into account the fact that a contemporary production can no longer ignore the close integration of all the elements that make up the visual framework, where lights are only one of the components, but there is a graphic component linked to images, to visuals that is increasingly predominant. In addition, there is another component that is emerging more and more and that is the change of scene thanks to the movements that are possible of entire portions of the stage. In reality what counts is finding the harmonization between these components. This is the main aspect that a designer today must take into account. Harmonization passes through the management of colors, but also through a balance of these sources. There is a need for an organic vision. And this is not only the task of color, but it is the task of an overall vision where the various elements do not clash with each other but contribute to the final result. Let me explain better, in my opinion this kind of study should try to get out of the theoretical sphere and look for concrete examples. Let's take a ballad, it may be that the text is melancholic and introspective, but the visual that has been chosen to represent that song is rich in color, rather than black and white etc.. So, in the video field it would be more difficult to apply this scheme as it is done. So, the task of lights is to find the harmony between everything, to take that multicolor video source and pull it into an emotional reading that cannot be bombarded by infinite visual information. The lights have the job of homogenizing everything. That's why you use a single color that could be for example red even if the song could be the saddest in the world, but you decide to make it red because maybe the visual is purple and going to accompany the purple with the red creates an even greater emotional tension. So it's always the combination of those elements. If it was just the lights I think this Russell's pattern would work. Keep in mind that the manual of the good lighting designer says that you are allowed to use a maximum of two colors at a time plus white. It's not written anywhere but it's a basic rule. Now the chromatic choices of light are subordinate to the video world. In fact, the lighting designer today has to deal with the visual designer, who probably has very different approaches to color, given that he or she moves in a figurative environment. In my opinion, an interesting thing for future developments of this project would be to include the point of view of visual designers, because they deal with light and color just like we do. Today LED screens are a source of strong light pollution. Just think that a single LED screen can illuminate an entire stadium. Earlier I was talking about graphic emotions, at the moment in fact there are many light fixtures that do not pose the problem of lighting. They produce light of course, but their primary objective is not to illuminate a field, an area, but to produce graphics. We are talking about a world now exclusively dedicated to LED sources where there is a tendency to create within the same light source more and more fragmentations. We are moving towards a "pixilation" of the sources. It is clear that lights are going in the direction of the video world, but without illuminating. They create a unidirectional source that pollutes from the luminous point of view, but is not meant to illuminate. In our world it's obviously fine to achieve this effect, it's part of the live world. A designer can no longer disregard the use of these sources because it is part of the emotional aspect to see a layout that is graphically complex and

managed with an internal dynamic, no longer linked simply to an on/ off or its color. It is an internal dynamic of the object. These objects replace the world of gobos that very few people use anymore. The gobos and the video dialogue very badly, increasing the confusion. All this world of lights would stand up great without the video world. But since the video world has become something unavoidable, lights must somehow evolve in order to communicate better with it.

Interview with JO CAMPANA

0. ***How long have you been working as a stage lighting designer and who are the artists you worked with / enjoyed working with the most?***

As a show lighting designer we can set the date at 1999. Obviously, after all the training that went before, without which I would not have been able to take a single step in this world. In 1987, I started with my apprenticeship. Small parenthesis, I come from the world of audio and after trying to be a musician, an attempt miserably failed and stranded locally. ooking for a way to stay near a stage I did the audio engineer, so much so that in 1987 I had the opportunity to do my first tour with Vasco Rossi, "THERE IS WHO SAYS NO tour", 62 dates, stuff of other times. At that time, in Italy the word backliner did not even exist. It was just me, Diego Spagnoli, his wife and the stevedore of the truck to manage technically a bit 'all the shack. Obviously Vasco was not yet such a great and successful artist as he is today, but in those years he was already beginning to play in arenas such as the PalaEur in Rome or the Palatrussardi in Milan. Up to 1990, I fiddled with monitors, mixers, DIboxes and amplifiers. Then, as I always say jokingly, I realized my mistake before it was too late, and I converted to the world of lighting in a completely random way, accepting a job offer for a one-month tour in Germany, setting up trusses and pointing avalanches of PAR64 and ACL. So I can't say that I was struck by lightning on the road to Damascus or that I had a passion since I was a child, something that is very common to many of my colleagues. In my case, the common thread has always been the enormous passion for music that then led me fortuitously to the profession that I have been doing for over thirty years.

The artists I have worked with have been many, so listing them all would be a bit problematic. Just a few names, Ligabue, Gianna Nannini, Litfiba, Gianni Morandi, Francesco Renga, Negrita, Daniele Silvestri, Mario Biondi. I have also been lucky to work in very different contexts, always remaining in the field of live music shows. By different contexts I mean both in terms of musical genre (and this helps to develop an 'open' approach and to diversify the interpretation in terms of lighting design) and in terms of the 'size' of the artist in question and consequently the structures that hosted their concerts. So I have been able to range from the club to the arena, from the theater to the stadium, and certainly this aspect has allowed me to widen my expertise to be able to handle multiple situations that often have unexpectedly many points in common, in short, everything is different but nothing changes! For example, Verdena in clubs, 200 seats, and Campovolo for Ligabue with 120 thousand people. It is evident that there are many technical and structural differences, but at the end of the day, the basic concepts are always the same and are

those from which we should always start. If I have to tell you some names of the artists I enjoyed working with, being a bit selective in my response, it's clear that with Ligabue I had the chance to develop impressive projects and to deal with economic possibilities of a certain importance. Even at the project level, it's very gratifying to be able to deal with a person, Luciano [Ligabue], who always wants to actively participate in the creative process, being among other things also an established film director and writer of novels. He gives us input that we tend to process and filter to derive projects that we then analyze and evaluate together. If instead I had to name an artist with a smaller audience, but no less competent, I could cite the example of Luca Carboni. Luca has a strong and developed artistic sensibility, among other things he draws very well and therefore he is the first to give us indications in the form of sketches even at the level of graphic contribution. The images destined to end up in the ledwalls are often suggested if not actually created by him. So there are artists who make the work much more stimulating because they participate from the beginning in this creative process.

1. ***What do you think about show lighting and emotions? Do lights actually arouse emotions in the audience during a concert?***

Definitely. I'll make a small premise. I believe that basically people come to concerts because they want to have fun. Because they want to make out with their girlfriends, they want to drink beer or Coke and spend two and a half hours singing at the top of their lungs to let off steam. I always say that our job with lighting [as Lighting Designers] is to create a frame around a painting and this is a metaphor I use often while always being careful to maintain a balance between these two entities. The frame must never overpower or weigh down the painting, the coherence and harmonious aspect between the two elements must always be held in the highest regard. All this in order to give to the audience that is watching the concert a sensation of pleasantness and enjoyment, being perfectly aware that the audience knows nothing about it. Visual perception is fundamentally based on this aesthetic aspect and we must never forget that aesthetics, a word that comes

from the Greek aestesis, means sensation, sensitivity. Therefore something that strikes by-passing the rational aspect, something that the brain in some way does not perceive in a rational way. At the same time, however, I realize that when the public is illuminated in a certain way, it reacts in a certain way and this is the certified proof that there is not only the purely visual aspect that affects people, but when people are involved by the lights themselves in some way they feel stimulated and react in a certain way. So my answer to the starting question is affirmative in a clear and undisputed way.

2. ***Given for granted that light evokes emotions in people, when you design lights at concerts, do you take into account people's emotional response? Or, do you design simply to achieve an aesthetically pleasant result?***

When programming, I would exclude the element of audience involvement as a priority factor or as a starting point. In my case it is something that comes as a consequence to underline a certain moment within a musical lineup. There are artists who expressly ask me to illuminate the audience profusely, others who are a bit 'intimidated'. In this regard, I would add that even if I wanted to, today in a stadium or in a large sports hall, the darkness, which is the essential condition for which to work with light, no longer exists, especially because of the flashes in smartphones. I say unfortunately, in a stadium when everything is ready for the start of the show, 15,000 cell phones are turned on and the darkness no longer exists, the magic of mystery is gone. And this is a big problem. Other artists, on the other hand, want to see the audience lit up so that they can trigger that virtuous energy transmission between themselves on stage and the audience. To get back to the question, I would have to say that it's quite contextualized at times that the audience gets involved. I would say that the programming of the lighting show is an end in itself, while if there are moments in which a particular involvement of the audience is required, in those moments we work with that particular focus. So in my case it varies from situation to situation and I do it both to achieve an aesthetic result and to add the element of participation.

3. ***If you design lighting taking into account people's emotions, which are light's features that have a the strongest emotional impact on them?***

So, good question and not an easy answer. Banally, this is very much related to the moment and the musical contextualization. When the piece explodes, for example, and people sing at the top of their voices, it is clear that the famous burst of light, which in itself is in some way violent, generates a strong reaction in people. I am also very fascinated by the discourse of darkness, which, as previously pointed out, is the essential condition for working with light. I noticed, and I felt a crazy pleasure, when I aroused an "ohhhhhh" from people, when there was the transition instead of 0 to full, the opposite then turn off everything, but really everything, from one moment to another. Somehow this gimmick was translated into a reaction of bewilderment, almost fear on the part of the people and then back to giving them the light on the next growth of the song. It's a way of taking the light away and then giving it back, even though it was actually the same light as before. Let's say it's the sense of lack that then makes you feel that sense of presence in an even stronger way. I remember a moment in which I used this expedient during Gianna Nannini's theatrical tour a few years ago. In the song "Fotoromanza", in each pre-chorus I would turn everything off completely (enough to lower the GranMaster of the console) and when Gianna [Nannini] hung up with the refrain "Questo amore è una camera a gas..." I would reopen all the lights pointed towards the audience, leaving the stage adequately lit. The reaction of the people was always very warm.

4. ***In your projects, what is the importance of color and movement of light?***

So, let's start with the 'color' factor. In my opinion it is inevitably linked to the subjectivity of the lighting designer and is therefore a very personal thing. Because the same musical base tends to arouse different emotions in people. It is certainly important, as I see it, never to mix too many colors and to keep to a scale of colors that are gradient, and in some way coherent. I am not a lover of the British school or what I call "pizzeria". If I do decide to do it, I develop it and force it in an overtly showy way, total harlequin. And at least once a concert I tend to throw in this rainbow effect. On Litfiba's "Regina di cuori, tra mille colori...", I went from being all white for just 5 seconds to having all the headlights powered by a different color. Then the rest of the song was managed by making it all white, because white is the sum of all colors. Basically I tend to keep a line from the beginning to the end of the piece, you start with some color choices, then you can make a variation but then you go back to where you were. The world of light color for me should work like that. Regarding the movement instead, you made me do an indirect reflection, because I am convinced that with 'movement' does not mean only what you get by changing the values of pan and tilt, but there is also the movement given by changes in intensity, which I love very much to experiment in all its forms, and another thing on which I like to work a lot is on the 'light source positioning factor', so displace the audience through a sense of disorientation by working only with the frontal or with the cuts on the ground and then in a break, if the piece allows me, just do a backlight or a lighting rain. So I really like to create movement by working on the juxtaposition of the position of light fixtures. We could say that it is not a "dynamic" movement but it is more a contraposition of position. It is a "static" movement. In my opinion this is very effective as it is anything but obvious. Moving heads are called like that, but they don't necessarily have to be moved. My goal is to make people get something they don't expect, something that will surprise them.

5. ***In your projects, have you ever given importance to the meaning and symbolism of colors as well as their specific physiological and psychological effects on people?***

Sometimes it happened to me to associate a color in a clear and decisive way to a song, and in those cases the thing was somehow called and taken for granted. Just to give you an example, Litfiba, "El Diablo" is red, it talks about bulls, Spain, passion, bullfighting, blood, I could only make it red with all the moving heads I had available. Let

me give you some example by two world famous Lighting Designers. Coldplay's tour: what color was used when they played the song 'Yellow'? Prince's tour: what color dominated the scene during the song 'Purple Rain'? This is to say that sometimes being didactic is not a sin to be ashamed of.
As you know there is also to consider that for many years now there has been an invasion of ledwall and then many times if there is a graphic that pulls the wagon and that traces the groove, many times the lights must adapt and go in symbiosis with the video. Many times the lights follow the dominant chromatic aspect of the graphic representation in the background, other times the opposite but always with that key word, balance. With Ligabue, in "Libera nos a malo", which in any case refers to a quotation from the Gospel, the intro to the song had a ledwall reproducing the image of a pipe organ, with the stained glass windows of a church, and so this whole moment was done with shades of lavender and purple, colors that refer to ecclesiastical vestments. There I realized that the symbolic approach actually worked. I don't know how much an audience perceives this, I'm not sure that people can process these data and associations in the moment. But anyway, they don't have to rationalize it. The important thing is that it is somehow perceived. It is in my opinion a matter of belly rather than head, a matter that bypasses the brain and goes straight to the belly and without us being aware of it makes us emotional. As for the specific effects on people's psyche, I would say that I have never evaluated the matter and I would not know how to give you a specific feedback about it.

6. ***Do you think that Russell's method could actually be used to design lighting at concerts with the aim to strengthen people's emotional response to music?***

This chart is very interesting, especially the movement aspect, even if it is probably a rather obvious thing. Surely it has its own undisputed logic and somehow I unconsciously reason in these terms, I am pleased to note and find myself aligned to this type of scheme. For example, if there is a "gloomy" song, I take it for granted that I will remain within these chromatic gradations that I see represented in the color scheme. Same thing if the song is up-tempo and upbeat, they are diametrically on the opposite spectrum. So from that perspective I completely confirm this chart. And I tell you that unknowingly, without having the technical/scientific knowledge and without ever having referred to these bases, I have always operated in this way. taking another look at it, I confirm that I consider my professional approach deeply connected to this graph. Perhaps it would be a stretch, but if one thing could be experimented with, it would be to use completely static lights on a very energetic piece, just to create a form of discord or conceptual distance.

Interview with JACOPO RICCI

0. ***How long have you been working as a stage lighting designer and who are the artists you worked with / enjoyed working with the most?***

I started a little over three years ago, but in the last year I've moved a bit away from designing just lights. The artists I've worked with include both national and international names. I have done projects for Travis Scott, Janet Jackson, Skrillex as far as electronic music is concerned. While among the Italians there are Gemitaiz and Fedez and I won't deny that working with the latter was one of my favorite experiences so far but simply because there was a greater involvement of the artist in the creative process. Also because at Fedez's tour I was in charge of show design at 360° and in that case the dialogue with the artist became fundamental.

1. ***What do you think about show lighting and emotions? Do lights actually arouse emotions in the audience during a concert?***

Yes, because anyway it's the element that allows you to show reality, it's the medium through which you shape what the audience sees. And it's just the way you shape it that gives you a certain level of control over what you want to convey to people. What I think is that the light fixtures themselves don't convey any emotion. It's more about what's being lit that does it. So, I don't think it's the light itself that generates emotion but the way the lighting designer uses it to shape the scene. In the last year, in the face of what we went up against [Covid-19 pandemic], I've been working a lot more for television and all those events that are enjoyed through a screen. Two years ago, I had a different idea about this theme. I thought that it was the choice of the lighting system that generated emotions. Today I have a completely different opinion and I can tell you that in my opinion it is the way in which the light touches the objects on stage that generates the emotion. Many people try to make projects using the coolest products with the most advanced features thinking they will get the best result. Actually, what counts is how the lighting designer uses light in the space.

2. ***Given for granted that light evokes emotions in people, when you design lights at concerts, do you take into account people's emotional response? Or, do you design simply to achieve an aesthetically pleasant result?***

In my opinion, it depends on the type of show you are going to design the light for. For example, if it's an electronic music concert, like the shows I designed for Skrillex, I honestly would say no. Emotion doesn't count there, it's more a matter of aesthetics and visuals. So much so that in those contexts I have often recycled ideas that I had developed in other contexts. On the other hand, there are some shows, such as Fedez's, where an inverse process was carried out. In that case I started from his songs, and on the basis of the emotions they evoked, I was led to make certain choices rather than others. The way I tend to approach show design is that you establish a story and the lights have to serve that purpose, so I program the light with the intention of generating emotions that can follow the rhythm of the story.

3. ***If you design lighting taking into account people's emotions, which are light's features that have a the strongest emotional impact on them?***

As I've already mentioned, my view on this has changed a bit over the years. I mean that a few years ago I would have chosen projectors primarily based on the amount of things they could do. Now, however, I tend to choose products on the basis of their qualities as opposed to the number of technical features they have. Indeed, I've realized that basically the elements I work with the most are color and gobos, so I don't need the whole extra set of ancillary elements that the next generation element has. I don't need state-of-the-art technology to convey what I want to convey. Other things I use a lot include definitely zooms and focuses.

4. ***In your projects, what is the importance of color and movement of light?***

As far as color goes, I have to say I'm pretty minimal. This means that over the course of a song I rarely change the colors I started

with, and if there are any changes it's because I set the song up a certain way from the beginning. I tend to end songs always following the same chromatic scale. As for movement is concerned, I can tell you that I rarely move a moving head with pan and tilt. Or rather, it always depends on the show I'm designing the light for. In the case of Skrillex or Travis Scott, where I have to deal with very exciting music, I sometimes use the physical movement of the moving head. On the other hand, in the case of more refined music like Janet Jackson's, I tend to keep the projectors motionless, giving dynamism with zoom changes, focus changes and gobos. Another way I give dynamics is by using color effects. This doesn't necessarily mean changing color but playing with the various shades that come from a color.

5. ***In your projects, have you ever given importance to the meaning and symbolism of colors as well as their specific physiological and psychological effects on people?***

Actually, throughout my career I've been quite instinctive and not very academic in my choices, also because I haven't done any specific studies for this work. I can tell you that the symbology part is something I have never followed. As far as the psychological aspect is concerned, I can say that I did, but I can also say that it was done in a completely unconscious way. I've always gone very much by feeling, I realize that the choices I've made have an effect on people, but as far as I'm concerned, this is not codified.

6. ***Do you think that Russell's method could actually be used to design lighting at concerts with the aim to strengthen people's emotional response to music?***

I believe that this association between color, movement and emotion of the song is true, at least it is in most cases. However, as I said before, I happened to turn the story completely upside down, so sometimes I made energetic songs with colors that are at the bottom of this chart, where the arousal is low. For example, I agree that purple is not one of the happiest and most energetic colors, but you could match it with fast movements to get a similar effect to what you could get by matching an orange to slower movements.

6

Considerations and design output

The interviews carried out with 5 stage lighting designers significantly complemented the theoretical knowledge put together by this body of work. In the first place, they all firmly confirmed the emotional impact of lighting on people during concerts. Specifically, what emerged is that emotions arouse as a reaction to the interaction between light and other elements such as music and the stage itself. Indeed, light has to match the rhythm of the musical arrangement highlighting the most emotionally intense moments of the song. In addition, light is what makes the performance visible turning a live show into a multi-sensorial experience. Therefore, it is essential to define the way lighting interacts with the stage gradually revealing certain portions of it. It is how light touches the scenic space and objects on the stage that helps generate emotion. It can be said that people's emotions during live shows are the result of a synergy between music, stage design and lighting design.

When the respondents were asked whether they design light at concerts taking into account people's emotional response or simply to achieve an aesthetically pleasant result, they provided varied answers. Giovanni Pinna says that people's emotions, as well as his own emotions, play an important role during the programming phase, but not during the previous design phase that is mainly technical and related to the choice and positioning of light fixtures.

In contrast, when programming he thinks of the kind of emotional impact he is willing to create. However, he states that designing

emotions is a sort of unconscious process since he realizes that he has actually made decisions that aroused people's emotions only once the show takes place. Carlotta Renzi and Mamo Pozzoli have two opposite perspectives on the topic. According to the former's personal experience, emotion and aesthetics go hand in hand. On the contrary, the latter affirms that it depends on the situation. When he programs light, sometimes aesthetic overcomes emotion and vice versa, but they never run parallel. To some extents, Jo Campana and Jacopo Ricci agree with Pozzoli's point of view. Indeed, even though Campana specifies that most of the times the element of audience involvement is not a priority factor or a starting point in his design, he also says that when a particular moment of a song requires to be emphasized by the lighting, then he takes into account people's emotional engagement. Jacopo Ricci says that it depends on the context too. For instance, when he programs light for an EDM show, it is just aesthetic. In contrast, in other situations he starts from the emotional development of a song and tries to underscore it through light. As a result, people's experience is enhanced. What is more, both Pinna and Ricci say that there are not any specific parameters of light that tend to generate more emotion in people. The former adds that it depends on the context, for instance the size of the venue. In a theatre, a powerful emotional impact can be obtained simply turning on a spotlight on the artist, whereas in a stadium, to obtain a strong reaction all lights should be turned on. The latter suggests that it is not a matter of features of light, but of how light touches the objects on the scene. These points of view are notably different from Pozzoli's who, conversely, listed four precise parameters of light whose changes affect the audience's emotional reaction. These are light intensity, the typology of the source, the beam direction and light color. As far as light intensity is concerned, Renzi and Campana add more. They both think that playing with this parameter of lighting helps to deliver the strongest emotional impact people can experience. Indeed, light can be dimmed not only in positive (from 0 to 100) but in negative as well (from 100 to 0). According to their experiences, when they turned off the lighting altogether, seeking a blackout, they obtained a huge reaction from the audience, the so called "wow" effect.

Moving onto the aspects of light analyzed in this research, the respondents were asked what is the importance of its movement and color in their works. In this case, the answers were quite consistent. Indeed, as far as movement is concerned, all interviewees agree in saying that movement is fundamental in nowadays productions because it helps create infinite layouts and therefore obtain a bigger engagement with the audience. However, they stress the attention on the fact that movement can be obtained without actually ever moving smart lights' bodies. Indeed, in chapter 4 it was already mentioned that when speaking about movement in this research, it is not just referring to the physical extension of the light fixture in the space (through pan and tilt parameters), but generally speaking to the visual dynamism perceived by the eye that can be created thanks to changes to the intensity of light, to the use of gobos and so on. In this regard, Pozzoli and Campana differentiate "dynamic movement", that is obtained by physically moving the light fixture when they are turned on, from "static movement", that, on the other hand, is the result of impactful visual changes that do not require any extension of the lamp in the space but is still perceived as movement by the human eye.

When it comes to the color of light, they all share the point of not using many colors during the same song, but a maximum of 2 to 3 colors where the third one is white or a nuance of one of the other two colors. Particularly, Pinna and Campana point out that this does not mean that many colors (such as the rainbow effect) cannot be used whether a particular moment of the show requires this approach.

Since color covers a huge part of this research, being the studies related to it much wider compared to movement, the interview tried to further investigate this aspect of light. The five show lighting designers were therefore asked their perspective about color and symbolism and color and psychological effects on people. Both Pinna and Campana consider the meaning behind color a legit approach to stage lighting design. Indeed, even though using color symbolism to match the meaning of a song might be didactic, they think it works very well. Nonetheless, Campana appears to be concerned whether people can grasp this not-too-subtle correspondence or not, but still thinks they are not supposed to. Of a different opinion, Pozzoli is inclined to believe that this kind of approach results into an excessively literal design output. In fact, he prefers giving more importance to the psychological

effect color (or white with its different temperatures) might have on people and their emotional response. Renzi shares the same view, but she thinks that the theory of the psychological effect of colors on people is underrated. However, Pozzoli specifies that color choices within each kind of approach, either symbolic or psychological, need to be compared with the practice. This means that sometimes, the color imagined for a certain song does not fit in the moment of the setlist that song is supposed to be placed in. Finally, Ricci's approach differs from the previous ones as he says his color choices are mainly intuitive and unconscious.

Being the core of this thesis trying to understand to what extent the show lighting designer can actually design light at concerts to arouse and strengthen people's emotional response, the interviewees were shown Russell's method applied to stage lighting design. They were asked to express their opinion confirming, or not, what was shown. Particularly, it was specified that the graphs are not meant to substitute a show lighting designer's already structured approach. Yet, it was proposed as a scientific way to enhance and stress a certain emotion during a particular moment of a show. Again, the answers were varied. On the one hand, Pinna and Pozzoli believe that this methodology could not be applicable. Specifically, the former thinks this would be a way to "cage the system". Nonetheless, he adds that he would compare "for fun" his work with the graphs once the show is done. The latter provides a deep analysis clarifying why, in his opinion, this method cannot be used today. Indeed, he points out that "this kind of interpretation […] is more applicable to a context that has been overtaken by events" because nowadays every kind of production features many elements and lighting is just one of them. Particularly, he focuses the attention on the graphic component linked to images and visuals that is becoming more and more predominant due to the introduction of video led walls. This means that light has to harmonize with these elements and its design cannot ignore them. He also talks about "graphic emotions". Indeed, nowadays lighting is not used only to light the scene, but to literally create thrilling graphics in the atmosphere. In his view, emotion is therefore not only related to the color and movement of light but much more. What is relevant to this research about this perspective, is that Pozzoli does not preclude

a further development of this methodology whether it takes into account a series of other elements such as the aforementioned led walls contamination. On the other hand, Renzi, Campana and Ricci appear to be supporters of this more scientific approach. Indeed, they all confirm they already operate in these terms in most cases. Notably, Campana says "[…] I consider my professional approach deeply connected to these graphs".

By way of conclusion the interviews gave further confirmation to the theory that lights do have an impact on people's emotions during a live show. Yet, they have to be considered in relationship with music and stage design, since both concur to arouse an emotional reaction in the audience. In addition, they highlighted certain design strategies that appeared to be highly efficient in arousing emotions in the audience (such as a full blackout). Going deeper into the investigation, and showing them Russell's methodology applied to stage lighting design, Pinna alone appeared to be totally doubtful about the effectiveness of it. Pozzoli, on the other hand, although he thinks that the graph as it stands would not work nowadays, leaves the door open to a possible development of this methodology that could lead to a more complete version of it that takes into account all the variables that come into play in a production (such as led walls). The others were all confident in the effectiveness of the methodology despite not denying exceptions to it.

Generally speaking, it can be said that show lighting designers use various approaches to design lighting at concerts and it is important to underline the relevance of the subjective component in each of them. Trying to better frame these approaches, they are:

- *Purely aesthetic approach*
- *Symbolic approach* (mainly referred to the color of light)
- *Intentionally emotional approach*

The first one simply consists of designing light to obtain a visually appealing picture. The second one happens when the lighting designer pairs a song with a color that shares the same meaning as that song. Finally, the last approach arises when the designer purposely thinks of the emotional reaction he wants to arouse in people (such as the

blackout trick described both by Renzi and Campana). However, it is has to be pointed out that all approaches share the same aim to emote the audience. In addition, even though they have been listed separately, this does not mean that they cannot occur together.

This research tried to define a fourth approach that is more scientific compared to the previous ones since it was obtained applying Russell's method to stage lighting design. As evaluated through the interviews this approach could be efficient but it should take into account the development of stage productions over the last decades. Indeed, nowadays productions are not just a matter of lighting. Therefore, further studies should be carried out to better develop this methodology.

This knowledge is applied to the stage lighting design of "The Chromatic Experience", a brand new show starring Lady Gaga designed on purpose for the occasion. Particularly, I worked on the stage design (which includes the analysis of the location, the stage re-design, and the design of the scenic elements), the show design (setlist and storyboard) and finally the lighting design (choice of the fixtures and layout). Particularly, with the help of programmers, I designed the lighting for some moments of the show using the previously mentioned approaches.

7

The Chromatic Experience

7.1 Project introduction

The Chromatic Experience is thought as a concert to finally introduce to the world Lady Gaga's sixth studio album, *Chromatica*, since the artist has not performed it live yet, except for a 10-minute performance during the MTV VMAs in late August 2020. Hypotetically, the show will take place at Radio City Music Hall, in New York City. That is because the album has been defined by music critics as the artist's return to her dance music roots (Saveriano, 2020). Not by chance, on the album track *Free Woman* she sings with convintion:

> *"This is my dance floor I fought for."*

Consequently, no place could have been more appropriate than New York, the artist's hometown and the city where she moved her first steps into the world of music before becoming the acclaimed popstar everyone knows. In an Apple Music interview with Zane Lowe (2020), Lady Gaga described the symbol on the cover (Fig.38) of the album with these words:

Fig. 38
The album cover shows the singer in hot pink hair pinned down to a metal grate, wearing a metallic bodysuit that features spikes and studs. She seems to be trapped under a heavy metal sine wave, the symbol of Chromatica.

"The symbol for Chromatica has a sine wave in it, which is the mathematical symbol for sound, and it's from what all sound is made from, and, for me, sound is what healed me in my life period, and it healed me again making this record, and that is really what Chromatica is all about. It's about healing and it's about bravery as well and it's really like, when we talk about love I think it's so important to include the fact that it requires a ton of bravery to love someone."
Chromatica is therefore an album that talks about the artist's personal recovery and how she goes through depression thanks to music and dance. Likewise, the show, which is described in detail in 7.10, is a story about healing: planet Chromatica inhabitants are in a never-ending fight and Lady Gaga is called to bring peace back there through

her music (and this is a metaphor for the artist's healing process). Each tribe is distinguished by a different color and that is because Chromatica is the planet for all the colors, that means it is the place for all the people. Indeed, Chromatica is also about inclusivity and freedom.

7.2 CHROMATICA - tracklist

The standard edition of the album is composed of 13 songs and 3 intros that divide it into three acts (note that the show division into acts does not reflect the album structure). The tracklist follows:

1. *Chromatica I* – 1:00
2. *Alice* – 2:57
3. *Stupid Love* – 3:13
4. *Rain on Me* (with Ariana Grande) – 3:02
5. *Free Woman* – 3:11
6. *Fun Tonight* – 2:53

7. *Chromatica II* – 0:41
8. *911* – 2:52
9. *Plastic Doll* – 3:41
10. *Sour Candy* (with Blackpink) – 2:37
11. *Enigma* – 2:59
12. *Replay* – 3:06

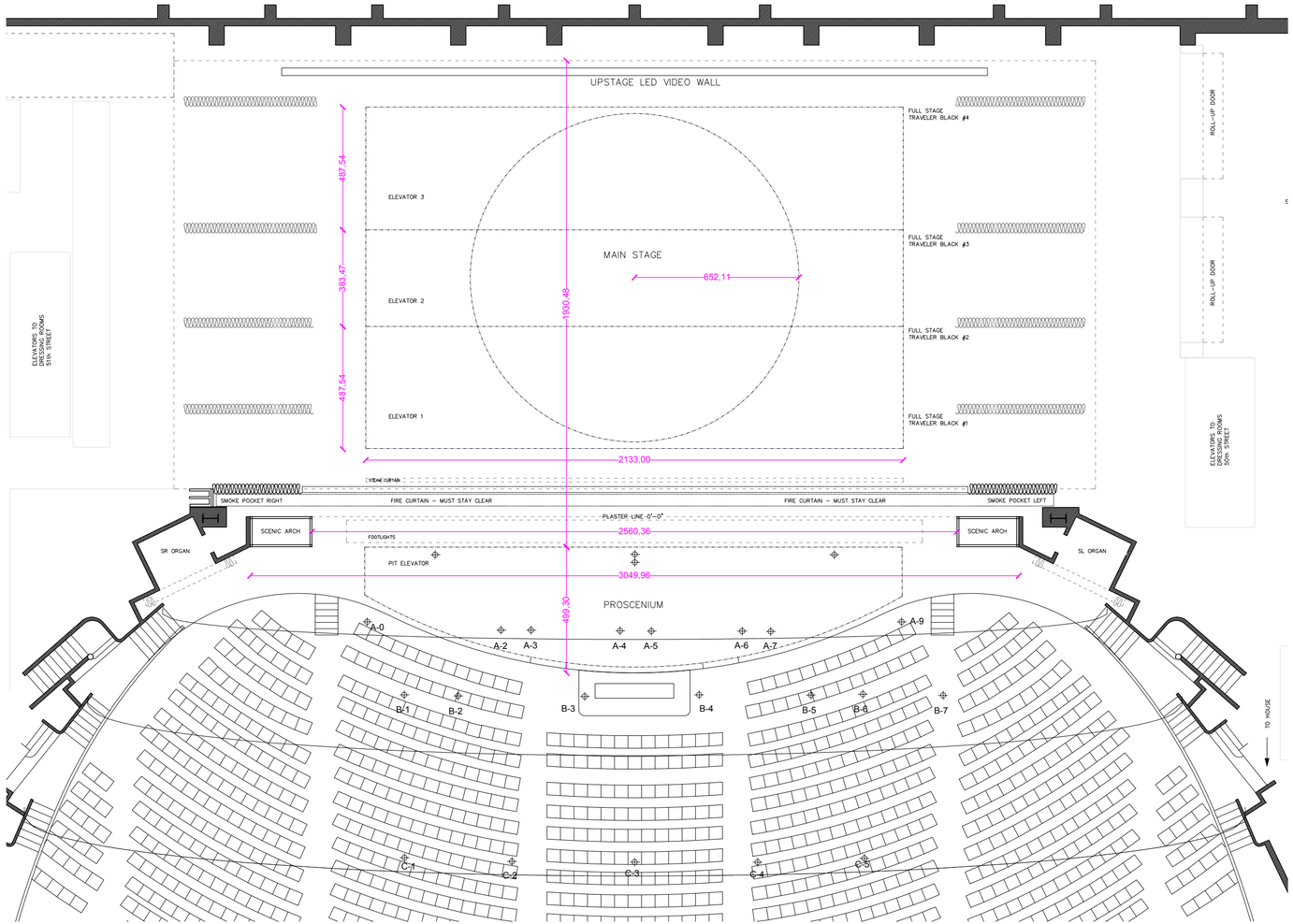
13. *Chromatica III* – 0:27
14. *Sine from Above* (with Elton John) – 4:04
15. *1000 Doves* – 3:35
16. *Babylon* – 2:41

7.3 Radio City Music Hall stage

To allow the artist to get closer to the audience, enhancing people's engagement with the performance, the actual stage of the Radio City Music Hall was redesigned preserving its existing features.
The stage of the aforementioned theatre, also known as the *Great Stage* (Fig.39), is considered by experts the most perfectly equipped in the world. The main stage floor features three imposing hydraulic stage elevators.

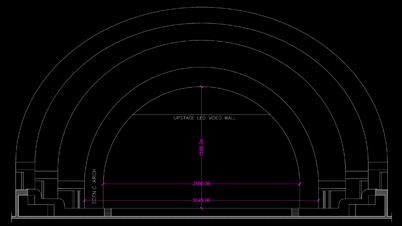
Fig. 39

Elevator 1 and Elevator 3 have the same dimensions, whereas Elevator 2, which is in the middle, is a bit smaller as shown on the plan on the left. These three elevators are capable of achieving heights of almost 4 meters over the stage level. Furhtermore, they can go down to 9 meters where there are two storage areas where scenic elements are stored. This allows the set design to be extremely dynamic and varied over the course of a play or a concert. They travel at an average speed of roughly 30 cm every 1.5 seconds (the speed can vary according to the needs of a performance.)

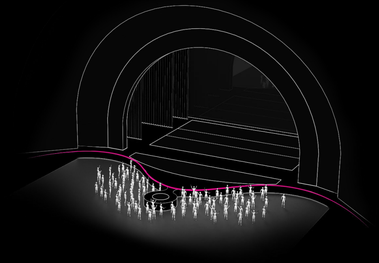


original plan - scale 1:150

The proscenium features a fourth elevator. It is the curved orchestra pit on the downstage. It can descend 8 meters to the sub-basement level. When the show does not need the orchestra, it can be brought to auditorium level and utilized as an additional seating area. However, it can also be used as an additional elevator to add more variations to the show.
Another remarkable feature of the stage consists of a turntable (diameter = 13m) that is integrated into the three elevators. Indeed, it can be activated only when the three of them are the same height and engaged. A full revolution takes 53 seconds.



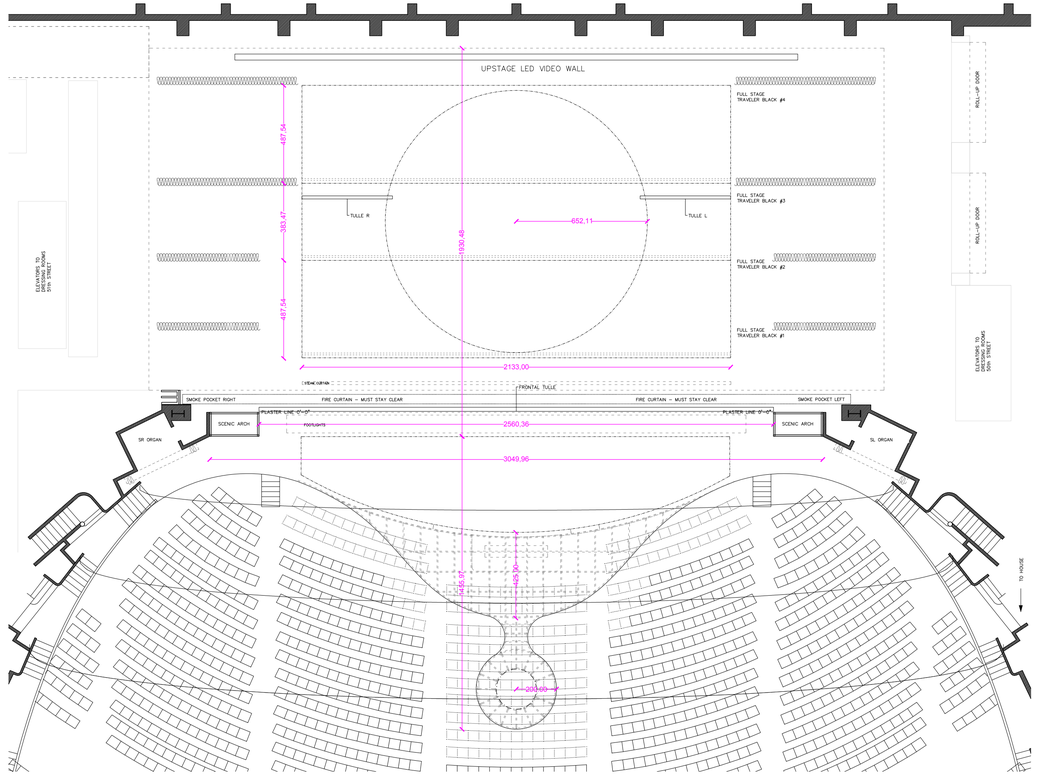
Front view - scale 1:300



7.4 Stage re-design

The new thrust stage extends into the audience on three sides and is connected to the main stage area by its downstage end. It was designed starting from the concept behind *Chromatica*: the sine. It is the mathematical representation of music that is what healed the artist during the process of creation of the album. Nonetheless, the continuity of the sinusoidal shape is interrupted at its middle where it converges in a circular stage that reminds of a drop of water. In addition, the re-designed shape of the down stage recalls the symbolgy of the tribes that live on Chromatica (especially the top left-hand corner one) (Fig.40).

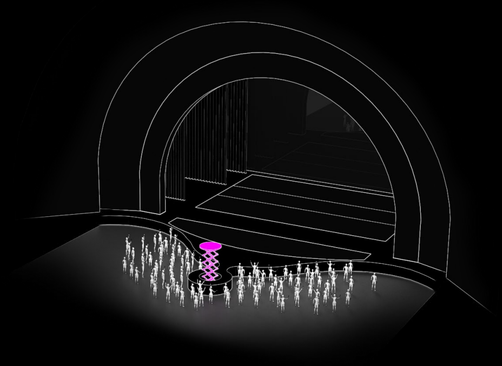
Fig. 40



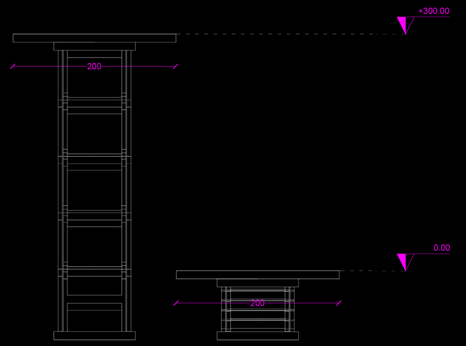
New plan - scale 1:150

7.4.1 Circular stage

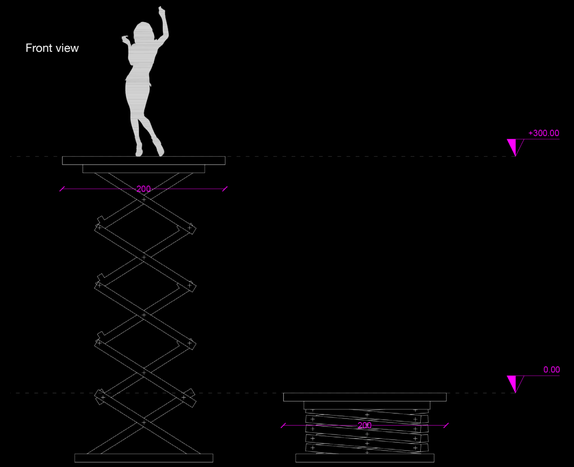
The circular stage has a 4-meter diameter that is enough space both for the artist and some dancers. It is the closest the artist can get to the audience. The main feature of this stage extention is an hydraulic lift system. It has a diameter of 2 meters being intented for the artist only. There are many companies that design customized pieces of hydraulic lift stages such as *Spectrum Production Services* which is one of the leading ones on this front. Particularly, in this case, as shown in the technical drawing on the next page, it can go up to 3 meters over the main stage level.



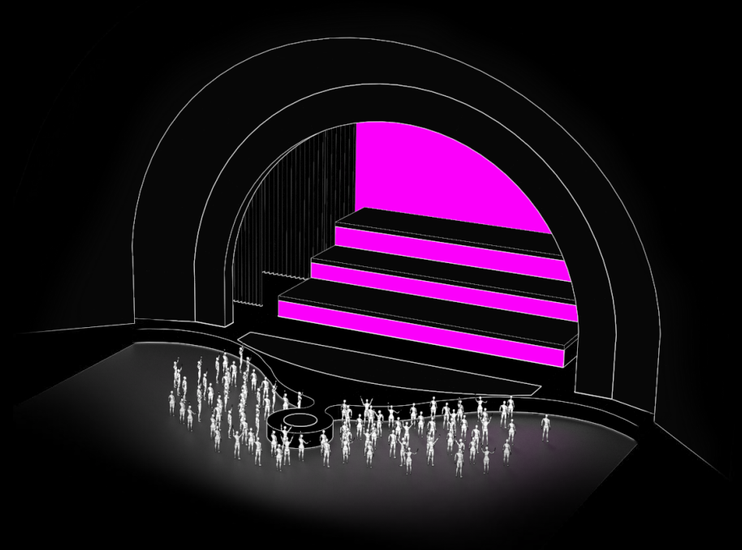
Side view



Front view



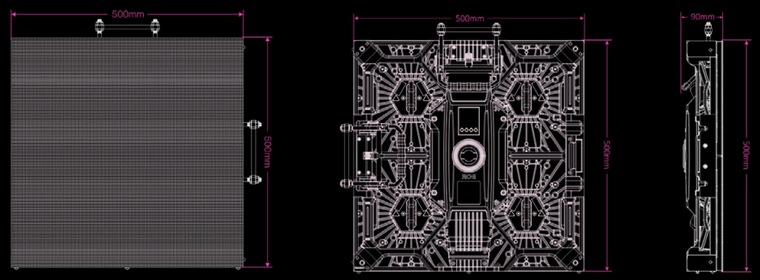
Technical drawings - 1:50



7.4.2 New ledwalls + resident ledwall

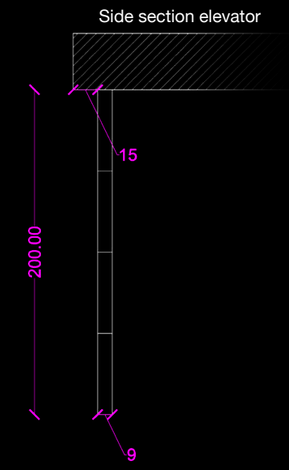
The upstage area features a huge ledwall 28 meters wide and 12 meters high (56 panels wide x 24 panels high), one of the biggest in the world regarding indoor theaters. It is a state-of-the-art visualization system that provides a full size stage backdrop, ideal for video playback, scenic elements and special effect content.

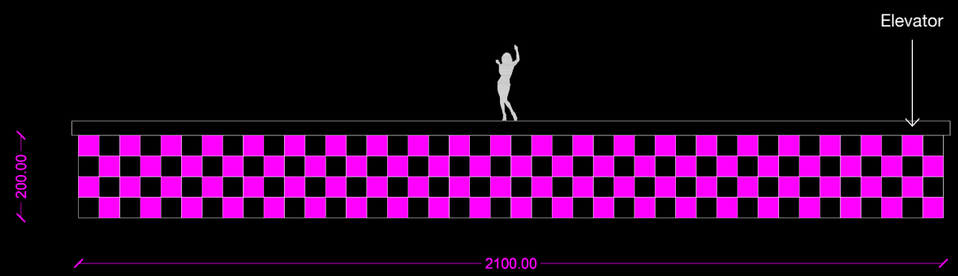
To create a more dynamic and deeper scenic space, ledwalls are mounted under each of the three elevators in the main stage area (no pit elevator). Particularly, in order to fullfill technical requirements such as image mapping, the same led tiles as the backdrop ledwall are used. This will allow to control all led surfaces together and play a seamless image/video on them. On the next page, details of the led tiles.



Black Onyx BO3
producer: Roe Visual

<u>Specifications</u> (they refer to a single tile)**:**
Pixel pitch: *3.47 mm*
Max brightness *1,500nits*
Panel resolution: *144 x 144*
Weight: *9.35 kg*
Power consumption Max/Average: *170W / 85 W*
Weight: *9.35 kg*
LED configuration: *SMD 2020 Black*
Viewing Angle Vertical: *140°*
Viewing Angle Horizontal: *140°*
Refresh Rate: *1920Hz*
Gray scale: *16bit*



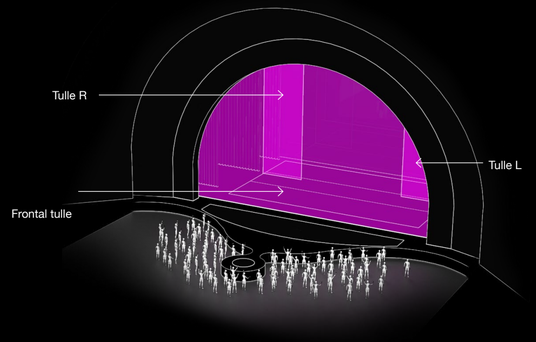


As shown by the image above, under each elevator there are 168 led tiles (42 panels wide x 4 panels high). In addition, in order to prevent any kind of mulfunctioning and interlocking in the system of the three elevators, led panels are set back 15 cm from the front edge of each of them (see section elevator above).

** The techical information reported above comes from Roe Visual website*

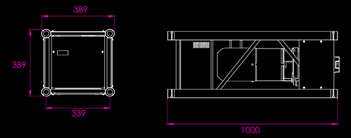
7.4.3 Tulle curtains

Designing a show in a theater gives you a lot of opportunities in terms of scenic changes. Indeed, the space above the scenic area (fly) is usually very high. This enables a stage crew to fly quickly, quietly and safely various components. Because of this, the Chromatic Experience will feature three semi-transparent tulle curtains. A large one (25 meters wide) that covers the whole void under the scenic arch (*frontal tulle*), and two thinner stripes (4,5 meters wide each) over elevator 2 (*tulle R* and *tulle L*).
Projectors are used to cast images one them and, according to the amount of light in the scenic space, they will appear as either compact or transparent surfaces. Particularly, the frontal tulle will appear as compact when everything in the scenic space is turned off and video interludes are projected on it.



To wrap and un-wrap the tulle at differant stages of the show, a roll-up system is needed, one for each curtain. The chosen one is produced by ShowTex and it is described on the top-half of the next page.

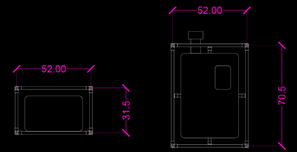
HISPEED MOTOR 300
producer: ShowTex



Specifications:
Motor power: *2.2 kW*
Motor torque: *244 Nm*
Motor speed: *86rpm*
Load capacity: *Max 190 kg*
Weight: *100 kg*

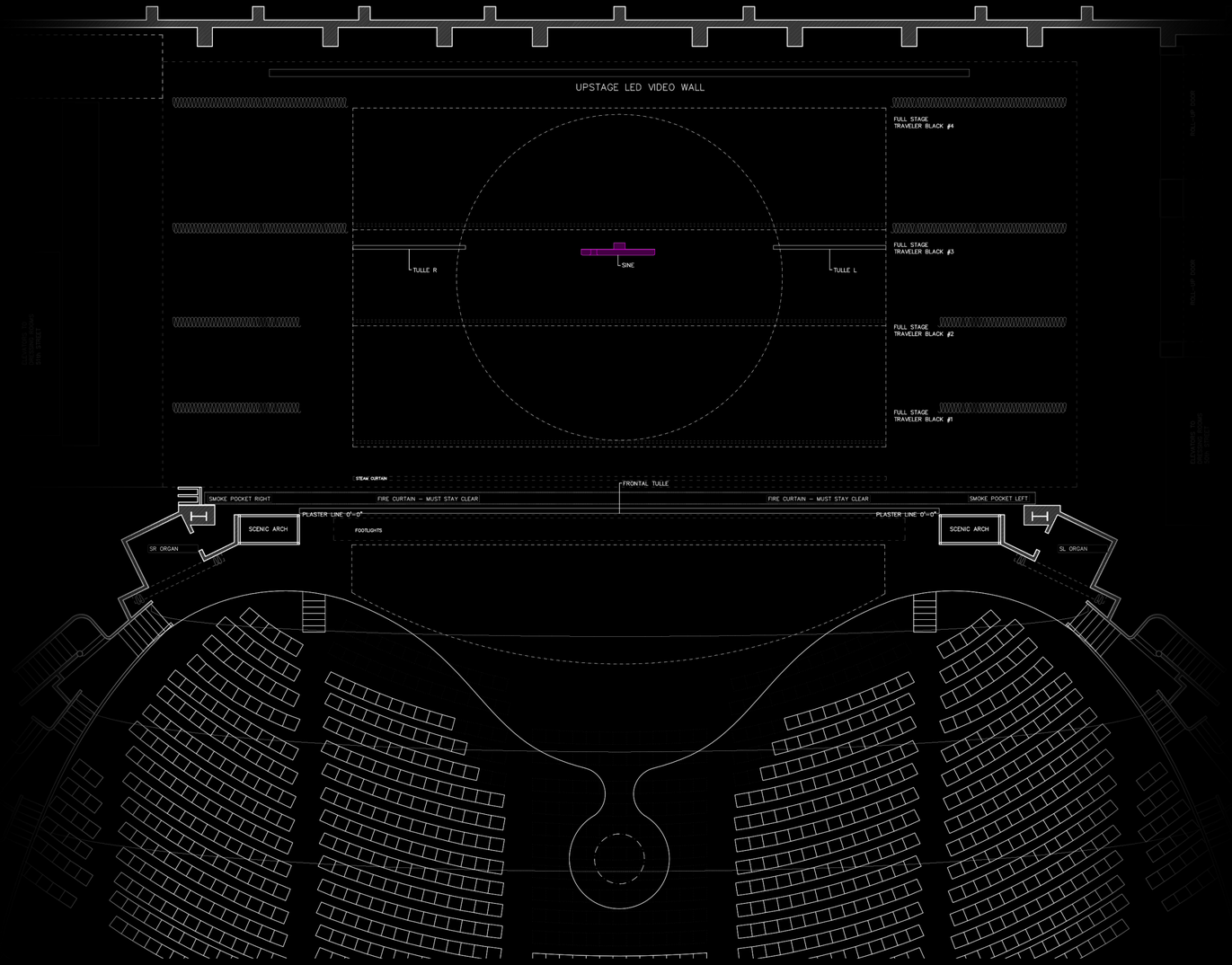
As far as projections are concerned, Radio City Music Hall features a resident system of projectors that are utilised to cast videos both on the scenic arch and on the huge vaults. This system can be used to project images on the frontal tulle as well. In contrast, the two other curtains both need their own projector. These two are placed on E border (see paragraph 7.11). The projector chosen is produced by Barco and it is described below. Note that the lens tyypology was calculated on Barco website according to the dimensions of the curtain and its distance from the projector.

UDM - 4K22
producer: Barco



Specifications:
Projector type: *4K UHD 3-chip DLP digital projector*
Technology: *0.9" DMDTM x3*
Resolution: *3,840 x 2,400 (4K UHD)*
Brightness: *22,000 ISO lumens*
Lens: *TLD + 1.5 - 2.0:1 (1.48-2.0 4:1 KUHD)*

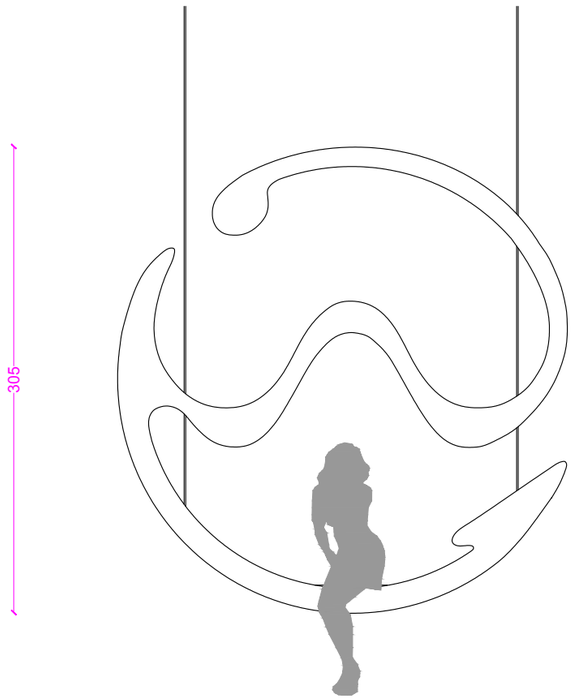
** The techical information reported above comes from ShowTex and Barco respective website*



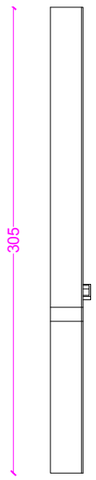
7.5 The sine

The sine is one of the most distinguishing scenic elements throughout the whole performance. It is a 3-meter-diameter structure that comes from above at the beginning of the show carrying the artist. The sine is inspired by the metal structure that lies down on the artist on the artwork for the album this show is intended for, Chromatica.
It is a sort of futuristic spaceship through which the artist lands on planet Chromatica once the show starts and that takes the artist back on planet Earth once the show comes to its end.

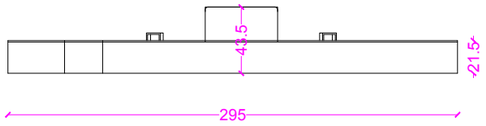
On the left, the technical plan with the exact positioning of the sine in the scenic space. Scale 1:150



Front view

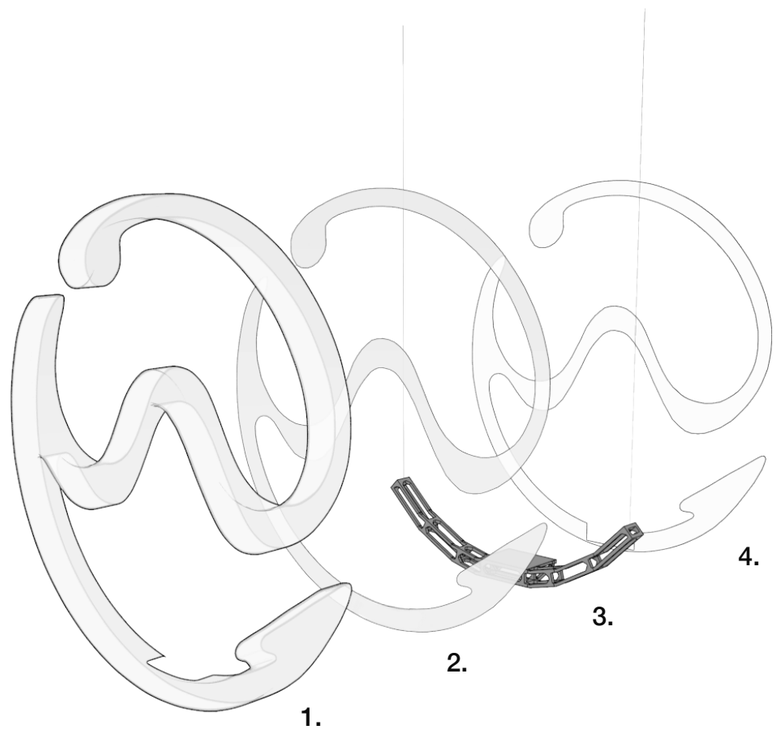


Side view



Top view

Techical drawings - scale 1:40



7.5.1 Structure and materials

1. OUTER PLASTIC SHELL

The main body of the sine is made of white-opal polycarbonate whose level of transparency allows the scenic element to shine bright.

2. STRIP LED SUPPORT

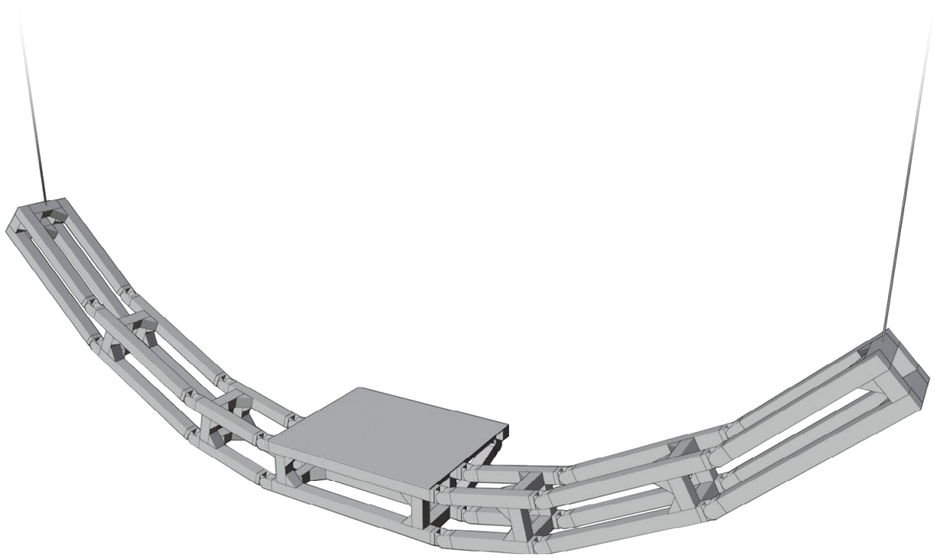
This surface works as support for RGB strip led as explained later. Again, the material used is white-opal polycarbonate in order to allow light to diffuse in the whole body of the sine.

3. ALUMINIUM STRUCTURE

This is the actual structure of the scenic element. It carries the whole load of it (and the artist's). Two hoists used to lift and drop the sine are physically connected to the extremes of this aluminium structure.

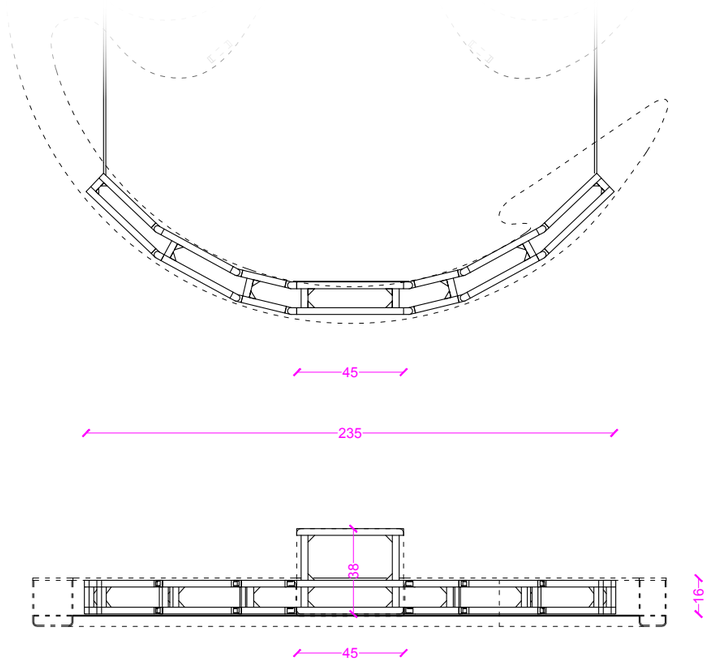
4. BACK

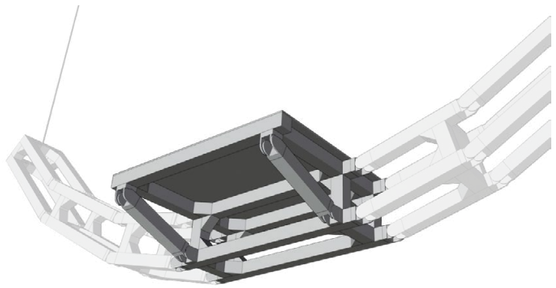
The back element is made of plywood. Particularly, the inner surface of it is white-coated in order to reflect as much light as possible inside the sine.



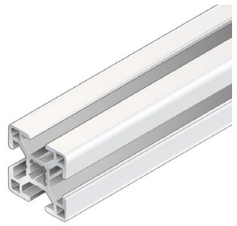
7.5.2 Aluminium structure details

The aluminium structure is made out of Rexroth (a Bosh company) strut profiles connected through lockable joints that allow to obtain the proper inclination to follow the shape of the sine. In addition, 90° connection elements are used to strengthen the strucuture.
The technical drawings below show the exact position of the aluminium structure inside the sine.



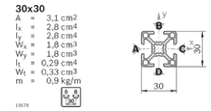


At its middle, the structure creates a protution covered with an aluminium sheet in order to define a seat on which the artist can comfortably sit.



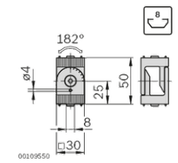
Strut profile 30x30 mm

Bosch Rexroth AG produces connectors with high load-bearing capacitWies combined with ultra robust slots and large central bores that make profile connections possible which can handle high static and dynamic loads.



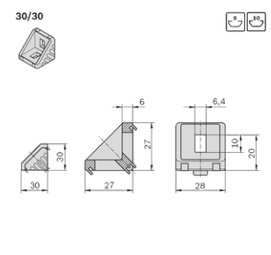
Lockable joint 30x30 mm

- *For movable or rigid profile connections at any angle*
- *Swivel range 182°*
- *With marking in 15° increments*
- *Locking by clamping (5 Nm) or fixing with pins (15 Nm)*



Bracket 30x30 mm

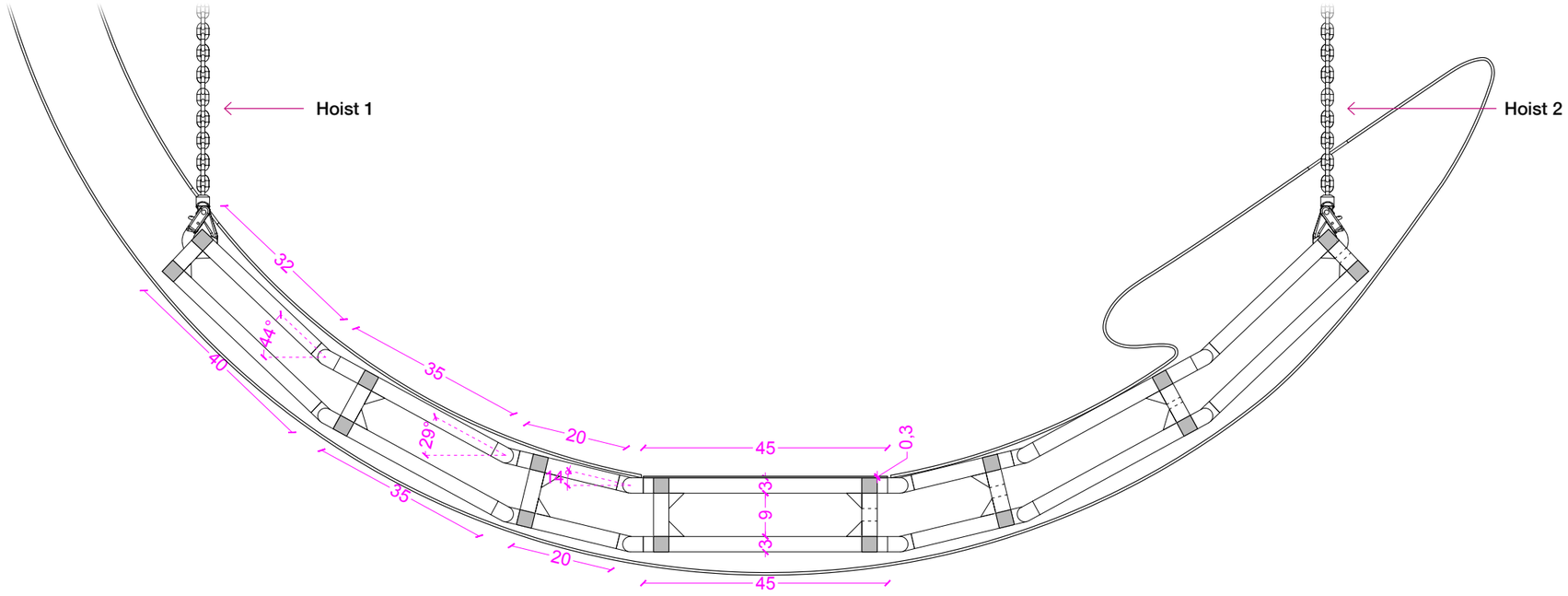
- *Brackets with centering lugs for rapid, precise assembly with protection against turning*
- *Centering lugs can be easily broken off for assembly on plates or at right angles to the slot*
- *Cover cap to protect from dirt*



** The techical information reported above comes from Bosch Rexroth AG website*

7.5.3 Hoist elevation system

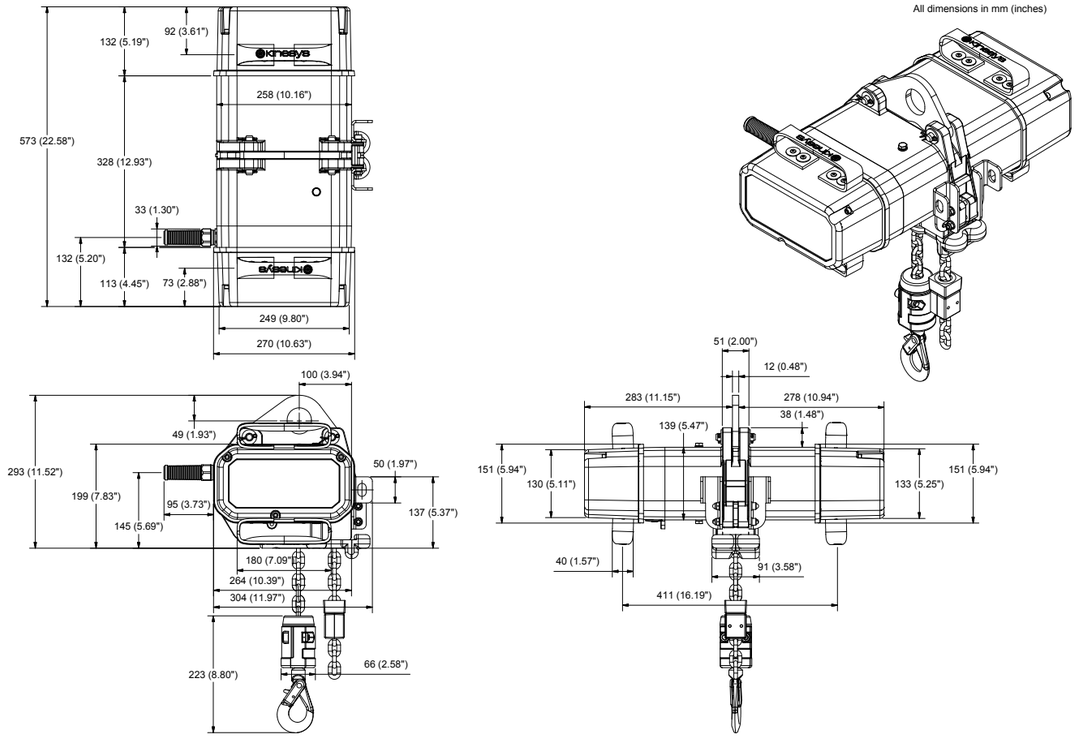
The sine can be lifted or dropped thanks to two hoists, one for each side of the aluminium structure. The chosen elevation hoist is produced by Kynesys, a British company specialized in manufacturing hoists and lifting systems.
This elevation hoist is fitted with double brakes, four position limit switches, encoder and it can reach conformity with many of the worlds most rigorous safety standards.
It is available in four different versions (according to the load they have to lift and to the maximum speed they can reach). The chosen model is the *250kg D8+ 24m/min.*



Techical drawing - scale 1:10

The technical information follows:

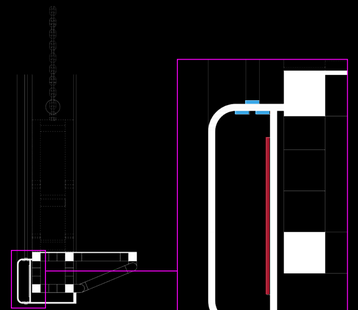
- *Maximum speed = 24m/min*
- *Weight of hoist = 41kg*
- *Weight of 1m load chain = 1.06kg (7×22 chain)*
- *Weight of hoist with 24m (79ft) Height Of Lift (HOL) = 69.62kg*
- *Double Brakes*
- *Black Chain **
- *Safety Latching Hook*
- *Large Delta Plate suspension on hoist body suitable for LibraCELL*



* *The techical information reported above comes from Kynesys website*

7.5.4 Lighting system

The sine stays visible to the audience throughout the whole show as its symbolic meaning is the core of the concept behind *Chromatica*.
Therefore, its lighting system was designed in order to obtain as diverse aspects as possible. As a result, it can either blend in the atmosphere thought for a song or stick out of it.
Two different led strips are used to achieve this diversity.
The first one is a dynamic HD white strip led:
this typology is used both in the inside, so that the whole body of the sine can turn white, and on the outside, so that when the body is turned off its profile is still visible.
The second one is an HD RGB strip led: this is placed only in the inside and, as mentioned before, it is mounted on a white opal polycarbonate support.



Dynamic HD white led strip

RGB led strip

Dynamic HD white strip led

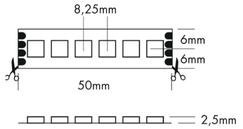
producer: LED PRO ELITE

Technical data:
Power consumption: *144W*
Maximum quantity per power input: *5m*
Width x height: *10mm x 5 mm*
Cuttable: *all 8 LEDs (6.2 cm)*

Photometric data:
LED type: *Samsung SMD2835*
Color temperature: *2700K to 5000K*
Luminous flux: *4200 Lumen/m*
Beam angle: *120°*
Dimmable

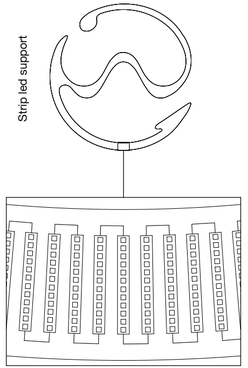
Flex Strip HD+ RGB

producer: PROLED



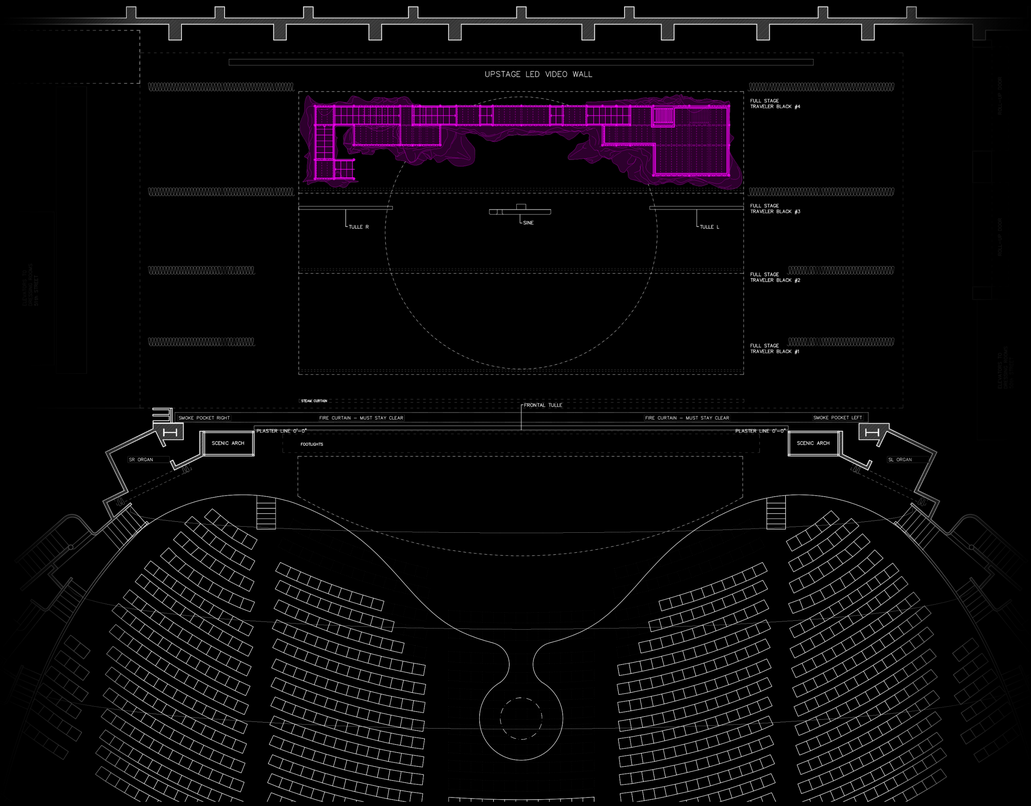
Technical data:
Power consumption: *64W*
Maximum quantity per power input: *2.5m*
Width x height: *12mm x 2.5 mm*
Cuttable: *all 6 LEDs (5 cm)*

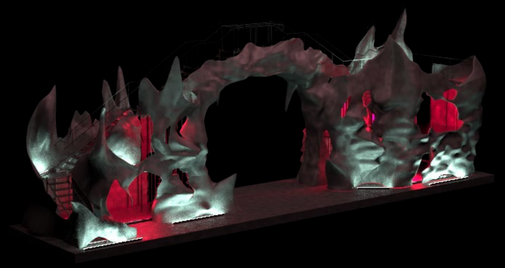
Photometric data:
LED type: *SMD RGB 3-in-1 LEDs*
Luminous flux: *red 330 Lumen/m*
green 880 Lumen/m
blue 200 Lumen/m
r+g+b (white) 1400 Lumen/m
Beam angle: *120°*
Dimmable



In order to guarantee an equal distribution of lumen to the whole body of the sine, RGB led strips have to be cut and put in series following the shape of the white-opal polycarbonate support as shown on the right.

** The techical information reported above comes from the producers' respective websites*

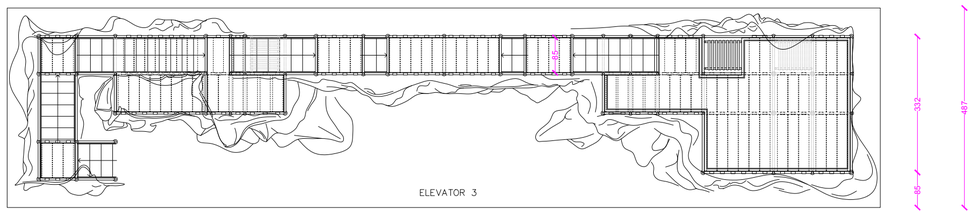




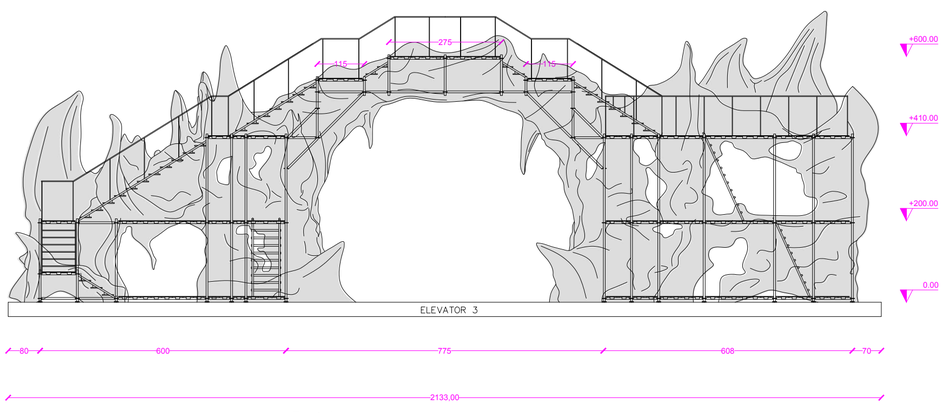
7.6 The mountain

The mountain is the main piece of scenography. It is inspired by the visuals of the album which are set on this mysterious planet, Chromatica, that is being explored throughout the show.
The mountain does not appear at the beginning of the show. It comes up once *Poker Face* starts, at the very end of the first act of the show as explained in 7.10.2.

On the left, the technical plan with the exact positioning of the mountain in the scenic space over the third elevator. Scale 1:150

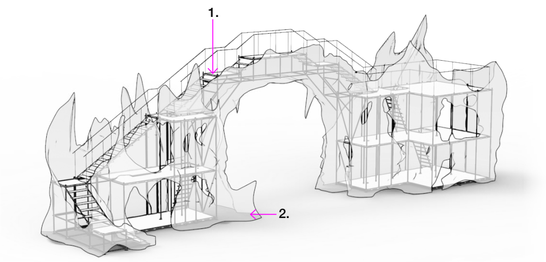


Top view



Front view

Techical drawings - scale 1:10



7.6.1 Structure and materials

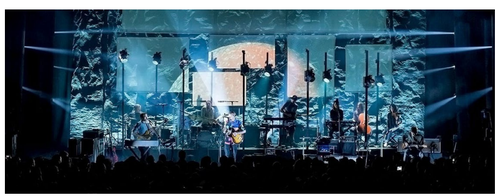
1. SCAFFOLDING STRUCTURE

The main body of the mountain is created with a common scaffolding structure. Therefore it is very easy and fast to assemble it. Due to its flexibility, given by the varied range of dimensions available, it is possible to connect the pieces in order to create whatever kind of structure you want. As a result, it is possible to organise the space on different levels connected by stairs (or ladders, for musicians and dancers) and a main bridge that defines an imposing arch in the middle.

2. ALUSHAPE COVER

The scaffolding system is covered with AluShape, a moulding fabric to create three dimensional scenic sculptures. It is produced by Show Tex, a worldwide leader in designing innovative flame retardant fabrics.

AluShape allows to create rocky backdrops, stage scenery in a fast and easy way by shaping this reusable and flexible molding cloth. Thanks to its sturdy design, the material is able to hold its shape without any kind of reinforcement. It can be painted.



AluShape backdrop at Ben Howard's concert

** The techical information reported above comes from ShowTex website*

7.6.2 Lighting system

As the mountain represents the main piece of the set design, lighting is fundamental to give it the right value.
As explained by the schemes on the right, there are four typology of lighting:

1. washlights on H border; these lights illuminate the structure from above and will be discussed in the “Lighting design” chapter.

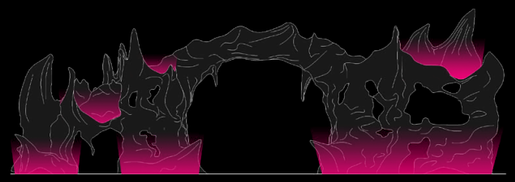
2. washlights inside the caves; in this case Color Force 48” and Color Force 12” by Chroma Q are used. These LED battens are part of the resident fixtures of the Radio City Music Hall.

3. washlights around mountain’s perimeter; the same LED battens described above are used. However, here light comes from below and this creates visually appealing and mysterious shadows on the rocky surface of the mountain.
These are placed both around the main perimeter of the mountain and the balconies’ perimeter as shown on the next page.

4. UV light; AluShape can be painted and the idea is to cover it with smart purple paint which will dry-clear (transparent) but glows brightly when exposed to UV Black light. These light fixtures are placed on G and H borders. Further details about these UV black lamps will be given in the “Lighting design” chapter.

1. Washlights on truss (H border)

2. Washlights inside the caves



3. Washlights around perimeter

4. UV black light on truss (G-H border)

COLOR FORCE 12”

producer: Chroma Q

Technical data:

Dimensions:	*335mm x 190mm x 218mm*
Weight:	*4 kgs*
Power consumption:	*120 W*

Photometric data:

LED Engines:	*2*
LEDs Per Engine:	*24 (g x RGBA)*
Total LEDs:	*48*
Lumen Output:	*white 2400 lumens*
Beam angle:	*23° (approx.)*

COLOR FORCE 48”

producer: Chroma Q

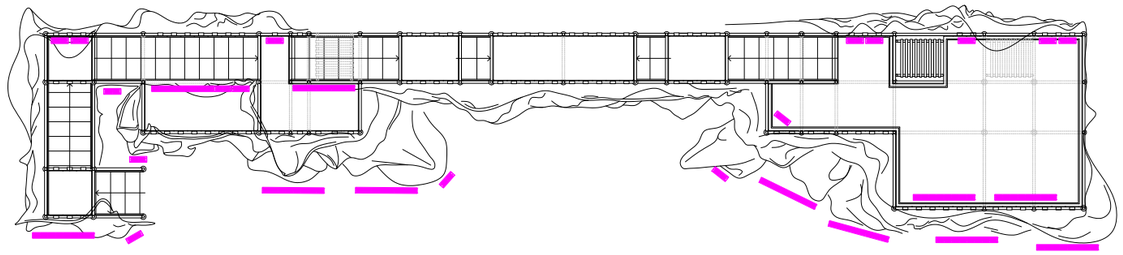
Technical data:

Dimensions:	*1,181mm x 182mm x 177mm*
Weight:	*15 kgs*
Power consumption:	*480 W*

Photometric data:

LED Engines:	*8*
LEDs Per Engine:	*24 (6 x RGBA) LEDs*
Total LEDs:	*192*
Lumen Output:	*white 12,000 lumens*
Beam angle:	*23° (approx.)*

The following plan shows the outer positioning of the light fixtures. More detailed drawings are provided in paragraph 7.11.3.



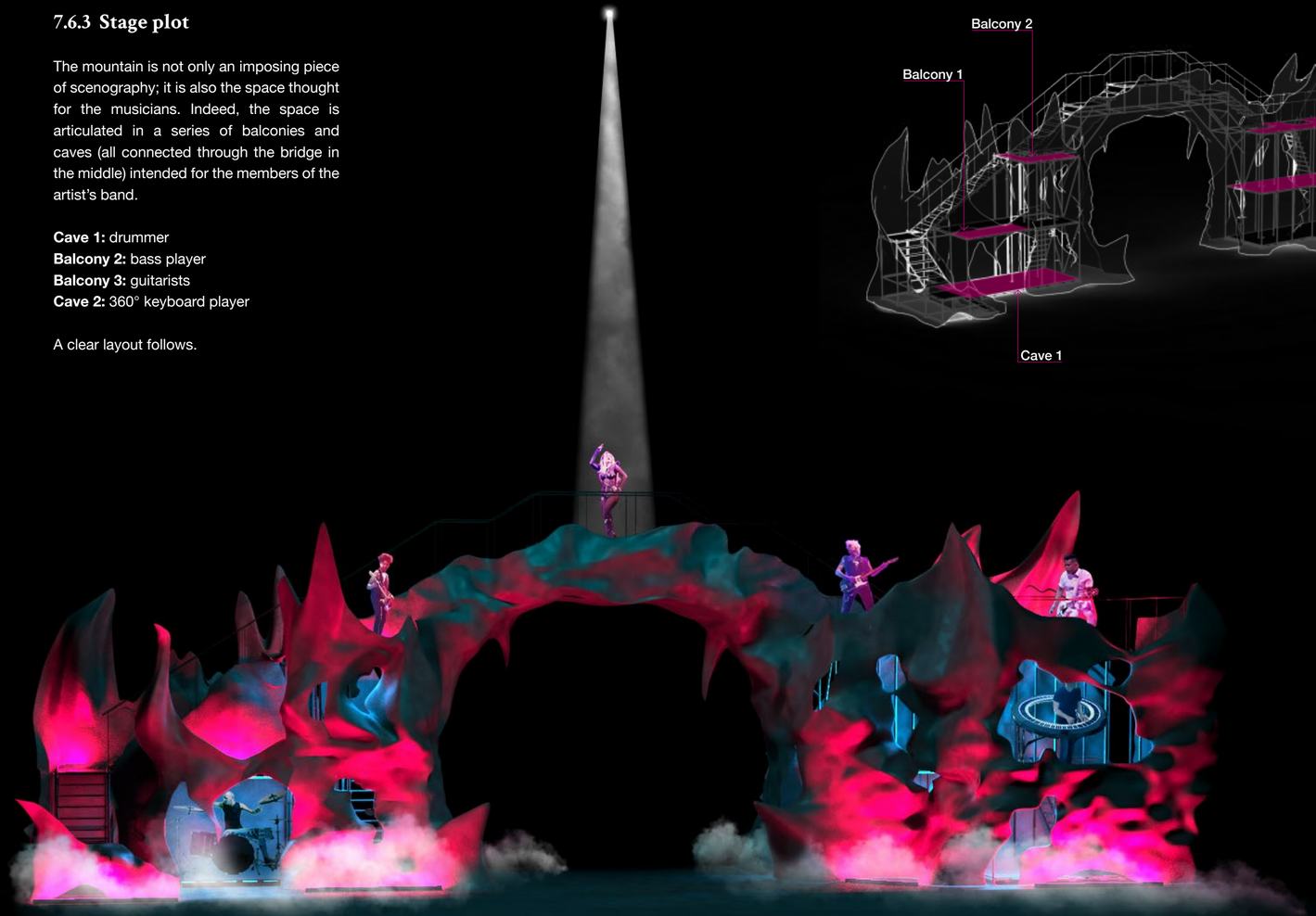
** The techical information reported above comes from the Chroma Q website*

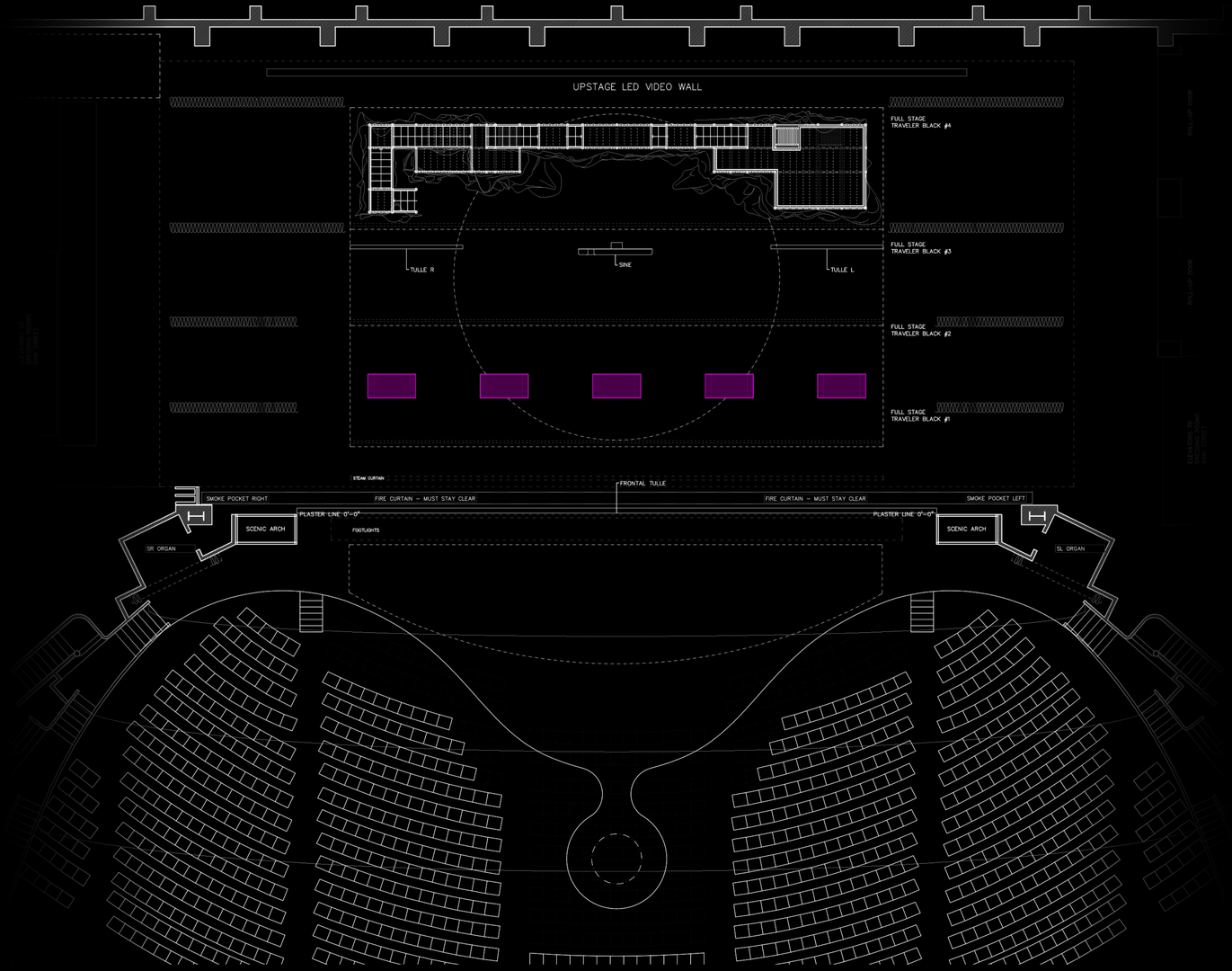
7.6.3 Stage plot

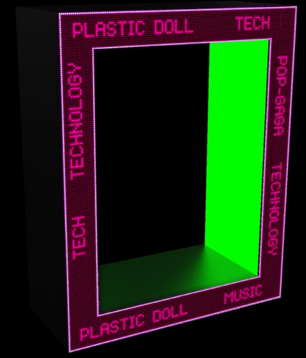
The mountain is not only an imposing piece of scenography; it is also the space thought for the musicians. Indeed, the space is articulated in a series of balconies and caves (all connected through the bridge in the middle) intended for the members of the artist's band.

Cave 1: drummer
Balcony 2: bass player
Balcony 3: guitarists
Cave 2: 360° keyboard player

A clear layout follows.





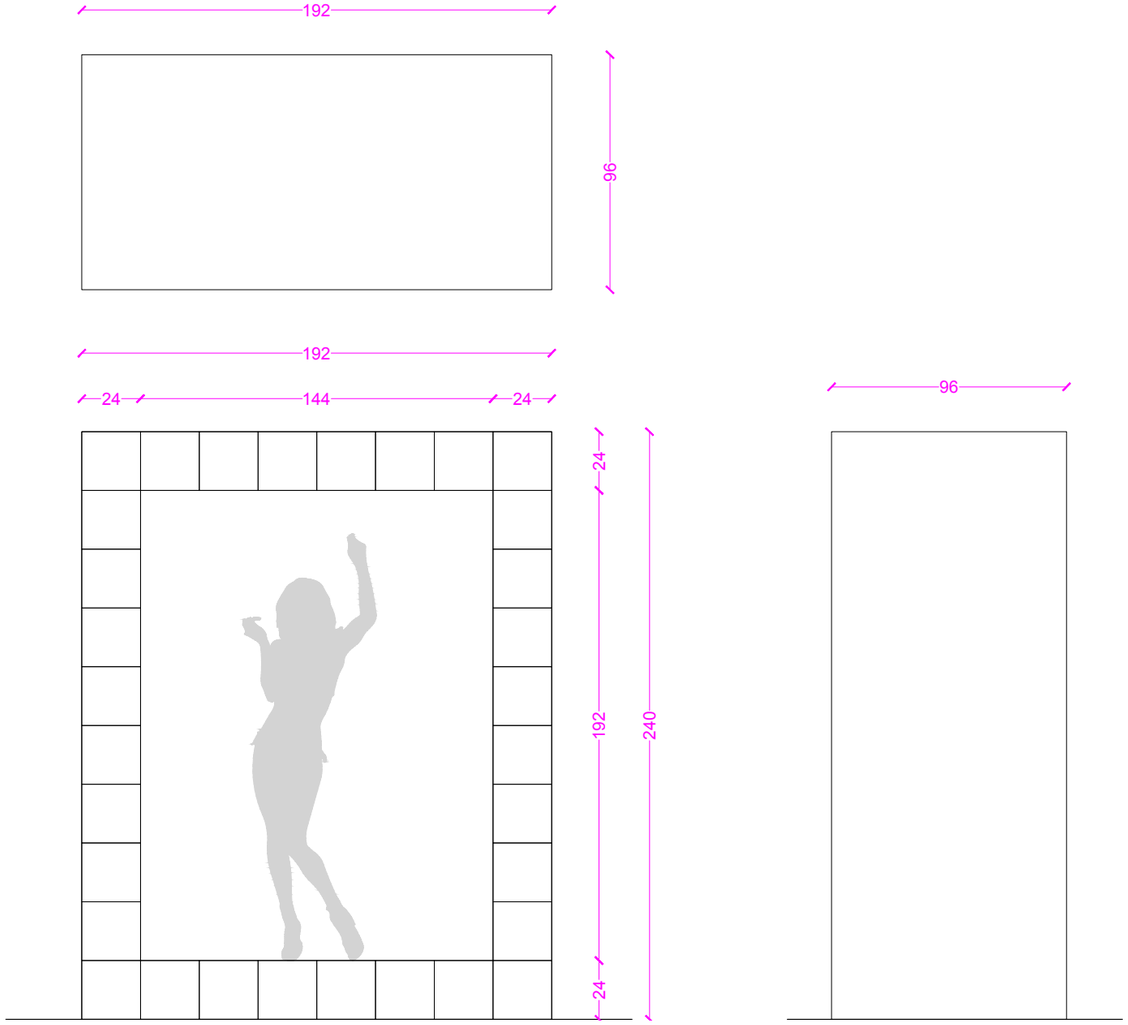


7.7 The "Plastic Doll" box

The second act of the show is opened by *Plastic Doll*. It is a song where she desperately repeats she is not a plastic doll, referring to the early years of her career during which she had felt like a money machine chained in men's hands. However, this is not a traditional doll: she is the state of the art, she is microchipped. As a result, the doll box she comes in has to be as technological advanced as its content.

On the left, the technical plan with the exact positioning of the 5 boxes in the scenic space over the first elevator. Scale 1:150

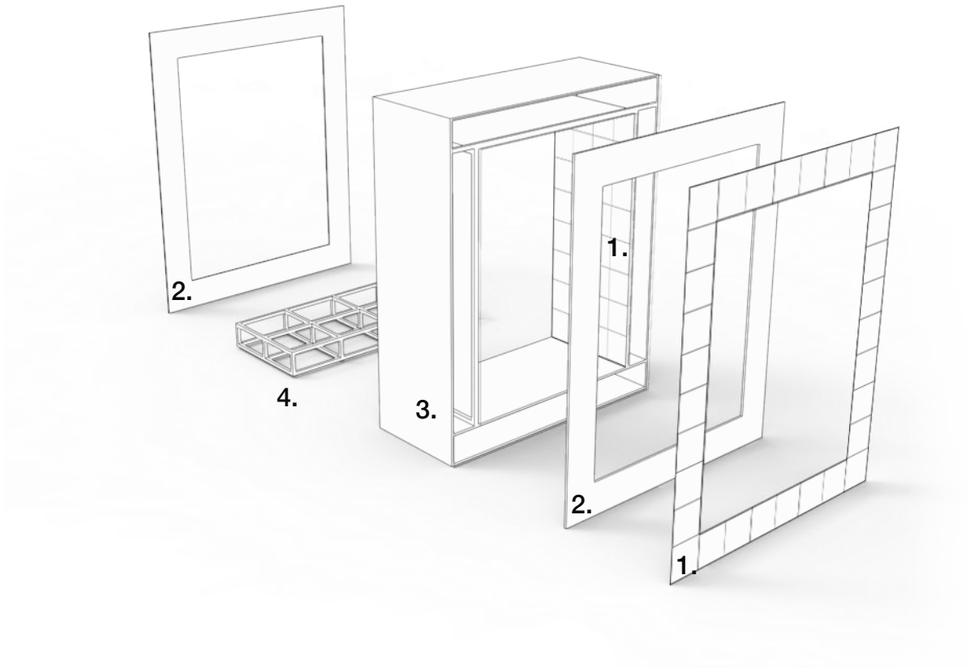
Top view



Front view

Side view

Techical drawings - scale 1:25



7.7.1 Structure and materials

1. CREATIVE LED VIDEO TILES
A Martin product. Further details are given in the next pages.

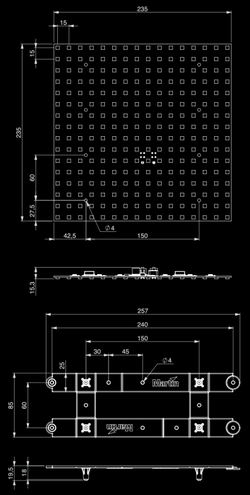
2. PLYWOOD FRAME
The two plywood surfaces work as caps to hide the structure of the box. In addition, the one that faces the audience, works as support for the creative led video tiles as well.

3. BOX BODY
It consists of plywood surfaces and wooden slats assembled to create the standing structure.

4. LOAD SUPPORT
Wooden framework that bear the loads of the artist once inside the box.

7.7.2 Lighting system

Lighting plays an important role in this scenic piece. The technology used in this case are Martin VC-Grid 15 whose measures dictated the dimension of the box itself. These are used both on the outside and on the inside.
As a matter of fact, on the outer frame the tiles will display sliding writings with a techno vibe.
In contrast, in the inside the video tiles are simply used as a very bright light source to create color contrast with the frame.

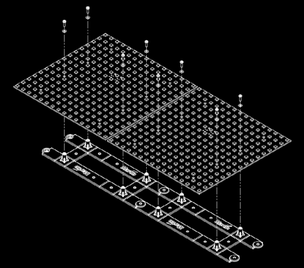


VC-Grid 15

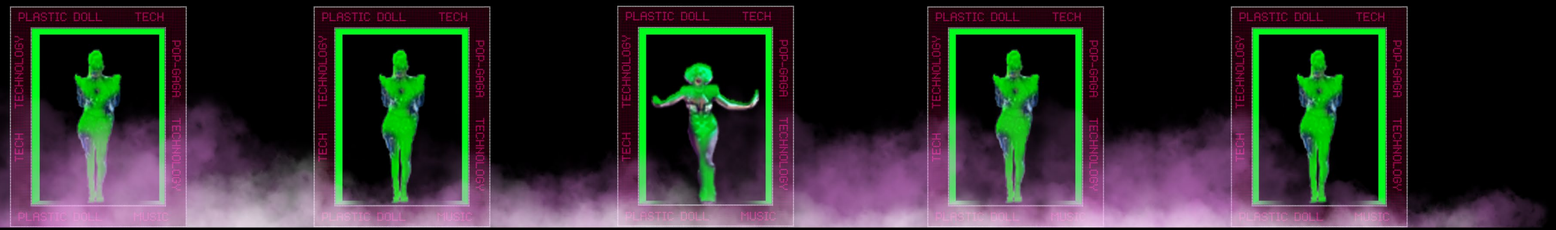
producer: Martin

<u>Features:</u>
• 256 individually controllable pixels per module
• 5000 nits of brightness
• High-quality 16-bit per color image processing technology
• Pixel-level brightness and color calibration for optimal image quality
• P3/DMX controllable (automatic protocol detection)
• Intuitive mapping and addressing via P3 System Controller

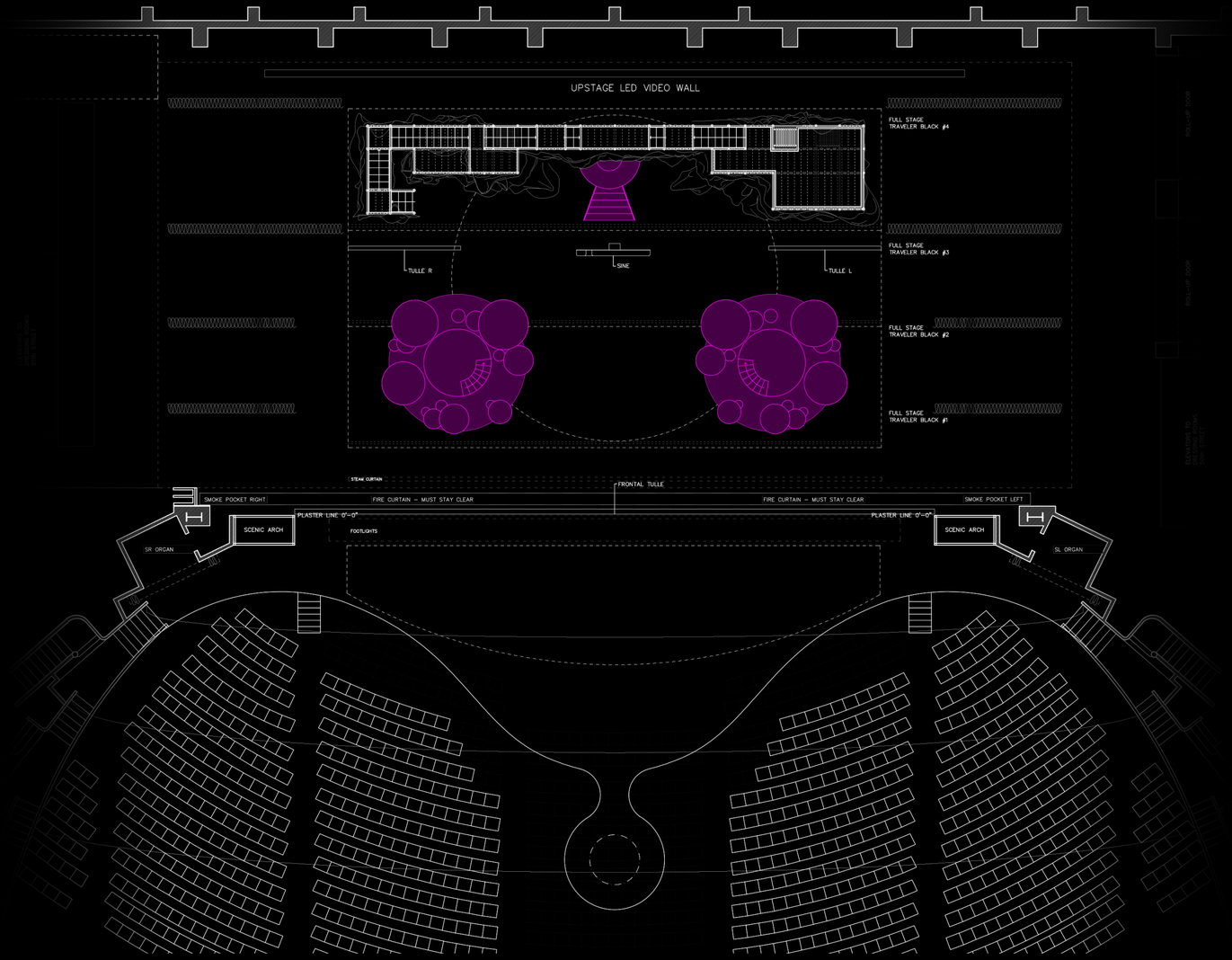
<u>Photometric data:</u>
Luminous intensity: *5000 Nit*
Total Max Output: *840 lumen per module*
Viewing angle: *120° x 120°*

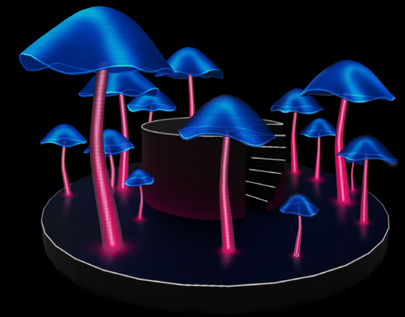


The producer provides dedicated mounting frames as accessories for a simplified and more uniform installation.



** The techical information reported above comes from Martin website*





7.8 The mushrooms

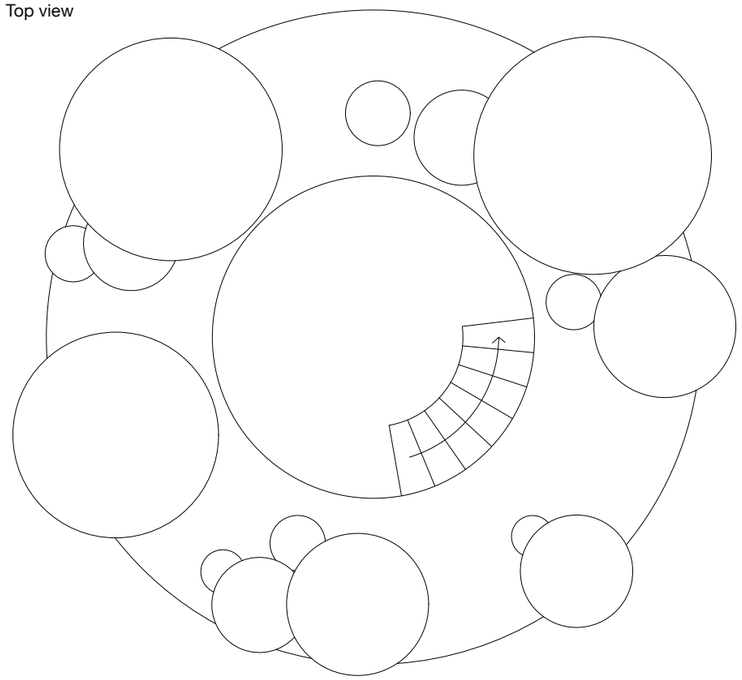
The third act of the show is the most intimate one. It is the moment during which the artist opens up about her fears and mental issues. “My biggest enemy is me”, this is what she says in 911, the first song of the act. It is about an antipsychotic medication called Olanzapine which the artist is prescribed.

> *“[...] it’s because I can’t always control things that my brain does. I know that. And I have to take medication to stop the process that occurs.”*
>
> (Paris, 2020)

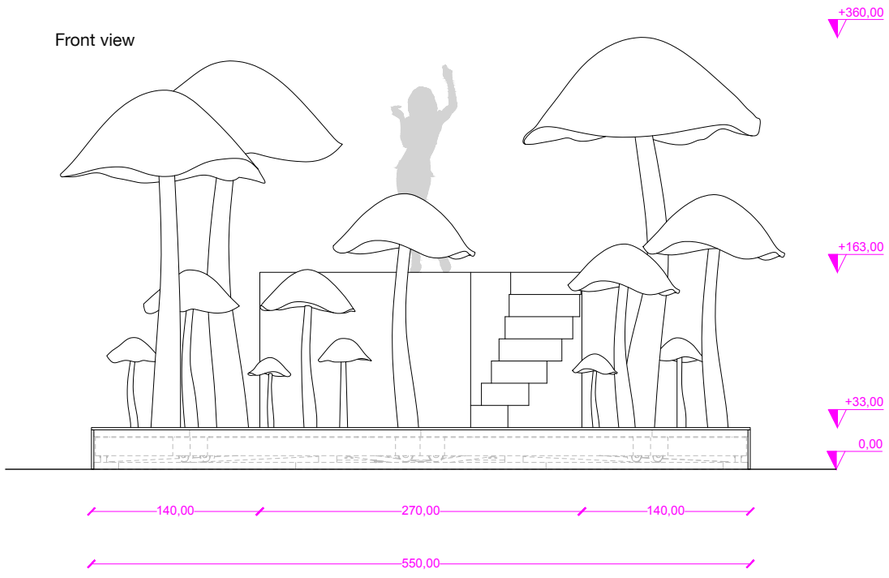
explained the artist in an interview. Moreover, the music video of this song gets the viewer through the distorted perception of reality the artist’s mind experiences when she does not assume those pills: everything is confounded and apparently meaningless.
To represent this idea of misperception of reality, two revolving platforms covered with mushrooms of different dimensions are used. Indeed, this element has always be associated with hallucinations by popular culture.

On the left, the technical plan with the exact positioning of the mushrooms (and the central elevated stage, described later) in the scenic space. Scale 1:150

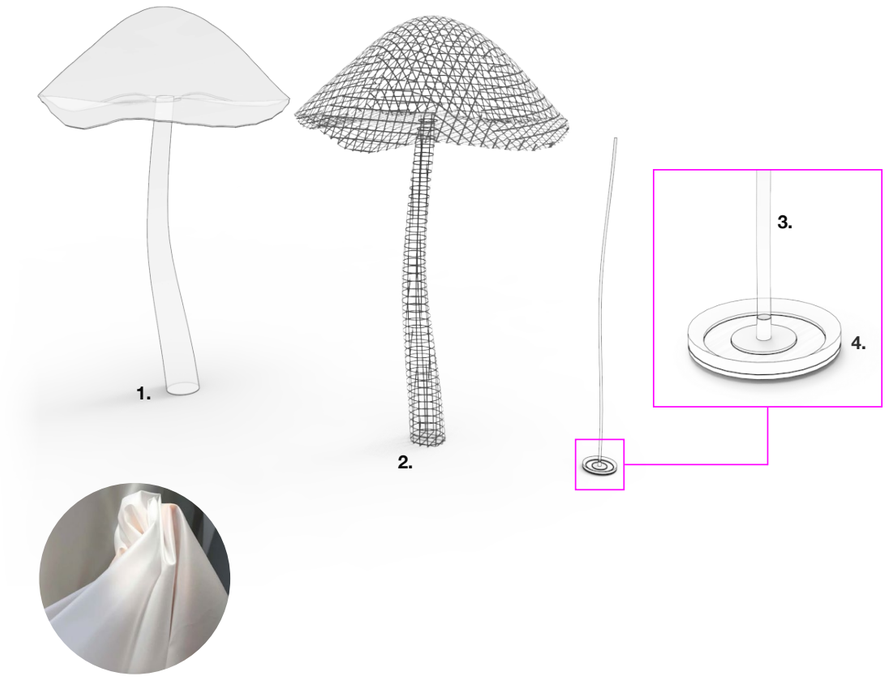
Top view



Front view



Techical drawings - scale 1:50



7.8.1 Structure and materials

1. OUTER LAYER

The outer layer is made of one layer of transparent PVC. It is a 100% polyurethane techno fabric that will be cut into various pieces in order to better adhere to the metal structure.

2. METAL MESH

The metal mesh is used to create the self-standing body of each mushroom. It is extremely light and it is easy to give it the desidered shape.

3. TRANSPARENT PVC PIPE

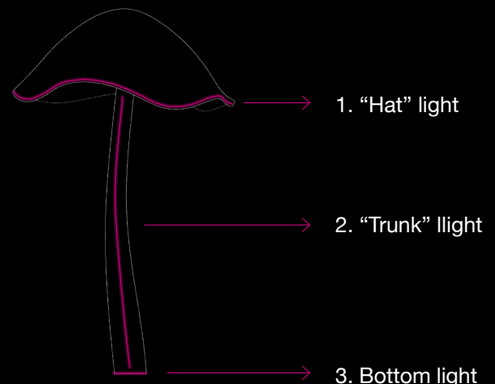
The transparent pvc pipe follows the shape of the mushroom's trunk and it is used as support for the led strips, as explained in detail on the next page.

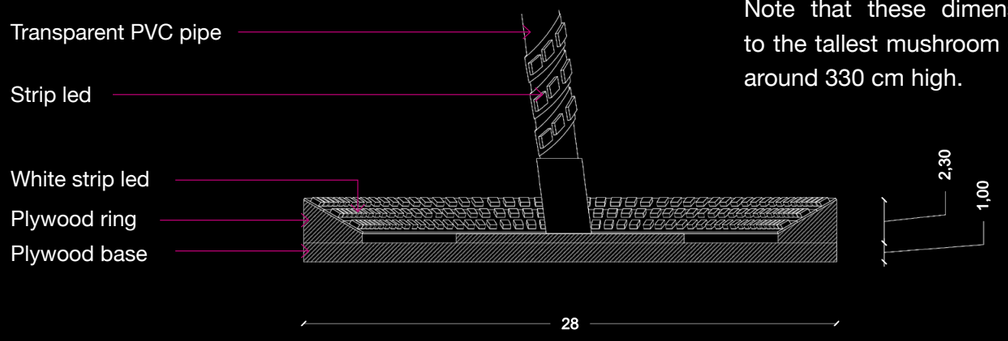
4. BASE

This part comprises a transparent PVC pipe support in the middle, an inclined ring (used as support for white led strips) and finally a plywood base used to stick each mushroom to the ground. A detailed scheme is shown on the next page.

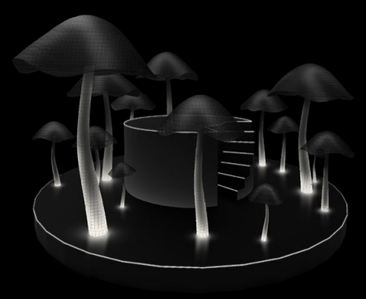
7.8.2 Lighting system

Each mushroom has 3 independent led strips in order to illuminate them in 3 different ways. The products used here are the same as those utilised for the sine (7.5.4). Particularly, the dynamic white strip led is used at the bottom of the trunk to obtain a sort of spot light effect.
The RGB strip led are instead used both inside the trunk, where one led strip is wrapped around a transparent PVC pipe, and inside the hat of the mushroom, where the strip led adheres the bottom of the metal mesh.
White led strips are also used to highlight each step of the platform and its main borders in order to make everything safe for the artist and dancers.

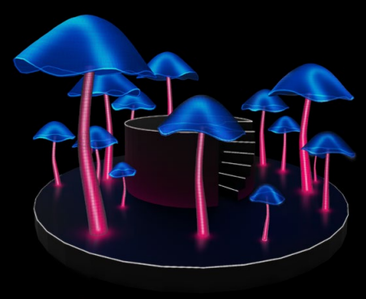




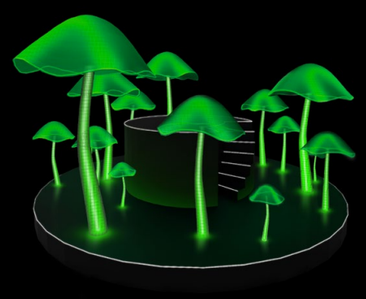
Note that these dimensions refer to the tallest mushroom only that is around 330 cm high.



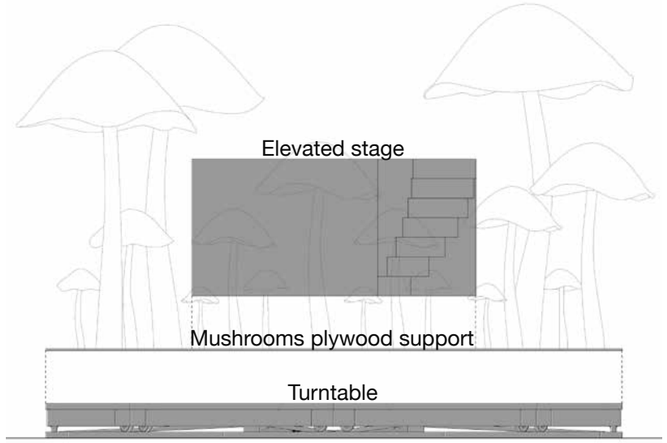
Spot light effect



Two-color light effect

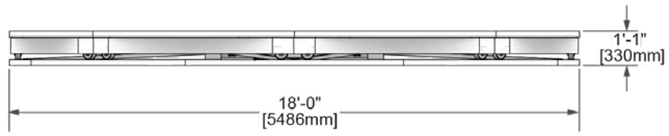


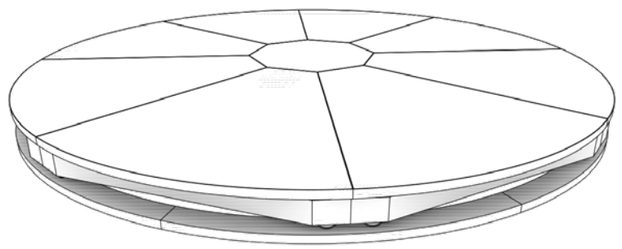
Monochromatic light effect



7.8.3 Revolving platform 1

To highlight the concept of confusion and misperception of reality, these mushrooms platform rotate on themselves.
To achieve this effect, ALLACCESS’ 18’ turntable is used. This is one of the companies on the forefront as far as staging automations are concerned and they deliver high quality products. A plywood layer with the same diameter as the turntable is placed over it and it works as support for the mushrooms. Finally, the elevated stage, which features a wooden framework inside, tops everything.





18’ TURNTABLE

producer: ALLACCESS

SPECIFICATIONS:

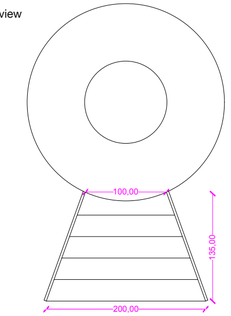
- Weight cap: 5000 lbs (2268 kg)
- Power req: 208v/120v, 3 phase (5 wire)
- Directional: Forward and reverse
- Variable speed control
- Remote control capabili

** The techical information reported above comes from ALLACCESS website*

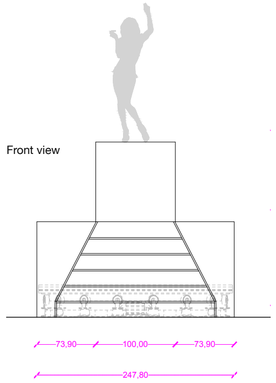
7.8.4 Central elevated stage

Together with the two mushroom platforms, during *911* the main stage will be enriched with a third revolving elevated stage exactly under the bridge of the mountain. However, this does not feature any mushrooms. As a matter of fact, this scenic element is thought for the artist and some dancers whereas the two mushrooms platforms are thought for dancers only. Its dimensions are smaller compared to the mushroom's platforms, that is why a smaller turntable is needed.
In addition, this elevated stage features a transparent PVC staircase to help the artist and the dancers to step on it easily. Nonetheless, to reach the highest spot of it, the artist will need the help of a few dancers. The stairs do not rotate. Again, the white strip led is used to hilight each step and the edges of the elevated stage.

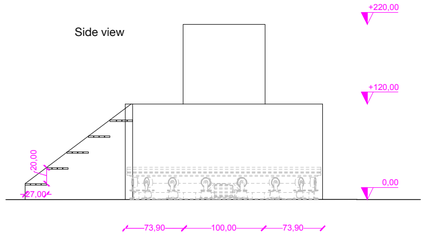
Top view



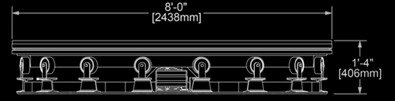
Front view

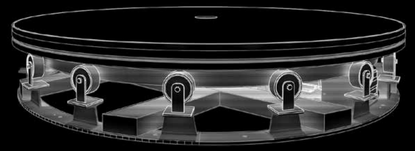


Side view



Techical drawings - scale 1:50





7.8.5 Revolving platform 2

In this case, considering the smaller dimensions of the elevated stage, the rotating platform is smaller as well. *8' turntable* by ALLACCES is the product chosen. Specifications follow:

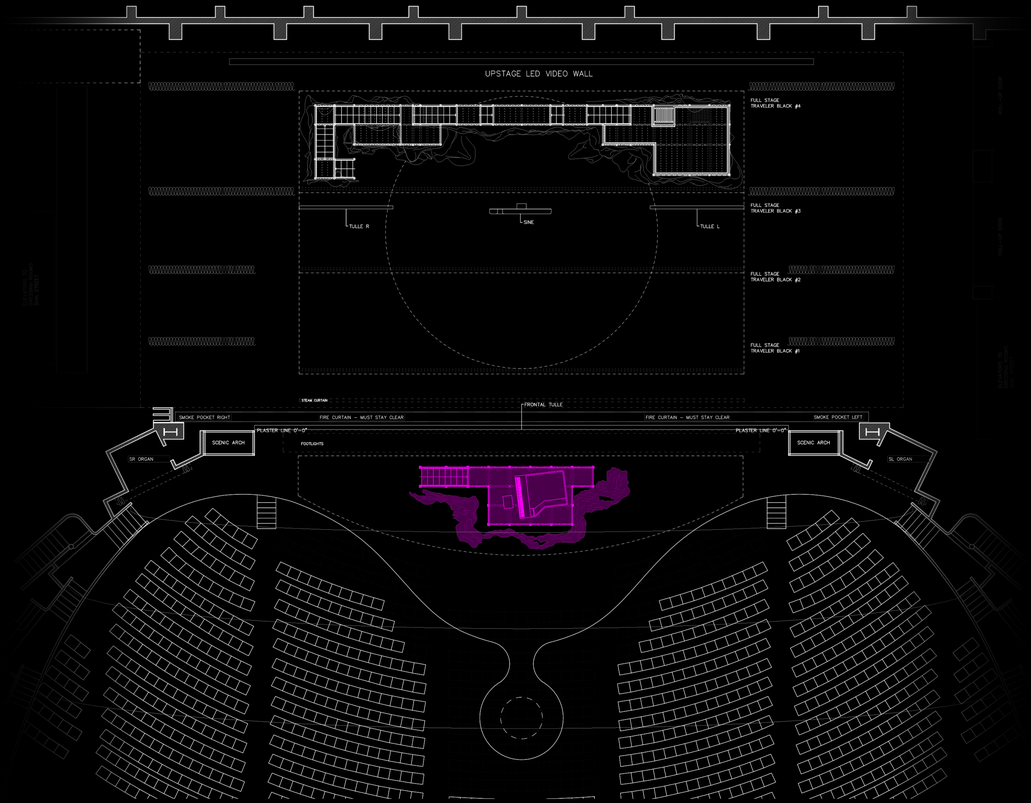
8' TURNTABLE

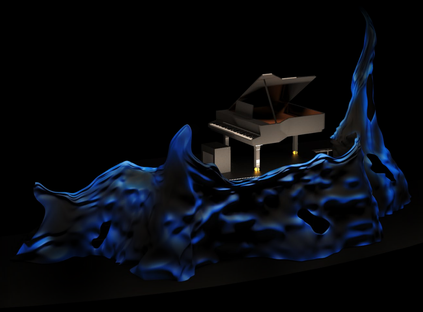
producer: ALLACCESS

SPECIFICATIONS:

- Weight cap: 2000 lbs (907 kg)
- Power req: 120v (20a)
- Directional: Forward and reverse
- Variable speed control

** The techical information reported above comes from ALLACCESS website*

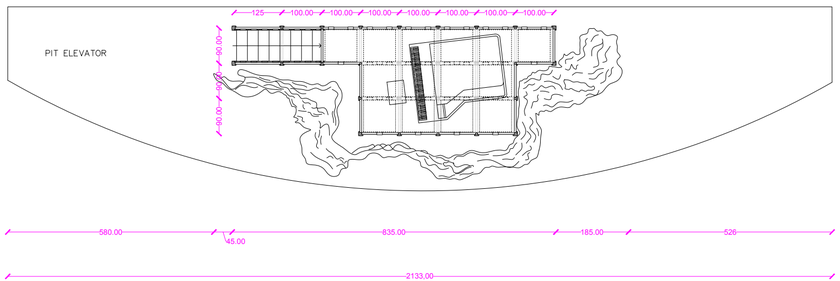




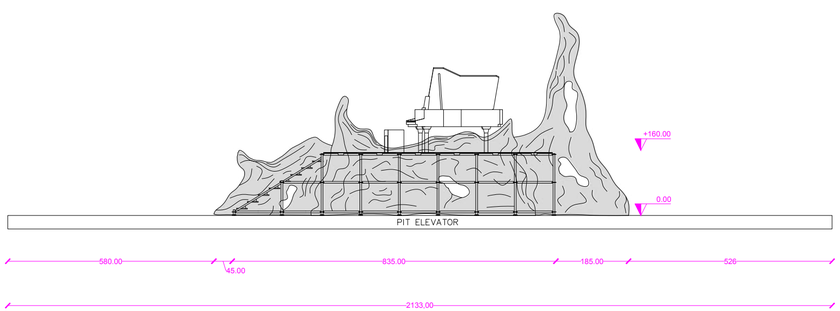
7.9 The piano rock

During the second part of the third act, the artist moves to the thrust stage and the frontal tulle goes down hiding the main stage and scenography. However, a rocky structure, which reminds of the mountain to show continuity in terms of scenography, appears on pit elevator and a grand piano is placed on top of it.

On the left, the technical plan with the exact positioning of the piano rock on pit elevator. Scale 1:150

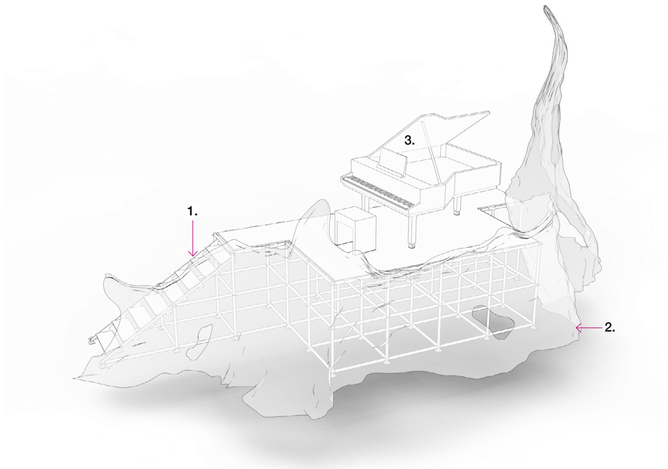


Top view



Front view

Techical drawings - scale 1:25



7.9.1 Structure and materials

1. SCAFFOLDING STRUCTURE
The main body of this rock is created with a common scaffolding structure. Therefore it is very easy and fast to assemble. This is the same structure as the one used for the mountain but its composition is simpler due to the much smaller dimensions of this scenic piece.

2. ALUSHAPE COVER
Again, the scaffolding system is covered with AluShape that, thanks to its moldability, allows to give the “rock” whatever kind of shape is needed. More information is available in 7.6.1.

3. GRAND PIANO AND SEAT
A grand piano appears to be nestled amongst the rocks.

7.9.2 Lighting system

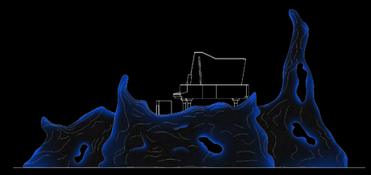
During this moment of the show most lighting will be turned of, with just a spotlight on the artist to evoke a feeling of intimacy that is needed when the artist plays the piano. As a result, the rock lighting has to be as soft, emotional and less intrusive as possible. The artist is the focus now.
As explained by the schemes on the right, compared to the mountain, here there are just two typology of lighting, plus one for the piano:

1. washlights on “Thrust stage truss”; these lights illuminate the structure from above and will be discussed in 7.11.

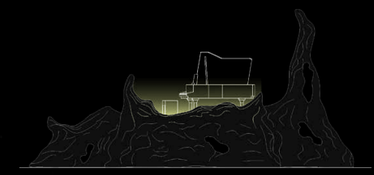
2. UV light; AluShape can be painted and, similarly to the mountain, the idea is to cover it with smart blue-ish paint which will dry-clear (transparent) but glow brightly when exposed to UV Black light. These light fixtures are placed on the “Thrust stage truss”. Further details about these UV black lamps will be given in 7.11.

3. Grand piano washlights; two LED battens (Chroma Q COLOR FORCE 48”), are placed over the scaffolding structure, directed to the piano to illumminate it from below giving depth to the space. These fixtures are hidden behind the AluShape cover.

1. Washlights on truss (thrust stage)



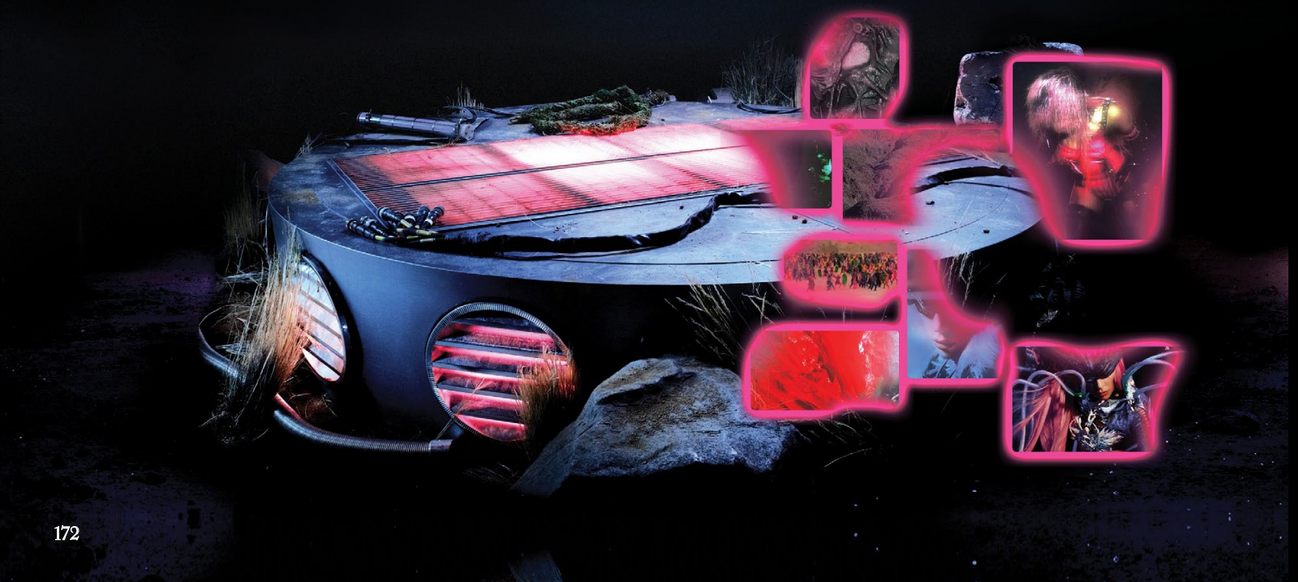
2. UV black light on truss (thrust stage)



3. Grand piano washlights

7.10 Show design

Lady Gaga's shows have always been much more than simple concerts. They are always highly conceptual since they tell the storyline behind her albums. During her show, she does not just sing, she also shows off her abilities as an actrees and as a dancer. From this point of view, they can be compared to a Brodway musical. Therefore, *The Chromatic Experience* was designed accordingly.
It was thought as a journey on planet Chromatica. It starts with the artist that will literally lands on this mysterious planet, her planet, thanks to the sinusoidal spaceship. With the help of the inhabitants of the place (the dancers) who belong to different warrior tribes she will explore various faces of this planet. Unfortunately, these tribes have been fighting for a long and the artist's mission is to heal the wounds restoring peace on the planet through the power of her music. Once she succeedes, it will be time for her to leave Chromatica and go back on planet Earth.
The show is divided into four acts (plus the encore), each supposed to tell a different aspect of the planet, and it lasts approximately 1 hour. All songs from Chromatica are performed except for *Sour Candy* and *Enigma* which, however, are included in video interludes that are intended to articulate the flow of the show and to help its narration. In addition, each act have been complemented with a classic by Lady Gaga and that is because there are certain songs that the artist's fans cannot help but ask for them to be performed.



7.10.1 Show setlist

The show features 14 songs divided into 4 acts plus the encore. The storyline is enriched by 3 video interludes. The setlist follows:

ACT I

VIDEO INTERLUDE (including excerpts from *Enigma*)

- *Chromatica I* into *Alice*
- *Stupid Love*
- *Poker Face*

ACT II

- *Plastic Doll*
- *Free Woman*
- *Born This Way*

ACT III

VIDEO INTERLUDE (including excerpts from *Sour Candy*)

- *Chromatica II into 911*
- *Replay*
- *Shallow/1000 Doves (piano version) medley*
- *Sine from above (feat. Elton John)*

ACT IV

VIDEO INTERLUDE

- *Rain On Me*
- *Bad Romance*
- *Babylon*

ENCORE

- *Fun Tonight*

7.10.2 ACT I - storyboard

The first act is the statement of intent of the show. It represents the landing of the artist on Chromatica, the artist's planet where *no one thing is greater than another* (Lady Gaga, 2020). This is a place where there is just one rule: to dance.
The act is introduced by a video interlude (containing excerpts from *Enigma)*, projected on the frontal tulle. It is followed by *Chromatica I* that fades into *Alice*, followed by *Stupid Love*, two of the most danceable tunes off the record.
Chromatica, the album, brought the artist back to her dance-pop roots. That is why *Poker Face*, her first dance global hit, closes the first segment of the show.

Note that light colors and lighting layouts shown on the storyboard might be subject to variations during the lighting design phase.

Chromatica I

The artist is in the space, right before landing on Chromatica. A cone of light coming from below illuminates the sine, which is carrying the artist, from the back. Stars are projected on the vaults of the theater and on the frontal tulle. Everything is dark.

Alice

As *Chromatica I* fades into *Alice*, the body of the sine turnes on and a dance of lights around the artist begins. These floating lights, which are better described in paragraph 7.11, are supposed to represent alien bodies greeting the artist as she is landing on the planet. The frontal tulle is lifted and stars are projected only on the vaults of the theatre.

Stupid Love

The artist has just lended on Chromatica. On *Stupid Love* both the artist and the dancers dance over the three elevators that constantly create different layouts. Two tulle curtains are unwrapped and projections of planet Chromatica are cast on them. What is more, the ledwall installed under the elevators are turned on, whereas the resident ledwall is turned off in order to avoid luminous interference with the image projected on the two tulles. Stars are still projected on the vaults of the theatre.

Poker Face

On *Poker Face* the mountain comes up and its silhouette is underlined by the backdrop ledwall that is turned on in red. Poker graphics are displayed on the ledwall under elevator 1.

7.10.3 ACT II - storyboard

The second act is about one of the messages Lady Gaga has always spread throughout her career: freedom and inclusivity and that is because Chromatica is a place for everyone, noone is excluded.
It opens with a song where she desperately repeats she is "*not a Plastic Doll*", referring to the early years of her career during which she had felt like a money machine chained in men's hands. Once on Chromatica, she has finally found the strenght to break those chains and she declare her own independece in *Free Woman*. The act closes with the song about freedom par excellence: *Born This Way*. It is a song from 2011, that immediately became an anthem for all those who have ever felt outcast.

Note that light colors and lighting layouts shown on the storyboard might be subject to variations during the lighting design phase.

Plastic Doll

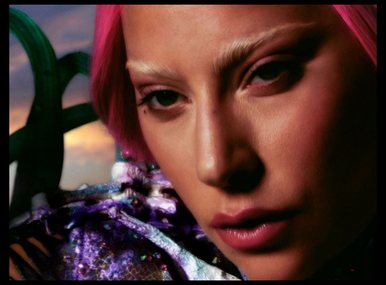
The artist comes up on elevator 1 inside a technological doll box together with 4 dancers, two for each side. The atmosphere gets greenish and the mountain start revealing itself thanks to the fluorescent light (as described later in 7.6.2). The mountain comes up whereas the sine comes down till they create the layout illustrated. Green-techno writings and numbers moving vertically (flowing down, similarly to the movement of water) are displayed both on the resident ledwall and on the ledwall mounted under elevator 3.

Free Woman

On this song the artist declares her independence as a woman. She moves to the circular stage, the closest to the audience and, surrounded by a dance of lights, sings her freedom and dances to it. On the back ledwall, the pink galaxies that are visible from planet Chromatica are shown.

Born This Way

This is the last song of the second act. A rainbow atmosphere bathes the scene enhancing the meaning of the song. It is the highest representation of freedom that is one of the concepts behind Chromatica.



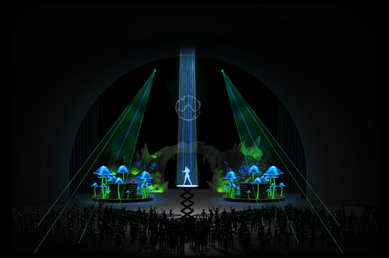
7.10.4 ACT III - storyboard

During the third act of the show the artist has to cope with her darkest moments. Fame has always been seen by people as a solution to their everyday problems. However, being famous does not mean that everything goes fine. In *911*, she describes her relationship with antipsychotics that she has to take to cope with her mental issues derived from the huge fame she got all of a sudden. In *Replay*, she talks about the trauma (described as monsters) she went through and that still affect her life. On the second part of the act, she moves to the piano that appears to be embedded in a rock. This is the most intimate moment of the show. It is just the artist and the piano. She sings a medley of *1000 Doves* and *Shallow*. Songs where she talks about loneliness and asks for help. The act comes to an end with *Sine From Above*, a song where she talks about a sign (sine=music) she received from above that healed her soul. And it is music that the artist deploys to bring peace back on Chromatica. This journey is therefore a metaphore: by bringing peace back on the planet, the artist is also healing her soul.

Note that light colors and lighting layouts shown on the storyboard might be subject to variations during the lighting design phase.

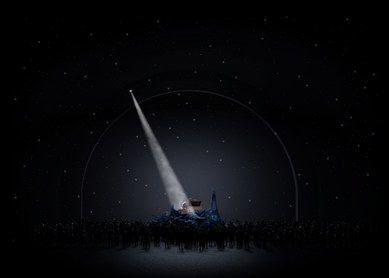
Chromatica II into *911*

On *911*, the artist appears on a rotating platform right under the arch of the mountain. A white circle on the back ledwall, which beats to the rhythm of the tune, highlights the silhouette of the artist and of the dancers. The stage is enriched with mushrooms whose presence strenghten the meaning of the song.



Replay

On *Replay*, the artist moves to the circular stage where she is lifted by the hydraulic stage. Lasers illuminate the scene.



1000 Doves / Shallow medley

Here the artist sings from the top the fluorescent rock that appears over pit elevator at the end of the previous song. The frontal tulle goes down and stars are again projected on it and on the huge vaults of the theatre.

Chromatica III into *Sine from Above*

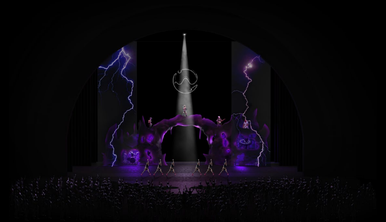
The act finishes with *Sine from Above* where the artist finally receives a sign (sine=music) from above that healed her soul. That is why the sine is turned on and it is visible through the tulle. She starts singing the acoustic version of it on the piano and then moves to the circular stage when the official version of the song takes off.

7.10.5 ACT IV + encore - storyboard

Finally, both the planet and the artist are healed and it is time to celebrate life. The journey ends with *Rain on Me*, the biggest hit off Chromatica. It is a song about finding beauty and dancing in the pain, heartbreak, and life. We are what we are because of our past, because of our pain that is part of us and therefore it has to be celebrated. *Rain on me* is followed by the timeless *Bad Romance* and *Babylon*, fan's favourite track from the artist's latest project. *Babylon* is a song with apologetic tones that exalts and celebrate life. Now, all the tribes join the artist in one last dance.

The very last song of the concert is *Fun Tonight*, where she clearly says "*Maybe it's time for us to say goodbye*". It is actually a sad song but its rhythm makes it perfect to end a show. She landed on Chromatica on the sine. Likewise, she leaves it behind her to go back on Earth. The scenography disappears as the arstist leaves the planet.

Note that light colors and lighting layouts shown on the storyboard might be subject to variations during the lighting design phase.



Rain On Me

On this song the artist appears at the top of the mountain which is illuminated with UV lamps to obtain the fluorescent effect. Tulle R and Tulle R are unwrapped and thunders are projected on them.

Bad Romance

Fire is displayed on all ledwalls as this element has always been associated with this song.

Babylon

This is the last dance before going back on planet Earth. Dancers climb the mountain and celebrate life together with the artist and the crowd.

Fun Tonight

The journey has ended and it is time to leave Chromatica. The artist goes back on the sine (with the help of two dancers) and takes off. As she leaves, the mountain goes down.

7.11 Stage Lighting Design

The last phase of the project consists of its lighting design. As emerged from the research, lighting is a fundamental element during a concert. Not only because it is what makes things visible on the stage, but also because it excerts an emotional pressure on the audience. Therefore, stage lighting design has to be well thought-out in order to enhance the overall result of the production.

7.11.1 Products utilized

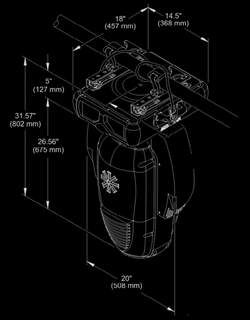
Many of the products that have been employed in this project are part of Radio City Music Hall resident instruments. Here follows the complete list.

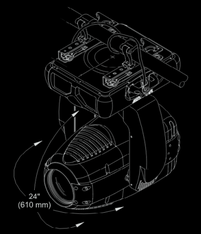
Moving heads:
54 Vari*Lite - VL3000 Profile
53 Vari*Lite - VL3500 Profile (with Shutters)
66 Vari*Lite - VL3500 Wash
15 Clay Paky - Scenius Profile
153 Clay Paky - Mythos 2
30 Clay Paky - Sharpy
34 Clay Paky - HY B-EYE K15

Conventional equipment:
16 ETC - S4 LUSTR 10° @140w
16 ETC - S4 LUSTR 19° @140w
15 Acme - STAGE BLINDER IP RGBW
13 Cameo - Pixbar DTW Pro
33 Martin - Rush Par 4UV
7 Chroma Q - Color Force 12”
22 Chroma Q - Color Force 48”

Lasers:
8 ER productions - 18WRGBB
1 ER productions - Cyclone

On the next pages, the features of each product are reported as shown on each company’s respective websites. Note that those products that were already described in the previous pages as part of the scenic elements are not listed again in here.





VL3000 Profile

*producer: Vari*Lite*

Color System: A three-filter CYM cross-fading mechanism. A fixed color wheel with six interchangeable color filters and continuous wheel rotation for additional effects. It includes a variable CTO color temperature correction filter.

Zoom Optics: A 13-element 6:1 zoom optics system, covering a range from 10° to 60°.

Beam Size Control: A mechanical iris provides continuous beam size control for rapid and smooth timed beam angle changes.

Intensity Control: Full field dimming designed for smooth timed fades as well as quick dimming effects.

Strobe: High-performance dual blade strobe system capable of ultra-fast operation.

Rotating Gobo Wheels: Three gobo/effects wheels combine to provide 14 rotatable, indexable gobo positions. Each wheel also has one open position.

Edge and Pattern Focus: Variable beam focus to soften edges of gobos or spots. Remarkable depth of field capability allows morphing effects between all pattern and effects wheels.

Pan and Tilt: Smooth, time-controlled continuous motion by way of three-phase stepper motor systems.

Range: Pan - 540°, Tilt - 270°.

Source: 1200W Short Arc Lamp

Color Temperature: 6000K

CRI: 85

Fixture Output: 20,000 lumens.

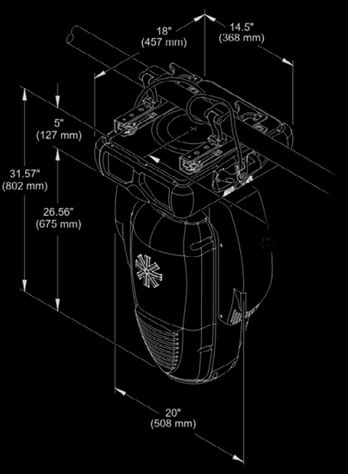
DMX Channels: 28

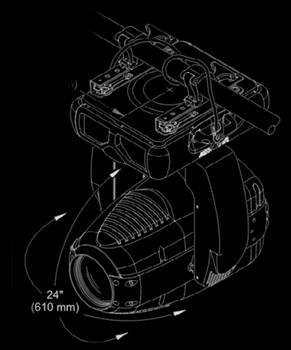
Weight: 41 kg

https://dsskc.org/project/varilite-vl3000-profile/

VL3500 Profile (with shutters)

*producer: Vari*Lite*





Color System: A three-filter CYM cross-fading mechanism. A fixed color wheel with six interchangeable color filters and continuous wheel rotation for additional effects. It includes a variable CTO color temperature correction filter.

Zoom Optics: A 13-element 6:1 zoom optics system, covering a range from 10° to 60°.

Shutter Control: A four-blade shutter mechanism that allows the blades to be operated independently or in unison on two planes for a clear and crisp image. The entire mechanism can rotate 50º in either direction.

Intensity Control: Full field dimming designed for smooth timed fades as well as quick dimming effects.

Strobe: High-performance dual blade strobe system capable of ultra-fast operation.

Rotating Gobo Wheels: One gobo/effects wheel provides five rotatable, indexable gobo positions and one open position.

Fixed Gobo Wheels: One fixed gobo/effects wheel provides six positions for standard or custom gobos and one open position.

Edge and Pattern Focus: Variable beam focus to soften edges of gobos or spots. Remarkable depth of field capability allows morphing effects between all pattern and effects wheels.

Pan and Tilt: Smooth, time-controlled continuous motion by way of three-phase stepper motor systems.

Range: Pan - 540°, Tilt - 270°.

Source: 1200W Short Arc Lamp

Color Temperature: 6000K

CRI: 85

Fixture Output: 20,000 lumens.

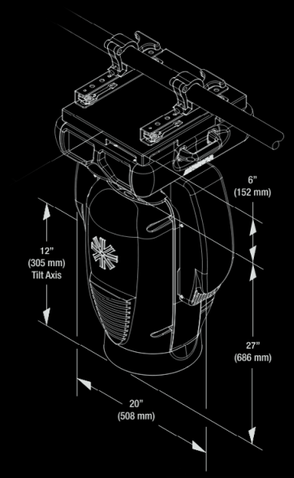
DMX Channels: 31

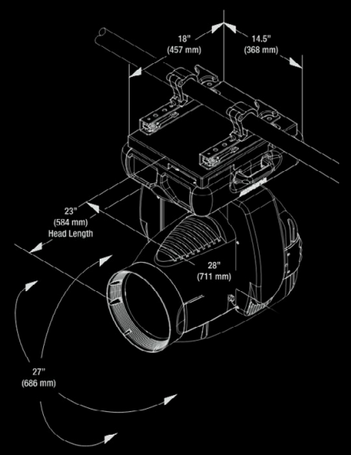
Weight: 41 kg

https://cdn01.usedlighting.com/products/files/f5ccb1d40dce74.pdf

VL3500 Wash

*producer: Vari*Lite*





Color System: Six color control wheels total. A three filter CYM cross fading system, two fixed color wheels with five interchangeable color filters each capable of continuous wheel rotation for additional effects, and a variable CTO color temperature correction wheel.

Beam Size Control: A zoomable beam spreader mechanism provides continuous beam size control for rapid or smooth timed changes. The VARIBRITE mode, accessible from all zoom positions, splits the beam spreader and produces a tight, intense column of light. Easily interchangeable glass panels (included) allow user to choose either Fresnel or Buxom spreader patterns.Beam may also be controlled through the use of one of three easily interchangeable front lenses: Plano Convex-Clear, Plano Convex-Stipple, and Fresnel – all three included. All front lens assemblies have mounting points to allow for attachment of after market accessory hardware.

Intensity Control: Full field dimming designed for both smooth timed fades as well as quick dimming effects.

Strobe: High-performance dual blade strobe system independent of dimmer wheel and capable of ultra-fast operation.

Pan and Tilt: Smooth, time-controlled continuous motion by way of three-phase stepper motor systems.

Range: Pan - 540°, Tilt - 270°.

Source: Triple wattage, double-ended lamp. The lamp is capable of operation at 900W, 1200W or 1650W - mode selectable from fixture or console.

Color Temperature: 6000K at 1650 Watts and 6300K at 900 and 1200 Watts.

Fixture Output: >70,000 lumens in 1650 Watt mode.

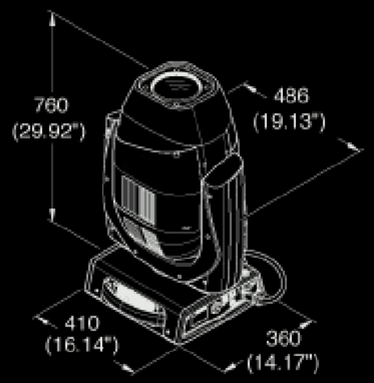
DMX Channels: 19

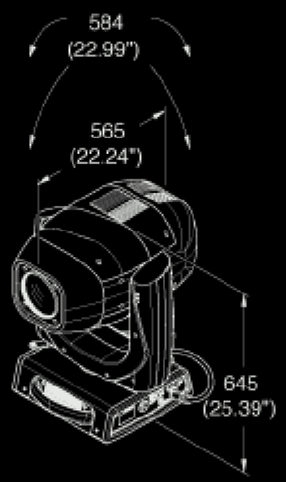
Weight: 43.5 kg

https://www.vari-lite.com/global/products/vl3500-wash

Scenius Profile

producer: Clay Paky





Scenius Profile is the new Clay Paky beam shaper at the top of the Clay Paky moving head range. The optical reflector has been designed specifically for this product, in order to make the projection perfectly uniform across the whole beam opening, avoiding the typical hotspot effect of many spotlights. Its framing system consists of four independent overlapping blades that create shapes of all sizes, not just quadrangular, but also triangular. It works simultaneously on four different focal planes and the exclusive “curtain effect” allows gradual total closure of the shape using any one of the four blades. The shape made may also be turned around itself up to an angle of 90°, either to change its orientation or keep it fixed as the light beam moves.

Its advanced optical unit and the new 1400W OSRAM discharge lamp provide very high light output and CRI. Thanks to its wide 7°-48° zoom, Scenius Profile is perfect for every set. A modern focus tracking system concentrates maximum luminous efficiency precisely on the effect you wish to project, and the focus may be set to be fully automatic.

The CMY color system, the linear CTO, 7 fixed colors, 14 gobos (6 rotating + 8 fixed), rotating prism, 2 variable frost filters, a very precise dimmer enhance the performances of this luminaire.

With all these features, the Scenius Profile is an extraordinary tool for theatrical use, in television studios or on the sets of large events, where it can fashion uniform light beams without limits and frame scenic elements precisely with fixed or animated light.

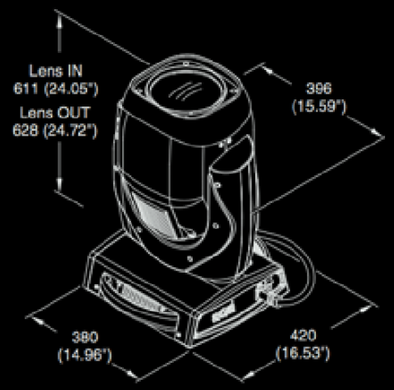
The optical reflector of Scenius Profile can be replaced with that of Scenius Spot, to obtain a higher luminous peak at the center of the beam.

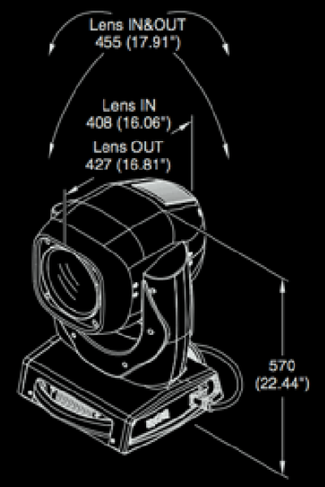
It features 37 or 41 DMX 512 control channels.

https://www.claypaky.it/en/products/scenius-profil

Mythos 2

producer: Clay Paky





Mythos 2 features a new and reliable Osram Sirius HRI® 440W X lamp, which ensures the extraordinary performances that have made the success of MYTHOS worldwide. Mythos 2 is an excellent spotlight, which produces an outstanding large light beam, featuring a zoom that ranges from 4° to 50° (1:12 ratio). Light beam is sharp, with perfectly defined edges, from the first millimetres after the front lens right along its entire length. The zoom is optimized for focusing, which is separate from that of the fixed and rotating gobos. Its movements are smooth, fast and very quiet. Mythos 2 also features an indexed visual effect disc, which may be superimposed on all the gobos, both in and out of focus. But Mythos 2 is also an extraordinary beam light, allowing you to switch to a minimum fixed beam angle of just 2.5°. A large, very dense, 160 mm-diameter light beam leaves the Mythos’s front lens and remains parallel for its entire length even at great distances. Mythos 2 is a very versatile tool, which is useful in any situation and therefore an excellent investment.

It features 30/34 DMX 512 control channels.

https://www.claypaky.it/en/products/mythos2

Sharpy

producer: Clay Paky

Sharpy is a 189W moving beam light with an unprecedented brightness usually achievable only with far greater wattages. Weighing just 19 kg, Sharpy produces a perfectly parallel, laser-like beam with an incredible output of 59,760 lx at 20m (5,100 footcandles at 65 ft). Sharpy is also groundbreaking for the purity of its beam, which is sharply defined and free of any halo or discoloration around the edges. It offers 14 different colors and 17 gobos, allowing you to change the shape of the beam and create an array of spectacular mid-air effects.

With its light weight and modest footprint, Sharpy is small enough to be fitted anywhere – on trusses at live and TV events, on stage, in showrooms or conference rooms.

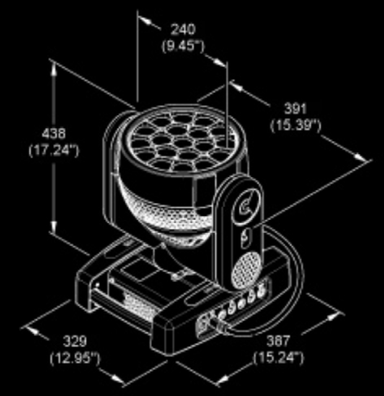
Sharpy is also available in a shiny mirror-finish chrome version, adding glamour to sets while making lights a less invasive presence.

It features maximum 20 DMX 512 control channels.

https://www.claypaky.it/en/products/sharpy

HY B-EYE K15

producer: Clay Paky

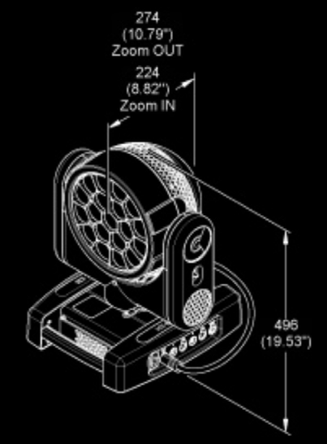


The B-EYE has revolutionized the way we think of LED show lighting. Its innovative optical unit enhances the uniformity and efficiency of the light output. The rotating front lens and the possibility to control each single LED individually have made spectacular kaleidoscopic projections and charming eye candy effectspossible. A sophisticated effect engine has made it easier to routinely use macro effects, which would otherwise be difficult to program. These technological innovations make the B-EYE a versatile product: it is a high-performance LED wash light, a perfect beam light, and a spectacular visual effect projector all in one. It has won several awards and been copied by countless manufacturers over the years.

Today Claypaky offers HY B-EYE, that is TWICE MORE POWERFUL and bright than B-EYE. It even offers more VERSATILITY and more INTERACTIVITY with the media servers (Kling-Net protocol included), it is very SILENT while featuring the same size and same control mode as the B-EYE.

It features DMX protocol signal: USITT DMX 512.

https://www.claypaky.it/en/products/HY_B-EYE_K15



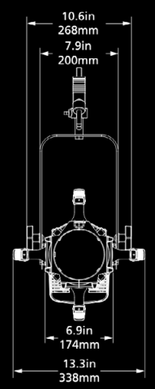
S4 LUSTR 10°/19° @140w

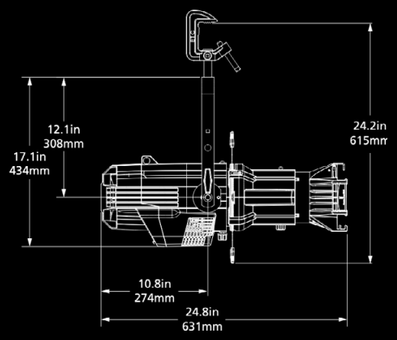
producer: ETC Connections

We put a twist of lime in the luminaire and mixed it all up. ETC's x7 Color System™ combines a balanced recipe of up to seven colors to create evocative color mixes. The Source Four LED Series 2 Lustr array takes the idea even further, with the addition of a lime-green LED emitter. Lime green increases the luminaire's lumen output in open white and lighter tints to make them brighter and livelier, better matching the color of a conventional Source Four fixture. The lime also enriches color-rendering by better marrying the red and blue ends of the color spectrum, for truer-to-life light that fills in the gaps that ordinary LEDs leave behind.

Source Four LED Series 2 Lustr

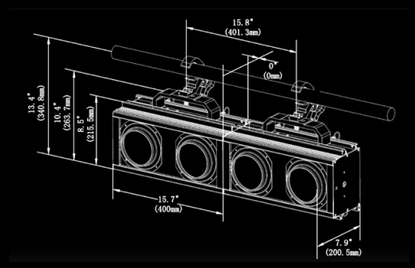
We also added more red to the x7 Color System in the Source Four LED Series 2 Lustr array. Working in unison with the lime-green emitter, the extra red means the luminaire can produce ambers, straws and pinks up to three hundred percent as bright as those from the original Source Four LED™. The deeper, richer color from the Source Four LED Series 2 Lustr array will evoke the strongest audience reaction to your sunset, moonlight and dramatic scenes.





Note that the picture and technical drawings on the left refer to the 19° lens version.

https://www.etcconnect.com/Products/Lighting-Fixtures/Source-Four-LED-Series-2/Features.aspx



STAGE BLINDER IP RGBW

producer: ACME

ACME's STAGE BLINDER IP RGBW is an LED fixture with a classic Blinder appearance and featuring HSIC mode. It has a patented plug-in function, and can be quickly rigged without the need for tools. It can be freely combined with ACME's other STAGE BLINDER IP series fixtures for added creative options, and offers multiple, easily located rotation angles.

Brighter than the traditional audience blinder, with an outstanding variable speed strobe effect, RGBW color options and IPX4 protection rating, the STAGE BLINDER IP RGBW is suitable for large and medium-sized concerts, variety acts and other professional stage or entertainment applications requiring a striking visual impact.

Features

- Light Source: 2x 150W LED module
- Variable CTO: 2000K - 10000K
- Beam Angle: 37°
- Unique HSIC mode
- Smooth dimming from 0-100%
- Outstanding variable speed strobe effect
- Fast, tool-free mounting of multiple units in an orientation
- Multiple, easily located rotation angles
- Ultra-high brightness, brighter than traditional audience blinder
- Compact design, excellent thermal design, easy installation
- Suitable for large and medium concerts and events of all kinds
- Flicker-free management
- Dust-proof and oil-proof design
- Protection Rating: IPX4
- Maximum Connection:
  - 120V, 60Hz = 4 sets
  - 230V, 50Hz = 8 sets

https://en.acme.com.cn/Info/productdetail/cat_id/16/id/3059

Pixbar DTW Pro

producer: Cameo

Featuring twelve 10 watt 3-in-1 cool white, warm white and amber Tri-LEDs, the Cameo PIXBAR DTW PRO permits full white temperature control from warm Tungsten white to ultra bright cool white. The professional LED bar features an 18° beam angle and Dim-to-Warm technology to emulate the smooth dimming of halogen lamps. Highly efficient convection cooling and a 3,000 Hz refresh rate ensure absolutely noiseless and flicker-free operation making it a perfect choice for TV and film applications.

The PIXBAR DTW PRO is RDM enabled and provides 9 modes of DMX control, sound activation plus automated operation. The fixture includes single pixel control for impressive chase effects and pixel mapping, a high-speed strobe and selectable 16-bit dimming curves with adjustable response. A 4-button display enables easy configuration. The rugged aluminium housing features 3 and 5-pin DMX and Neutrik powerCON inputs and outputs that enable convenient daisy chaining. The PIXBAR DTW PRO comes with a glare shield and frost filter if softer washes are called for.

https://www.cameolight.com/en/solutions/install/static-lighting/bars/19182/pixbar-dtw-pro

RUSH PAR 4 UV

producer: Martin

The RUSH PAR 4 UV is a bright single-lens UV LED PAR can light fixture for use in blacklight applications. The fixture includes a 100 watt COB 400nm UV LED mounted in a reflector for high-output ultraviolet light, and has regulated air cooling for quiet operation. With electronic dimming and strobe and a bracket suitable for floor or truss mounting, the RUSH PAR 4 UV is ideal for a variety of nightlife, stage, and concert applications.

- Single-lens 100W UV LED PAR
- Dimming: 0 – 100%, coarse & fine control
- Shutter: Strobe & pulse effects, instant open and blackout
- 100 watt COB 400nm UV LED
- Forced air cooling for quiet operation
- Electronic dimming and strobe
- Bracket suitable for floor or truss mounting
- Lightweight construction (4 kg)
- 3 DMX-512 channels

https://www.martin.com/en/products/rush-par-4-uv

18WRGBB

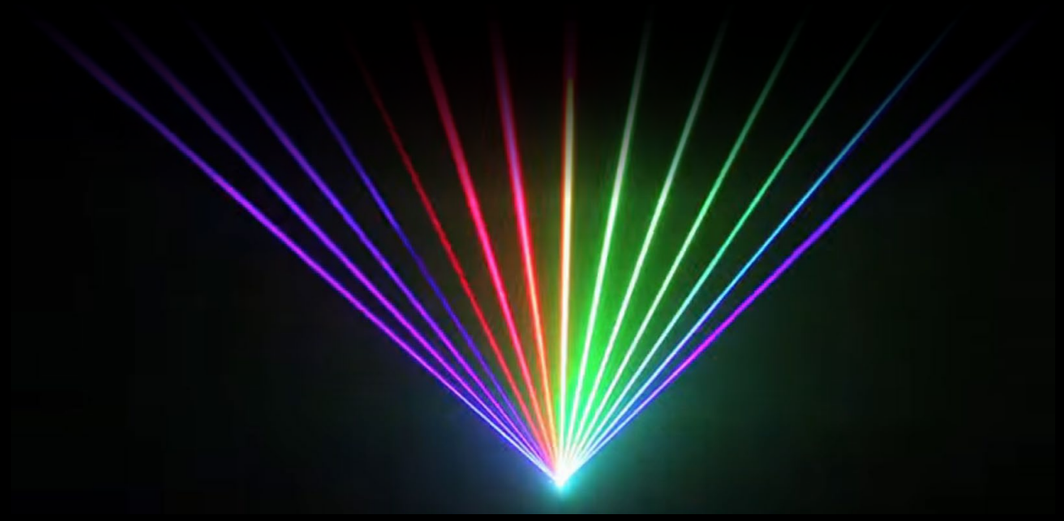
producer: ER productions

The 18WRGBB is a lightweight, flight friendly, high power, all OPSL, full color laser system with high speed X/Y scanning, which has been used in projects for Faithless, Kasabian and Fatboyslim, to name but a few.

Specifications:

Laser Type: Diode
Wavelengths: 532nm, 632nm, 460nm, 445nm
Beam Diameter: 3mm
Beam Divergence: 1mrd
NOHD: 950mt
FX: X/Y Scanning
Input: Minicon
Electrical Input: 90 to 240v
Power Consumption: 1200W
Weight: 18kg
Dimensions: 400 x 170 x 450mm

https://www.er-productions.com/products/laser-systems/18wrgbb



Cyclone

producer: ER productions

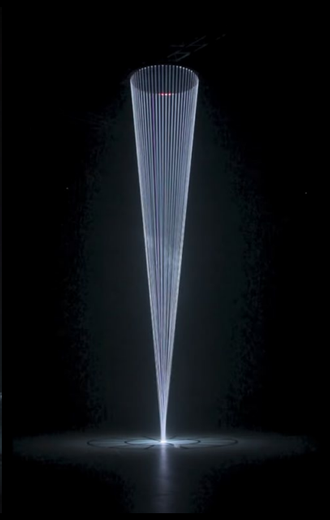
Completely unique in the marketplace, Cyclone is the latest laser from ER Productions. A full colour, DMX fixture, with 60 high speed INAL X/Y scanning outputs that span 2-metres.

Mounted vertically or horizontally, Cyclone's multi-directional head casts a range of geometric shapes and cage effects and its modular design makes for a easy mounting and dismounting.

Specifications:

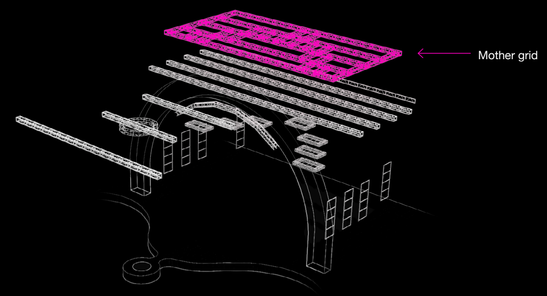
Laser Type: Diode
Wavelengths: 450nm, 520nm, 650nm
Beam Diameter: 1mm
Beam Divergence: 0.6mrd
NOHD: 123mt
FX: 60 x X/Y scanning pairs, rotating truss fixture
Input: DMX
Electrical Input: 110 to 240v
Power Consumption: 5750W
Weight: 100kg
Dimensions: 2000 x 2000 x 1000mm

https://www.er-productions.com/products/laser-systems/cyclone

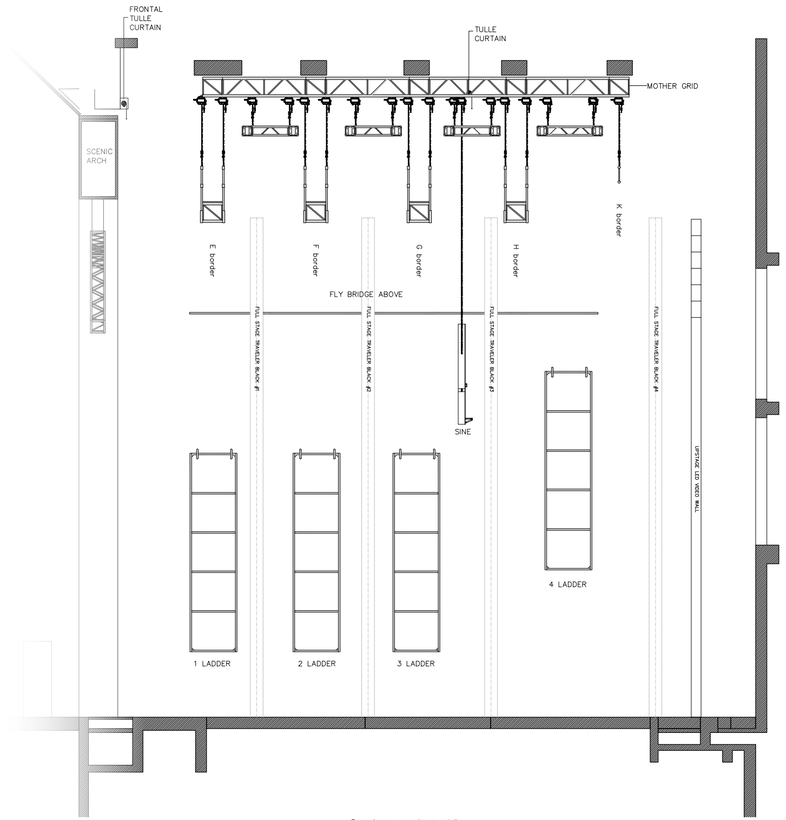


7.11.2 System of trusses and light positioning

Radio City Music Hall already provides a system of resident trusses. Particularly those over the scenic space are 5 respectively named E, F, G, H and K border. For the purpose and the proper fullfillment of this show some structural changes have been made. Indeed, 7 floating pods are needed to light the scene, particularly during the first song, *Alice*. These pods, which are placed inbetween the resident borders, are not supposed to stay still throughout the show, but they will incline in different directions. Therefore, they cannot be hung to the resident trusses, otherwise everything would move. This implies that extra rigging points are needed. To solve this issue a mother grid has been designed so that both the resident borders, the pods, the sine and the tulle curtains will all be hung to it. The hoist systems used to lift and drop the various elements are the same as in 7.6.3

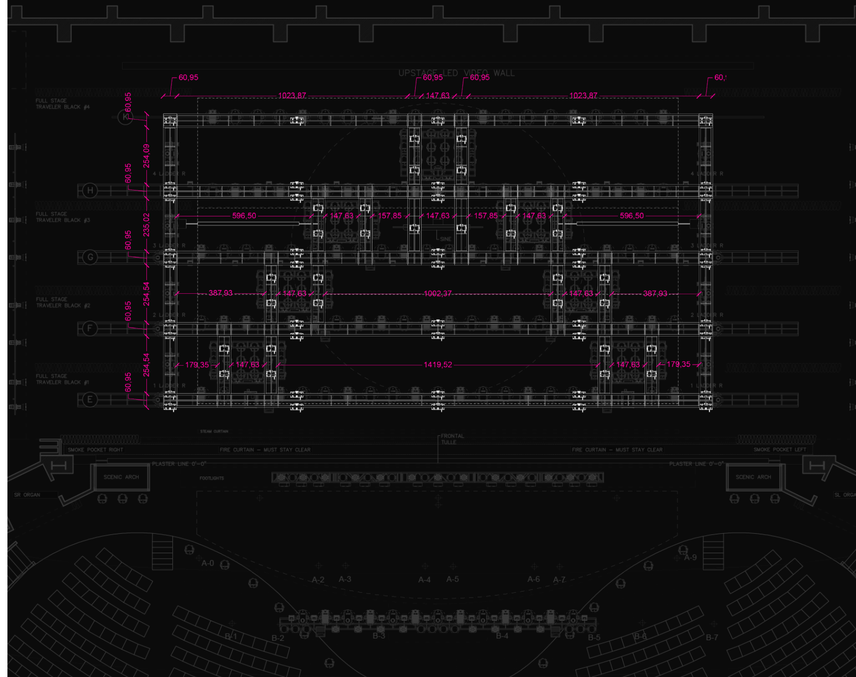


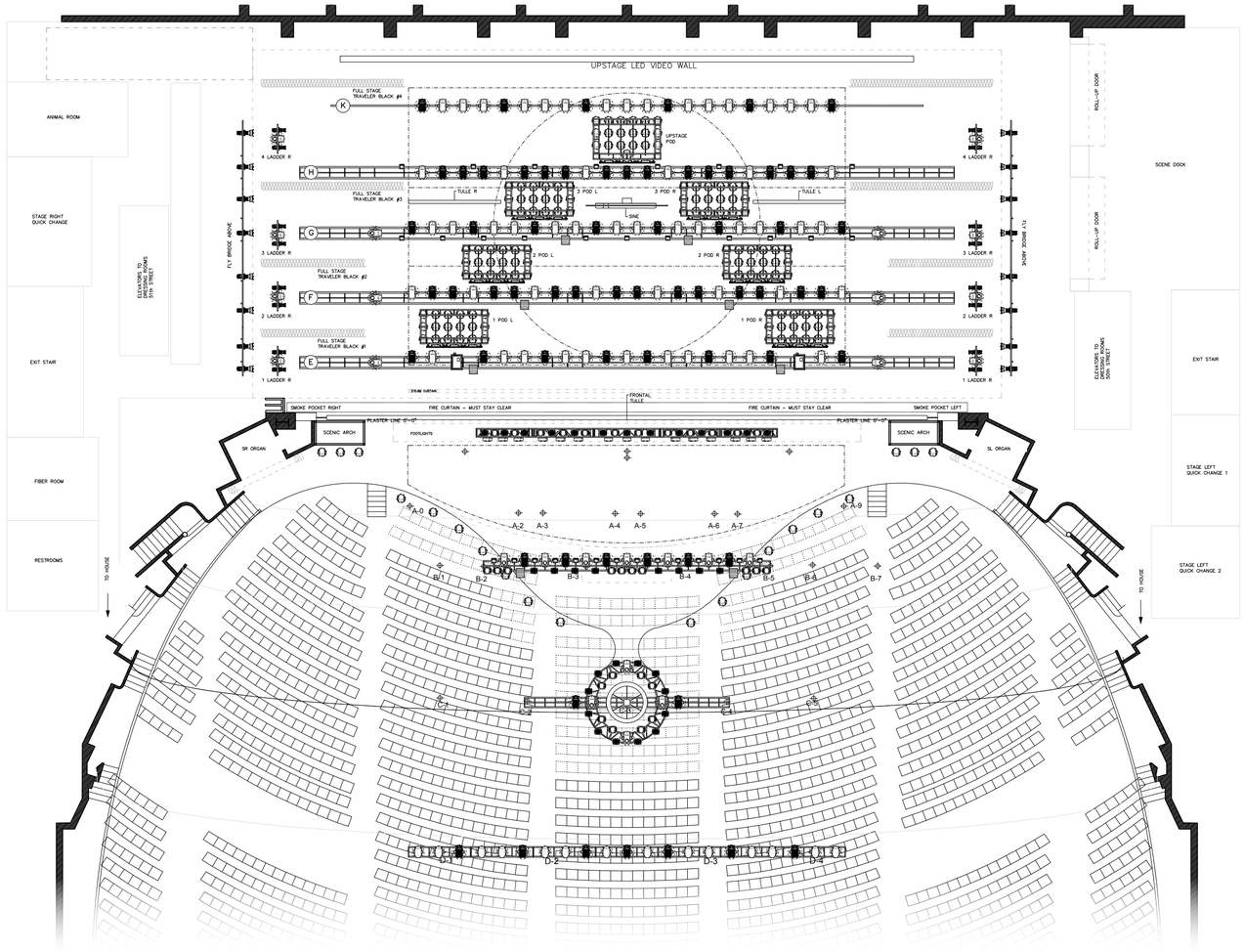
One more truss is mounted in correspondence of the scenic arch and 3 other trusses are mounted over the audience area (D border is resident).
The section on the right shows the exact positioning of the mother grid over the scenic area. Note that the side ladders, are 2 meters above the main stage level, except for the upstage one, that, being in correspondance of the mountain, is 4.5 meters high.



Section - scale 1:125

Lights have been distrubuted on the trusses according to a symmetric layout. In addition, over the scenic space, washlights on different depth levels never overlay. Same happens for spotlights. Indeed, the same typologies of light fixtures are always out-of-alignment so that the depth of the scenic area can be emphasized by different beams of light. Note that the mother grid is not represented over the main plan for visual clarity purpose (open this page to see it). Yet, its dimensions and positioning over the scenic area are reported below.





Plan - scale 1:200

LEGEND

Moving heads:

VL3000 Profile

VL3500 Profile (with Shutters)

VL3500 Wash

Scenius Profile

Mythos 2

Sharpy

HY B-EYE K15

Conventional equipment:

S4 LUSTR 10° @140w

S4 LUSTR 19° @140w

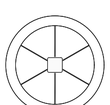
STAGE BLINDER IP RGBW

Pixbar DTW Pro

Rush Par 4UV

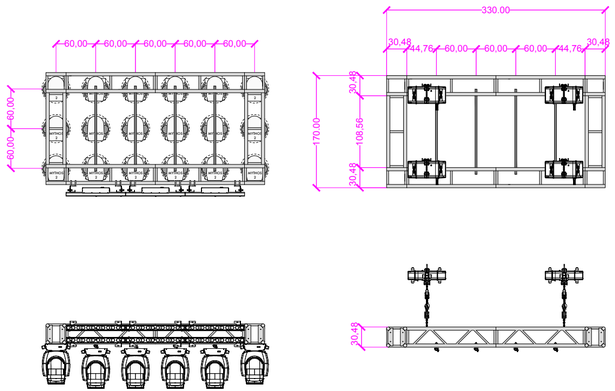
Lasers:

18WRGBB

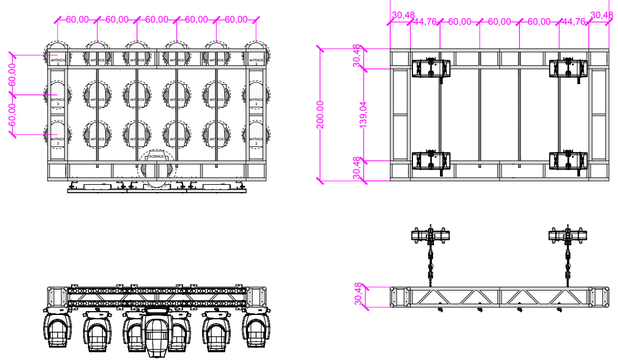


Cyclone

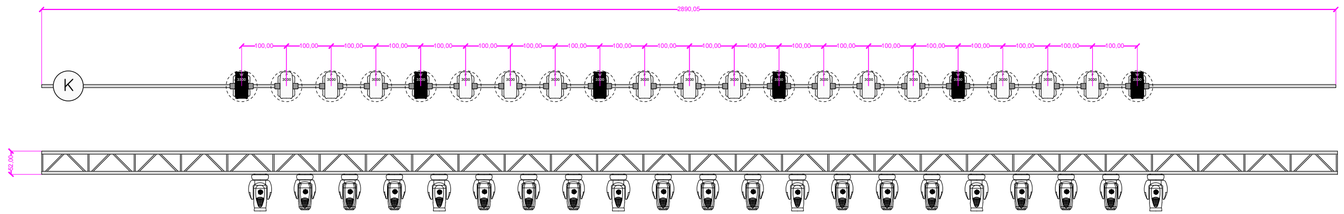
Here follows the detailed technical drawings of the pods.

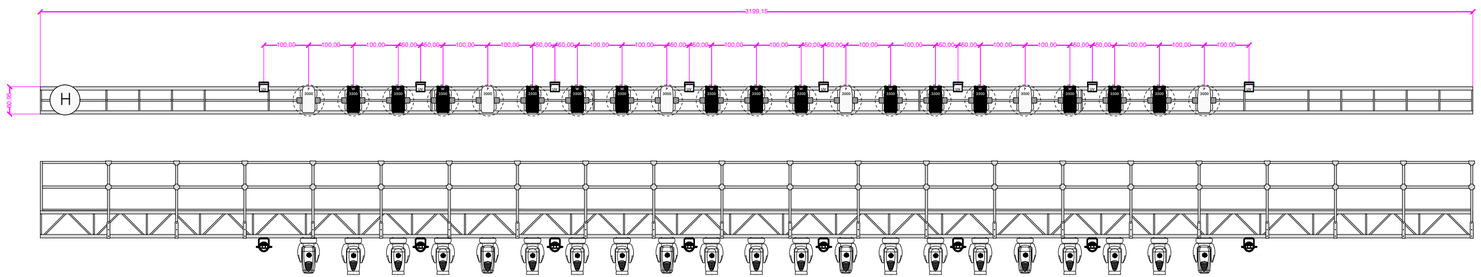


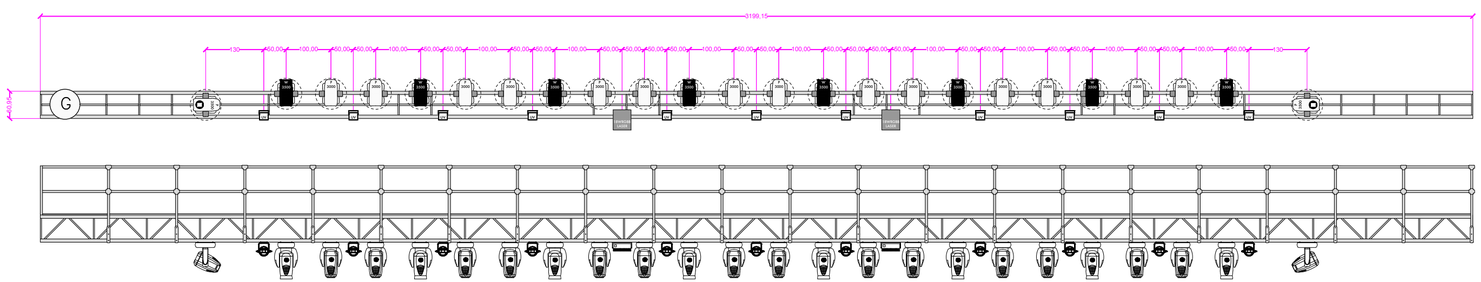
Note that the upstage pod is bigger than the others since it features a scenius profile in correspondance of its downstage side. See drawings below.



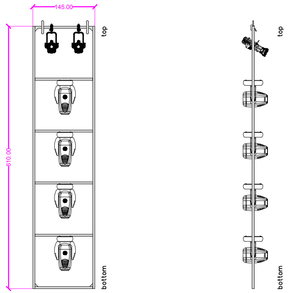
Here follows the detailed technical drawings of the resident border K-H-G (from top to bottom).

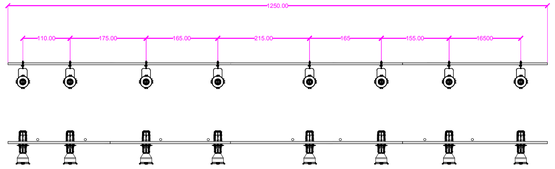




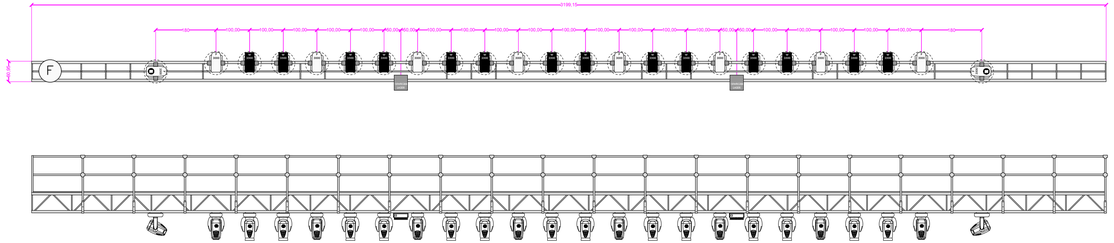


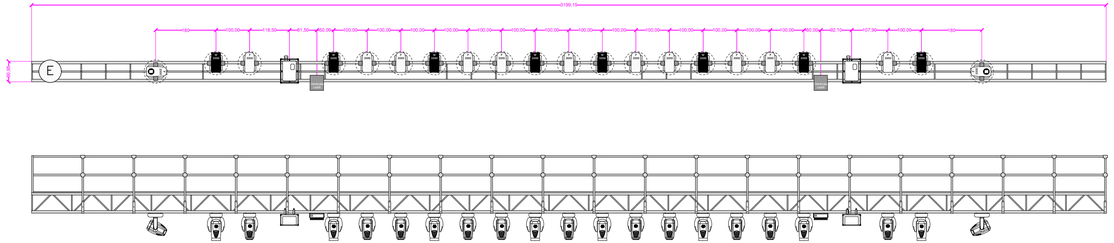
Here follows the detailed technical drawings of the ladders and the fly bridges above. Note that all ladders have the same layout.





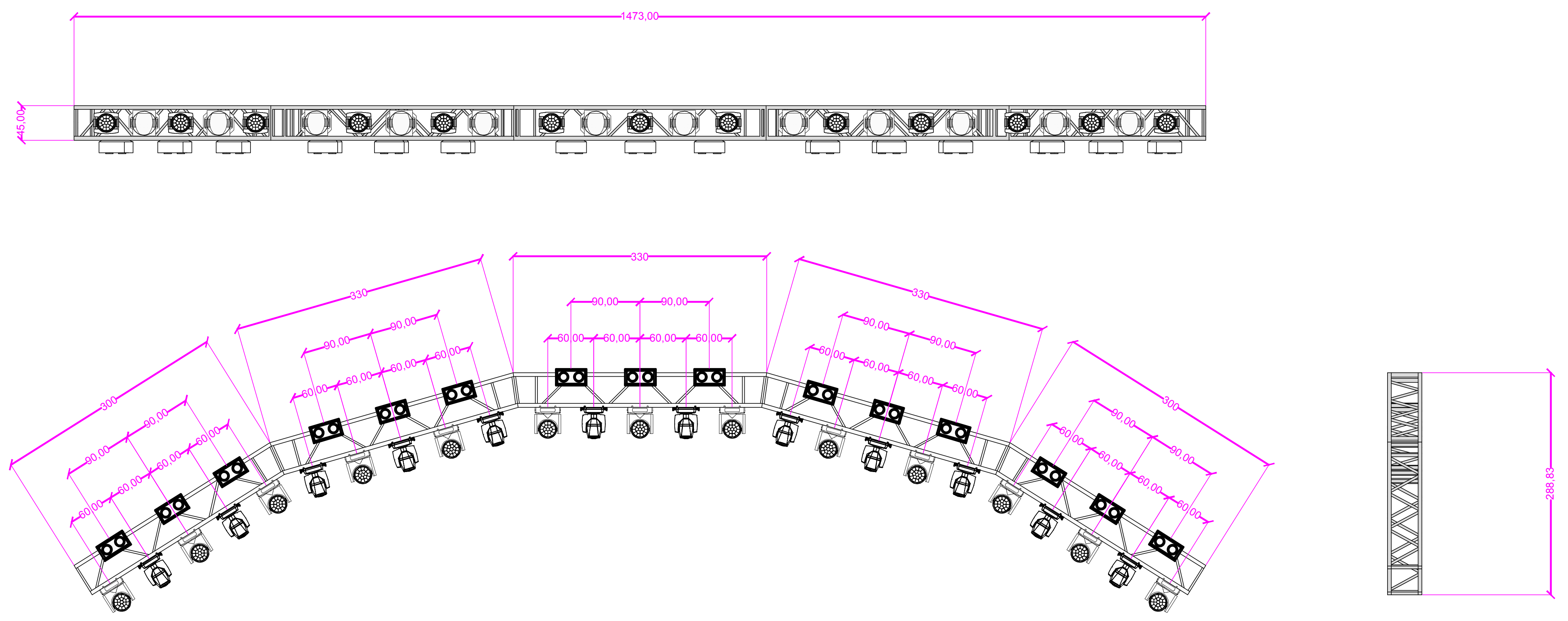
Here follows the detailed technical drawings of the resident border F-E (from top to bottom).



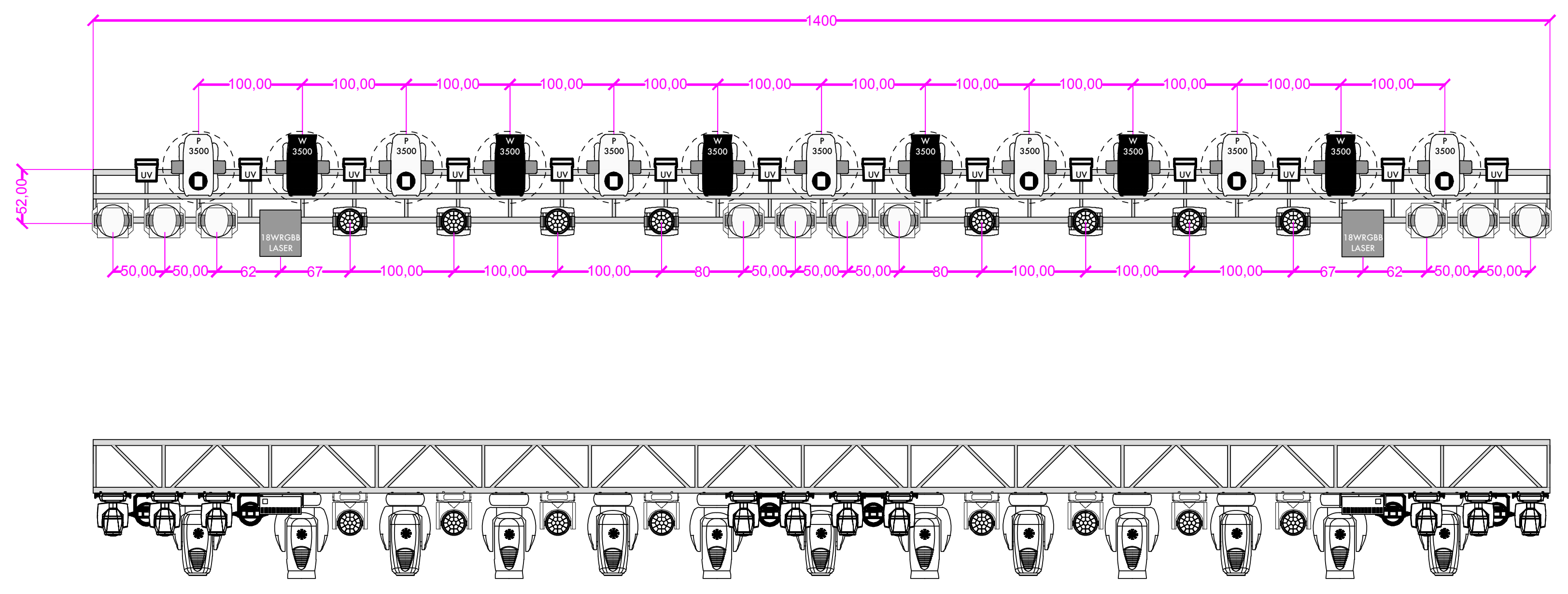


Here follows the detailed technical drawings of the scenis arch truss and the thrust stage truss (from top to bottom).

SCENIC ARCH TRUSS

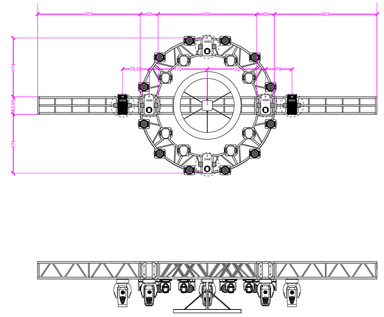


THRUST STAGE TRUSS

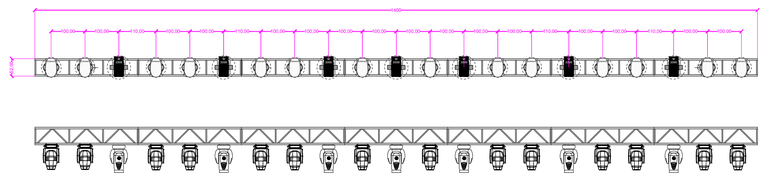


Here follows the detailed technical drawings of the circular stage truss and of D border (from top to bottom).

CIRCULAR STAGE TRUSS



D BORDER



7.11.3 Spot ID and DMX512 channels

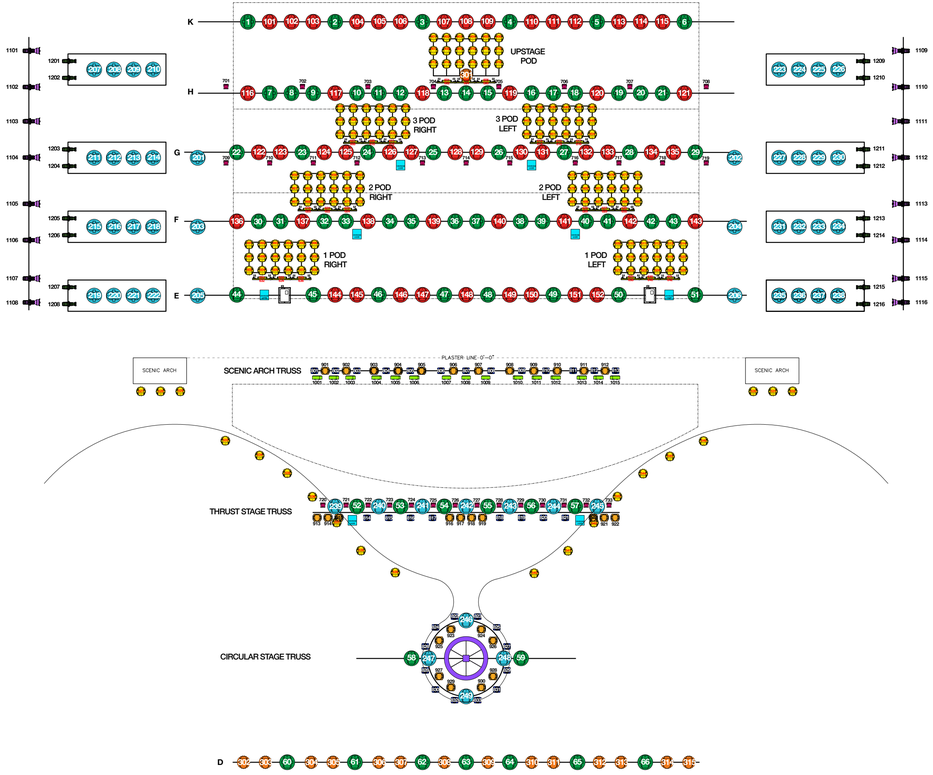
Every fixture was given a unique spot ID so that each of them corresponds to certain DMX channels. Particularly, the number was given according to the fixture typology. When the typology changes, the number starts again from the first number of the next hundreds. For instance:

...
64 VL3500 WASH
65 VL3500 WASH
66 VL3500 WASH

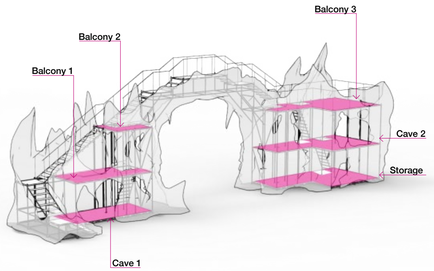
101 VL3000 PROFILE
...
152 VL3000 PROFILE

201 VL3500 PROFILE (with shutters)
202 VL3500 PROFILE (with shutters)
...

And so on.
A total of 37 universes DMX 512 have been used.

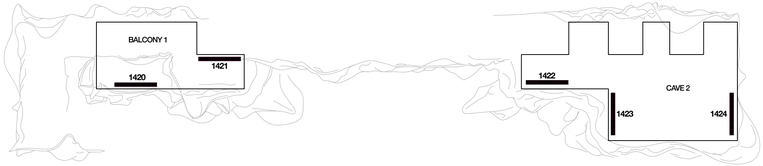


On the right, the plans show the placement and SPOT ID of the light fixtures that have been used for the mountain as described in 7.7.2. Because the structure is divided into 3 levels, they have been represented individually for visual clarity.

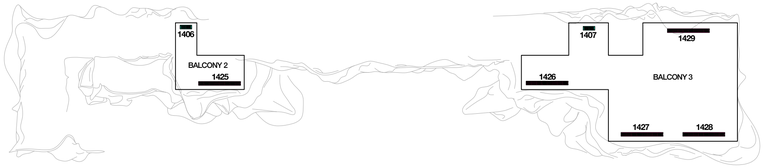


+ 0.00 m

+ 2.00 m



+ 4.10 m



SPOT ID	DEVICE	DMX ch.	UNIVERSE	POSITION
1	VL3500 WASH	1	1	K BORDER
2	VL3500 WASH	20	1	K BORDER
3	VL3500 WASH	39	1	K BORDER
4	VL3500 WASH	58	1	K BORDER
5	VL3500 WASH	77	1	K BORDER
6	VL3500 WASH	96	1	K BORDER
7	VL3500 WASH	169	3	H BORDER
8	VL3500 WASH	188	3	H BORDER
9	VL3500 WASH	207	3	H BORDER
10	VL3500 WASH	226	3	H BORDER
11	VL3500 WASH	245	3	H BORDER
12	VL3500 WASH	264	3	H BORDER
13	VL3500 WASH	283	3	H BORDER
14	VL3500 WASH	302	3	H BORDER
15	VL3500 WASH	321	3	H BORDER
16	VL3500 WASH	340	3	H BORDER
17	VL3500 WASH	359	3	H BORDER
18	VL3500 WASH	378	3	H BORDER
19	VL3500 WASH	397	3	H BORDER
20	VL3500 WASH	416	3	H BORDER
21	VL3500 WASH	435	3	H BORDER
22	VL3500 WASH	1	4	G BORDER
23	VL3500 WASH	19	4	G BORDER
24	VL3500 WASH	37	4	G BORDER
25	VL3500 WASH	55	4	G BORDER
26	VL3500 WASH	73	4	G BORDER
27	VL3500 WASH	91	4	G BORDER
28	VL3500 WASH	109	4	G BORDER
29	VL3500 WASH	127	4	G BORDER
30	VL3500 WASH	1	6	F BORDER
31	VL3500 WASH	20	6	F BORDER
32	VL3500 WASH	39	6	F BORDER
33	VL3500 WASH	58	6	F BORDER
34	VL3500 WASH	77	6	F BORDER
35	VL3500 WASH	96	6	F BORDER
36	VL3500 WASH	115	6	F BORDER
37	VL3500 WASH	134	6	F BORDER
38	VL3500 WASH	153	6	F BORDER
39	VL3500 WASH	172	6	F BORDER
40	VL3500 WASH	191	6	F BORDER
41	VL3500 WASH	210	6	F BORDER
42	VL3500 WASH	229	6	F BORDER
43	VL3500 WASH	248	6	F BORDER
44	VL3500 WASH	1	8	E BORDER
45	VL3500 WASH	20	8	E BORDER
46	VL3500 WASH	39	8	E BORDER
47	VL3500 WASH	58	8	E BORDER
48	VL3500 WASH	77	8	E BORDER
49	VL3500 WASH	96	8	E BORDER
50	VL3500 WASH	115	8	E BORDER
51	VL3500 WASH	134	8	E BORDER
52	VL3500 WASH	43	31	THRUST STAGE TRUSS
53	VL3500 WASH	62	31	THRUST STAGE TRUSS
54	VL3500 WASH	81	31	THRUST STAGE TRUSS
55	VL3500 WASH	100	31	THRUST STAGE TRUSS
56	VL3500 WASH	119	31	THRUST STAGE TRUSS
57	VL3500 WASH	138	31	THRUST STAGE TRUSS
58	VL3500 WASH	1	32	CIRCULAR STAGE TRUSS
59	VL3500 WASH	20	32	CIRCULAR STAGE TRUSS
60	VL3500 WASH	1	35	D TRUSS
61	VL3500 WASH	10	35	D TRUSS
62	VL3500 WASH	19	35	D TRUSS
63	VL3500 WASH	28	35	D TRUSS
64	VL3500 WASH	37	35	D TRUSS
65	VL3500 WASH	46	35	D TRUSS
66	VL3500 WASH	55	35	D TRUSS
101	VL3000 PROFILE	115	1	K BORDER
102	VL3000 PROFILE	143	1	K BORDER
103	VL3000 PROFILE	171	1	K BORDER
104	VL3000 PROFILE	199	1	K BORDER
105	VL3000 PROFILE	227	1	K BORDER
106	VL3000 PROFILE	255	1	K BORDER
107	VL3000 PROFILE	283	1	K BORDER
108	VL3000 PROFILE	311	1	K BORDER
109	VL3000 PROFILE	339	1	K BORDER
110	VL3000 PROFILE	367	1	K BORDER
111	VL3000 PROFILE	395	1	K BORDER
112	VL3000 PROFILE	423	1	K BORDER
113	VL3000 PROFILE	451	1	K BORDER
114	VL3000 PROFILE	479	1	K BORDER
115	VL3000 PROFILE	1	2	K BORDER
116	VL3000 PROFILE	1	3	H BORDER
117	VL3000 PROFILE	29	3	H BORDER
118	VL3000 PROFILE	57	3	H BORDER
119	VL3000 PROFILE	85	3	H BORDER
120	VL3000 PROFILE	113	3	H BORDER
121	VL3000 PROFILE	141	3	H BORDER
122	VL3000 PROFILE	1	5	G BORDER
123	VL3000 PROFILE	29	5	G BORDER
124	VL3000 PROFILE	57	5	G BORDER
125	VL3000 PROFILE	85	5	G BORDER
126	VL3000 PROFILE	113	5	G BORDER
127	VL3000 PROFILE	141	5	G BORDER

128	VL3000 PROFILE	169	5	G BORDER
129	VL3000 PROFILE	197	5	G BORDER
130	VL3000 PROFILE	225	5	G BORDER
131	VL3000 PROFILE	253	5	G BORDER
132	VL3000 PROFILE	281	5	G BORDER
133	VL3000 PROFILE	309	5	G BORDER
134	VL3000 PROFILE	337	5	G BORDER
135	VL3000 PROFILE	365	5	G BORDER
136	VL3000 PROFILE	1	7	F BORDER
137	VL3000 PROFILE	29	7	F BORDER
138	VL3000 PROFILE	57	7	F BORDER
139	VL3000 PROFILE	85	7	F BORDER
140	VL3000 PROFILE	113	7	F BORDER
141	VL3000 PROFILE	141	7	F BORDER
142	VL3000 PROFILE	169	7	F BORDER
143	VL3000 PROFILE	197	7	F BORDER
144	VL3000 PROFILE	153	8	E BORDER
145	VL3000 PROFILE	181	8	E BORDER
146	VL3000 PROFILE	209	8	E BORDER
147	VL3000 PROFILE	237	8	E BORDER
148	VL3000 PROFILE	265	8	E BORDER
149	VL3000 PROFILE	293	8	E BORDER
150	VL3000 PROFILE	321	8	E BORDER
151	VL3000 PROFILE	349	8	E BORDER
152	VL3000 PROFILE	377	8	E BORDER
201	/L3500 PROFILE (with shutters	146	4	G BORDER
202	/L3500 PROFILE (with shutters	177	4	G BORDER
203	/L3500 PROFILE (with shutters	267	6	F BORDER
204	/L3500 PROFILE (with shutters	298	6	F BORDER
205	/L3500 PROFILE (with shutters	405	8	E BORDER
206	/L3500 PROFILE (with shutters	436	8	E BORDER
207	/L3500 PROFILE (with shutters	1	9	4 LADDER RIGHT
208	/L3500 PROFILE (with shutters	32	9	4 LADDER RIGHT
209	/L3500 PROFILE (with shutters	63	9	4 LADDER RIGHT
210	/L3500 PROFILE (with shutters	94	9	4 LADDER RIGHT
211	/L3500 PROFILE (with shutters	125	9	3 LADDER RIGHT
212	/L3500 PROFILE (with shutters	156	9	3 LADDER RIGHT
213	/L3500 PROFILE (with shutters	187	9	3 LADDER RIGHT
214	/L3500 PROFILE (with shutters	218	9	3 LADDER RIGHT
215	/L3500 PROFILE (with shutters	249	9	2 LADDER RIGHT
216	/L3500 PROFILE (with shutters	280	9	2 LADDER RIGHT
217	/L3500 PROFILE (with shutters	311	9	2 LADDER RIGHT
218	/L3500 PROFILE (with shutters	342	9	2 LADDER RIGHT
219	/L3500 PROFILE (with shutters	373	9	1 LADDER RIGHT
220	/L3500 PROFILE (with shutters	404	9	1 LADDER RIGHT
221	/L3500 PROFILE (with shutters	435	9	1 LADDER RIGHT
222	/L3500 PROFILE (with shutters	466	9	1 LADDER RIGHT
223	/L3500 PROFILE (with shutters	1	10	4 LADDER LEFT
224	/L3500 PROFILE (with shutters	32	10	4 LADDER LEFT
225	/L3500 PROFILE (with shutters	63	10	4 LADDER LEFT
226	/L3500 PROFILE (with shutters	94	10	4 LADDER LEFT
227	/L3500 PROFILE (with shutters	125	10	3 LADDER LEFT
228	/L3500 PROFILE (with shutters	156	10	3 LADDER LEFT
229	/L3500 PROFILE (with shutters	187	10	3 LADDER LEFT
230	/L3500 PROFILE (with shutters	218	10	3 LADDER LEFT
231	/L3500 PROFILE (with shutters	249	10	2 LADDER LEFT
232	/L3500 PROFILE (with shutters	280	10	2 LADDER LEFT
233	/L3500 PROFILE (with shutters	311	10	2 LADDER LEFT
234	/L3500 PROFILE (with shutters	342	10	2 LADDER LEFT
235	/L3500 PROFILE (with shutters	373	10	1 LADDER LEFT
236	/L3500 PROFILE (with shutters	404	10	1 LADDER LEFT
237	/L3500 PROFILE (with shutters	435	10	1 LADDER LEFT
238	/L3500 PROFILE (with shutters	466	10	1 LADDER LEFT
239	/L3500 PROFILE (with shutters	1	30	THRUST STAGE TRUSS
240	/L3500 PROFILE (with shutters	31	30	THRUST STAGE TRUSS
241	/L3500 PROFILE (with shutters	61	30	THRUST STAGE TRUSS
242	/L3500 PROFILE (with shutters	91	30	THRUST STAGE TRUSS
243	/L3500 PROFILE (with shutters	121	30	THRUST STAGE TRUSS
244	/L3500 PROFILE (with shutters	151	30	THRUST STAGE TRUSS
245	/L3500 PROFILE (with shutters	181	30	THRUST STAGE TRUSS
246	/L3500 PROFILE (with shutters	39	32	CIRCULAR STAGE TRUSS TOP
247	/L3500 PROFILE (with shutters	70	32	CIRCULAR STAGE TRUSS RIGHT
248	/L3500 PROFILE (with shutters	101	32	CIRCULAR STAGE TRUSS LEFT
249	/L3500 PROFILE (with shutters	132	32	CIRCULAR STAGE TRUSS BOTTOM
301	SCENIUS PROFILE	31	13	UPSTAGE POD
302	SCENIUS PROFILE	1	34	D TRUSS
303	SCENIUS PROFILE	38	34	D TRUSS
304	SCENIUS PROFILE	75	34	D TRUSS
305	SCENIUS PROFILE	112	34	D TRUSS
306	SCENIUS PROFILE	149	34	D TRUSS
307	SCENIUS PROFILE	186	34	D TRUSS
308	SCENIUS PROFILE	223	34	D TRUSS
309	SCENIUS PROFILE	260	34	D TRUSS
310	SCENIUS PROFILE	297	34	D TRUSS
311	SCENIUS PROFILE	334	34	D TRUSS
312	SCENIUS PROFILE	371	34	D TRUSS
313	SCENIUS PROFILE	408	34	D TRUSS
314	SCENIUS PROFILE	445	34	D TRUSS
315	SCENIUS PROFILE	482	34	D TRUSS
401	MYTHOS 2	1	12	UPSTAGE POD
402	MYTHOS 2	31	12	UPSTAGE POD
403	MYTHOS 2	61	12	UPSTAGE POD
404	MYTHOS 2	91	12	UPSTAGE POD

405	MYTHOS 2	121	12	UPSTAGE POD
406	MYTHOS 2	151	12	UPSTAGE POD
407	MYTHOS 2	181	12	UPSTAGE POD
408	MYTHOS 2	211	12	UPSTAGE POD
409	MYTHOS 2	241	12	UPSTAGE POD
410	MYTHOS 2	271	12	UPSTAGE POD
411	MYTHOS 2	301	12	UPSTAGE POD
412	MYTHOS 2	331	12	UPSTAGE POD
413	MYTHOS 2	361	12	UPSTAGE POD
414	MYTHOS 2	391	12	UPSTAGE POD
415	MYTHOS 2	421	12	UPSTAGE POD
416	MYTHOS 2	451	12	UPSTAGE POD
417	MYTHOS 2	481	12	UPSTAGE POD
418	MYTHOS 2	1	13	UPSTAGE POD
419	MYTHOS 2	1	14	3 POD RIGHT
420	MYTHOS 2	31	14	3 POD RIGHT
421	MYTHOS 2	61	14	3 POD RIGHT
422	MYTHOS 2	91	14	3 POD RIGHT
423	MYTHOS 2	121	14	3 POD RIGHT
424	MYTHOS 2	151	14	3 POD RIGHT
425	MYTHOS 2	181	14	3 POD RIGHT
426	MYTHOS 2	211	14	3 POD RIGHT
427	MYTHOS 2	241	14	3 POD RIGHT
428	MYTHOS 2	271	14	3 POD RIGHT
429	MYTHOS 2	301	14	3 POD RIGHT
430	MYTHOS 2	331	14	3 POD RIGHT
431	MYTHOS 2	361	14	3 POD RIGHT
432	MYTHOS 2	391	14	3 POD RIGHT
433	MYTHOS 2	421	14	3 POD RIGHT
434	MYTHOS 2	451	14	3 POD RIGHT
435	MYTHOS 2	481	14	3 POD RIGHT
436	MYTHOS 2	1	15	3 POD RIGHT
437	MYTHOS 2	1	16	3 POD LEFT
438	MYTHOS 2	31	16	3 POD LEFT
439	MYTHOS 2	61	16	3 POD LEFT
440	MYTHOS 2	91	16	3 POD LEFT
441	MYTHOS 2	121	16	3 POD LEFT
442	MYTHOS 2	151	16	3 POD LEFT
443	MYTHOS 2	181	16	3 POD LEFT
444	MYTHOS 2	211	16	3 POD LEFT
445	MYTHOS 2	241	16	3 POD LEFT
446	MYTHOS 2	271	16	3 POD LEFT
447	MYTHOS 2	301	16	3 POD LEFT
448	MYTHOS 2	331	16	3 POD LEFT
449	MYTHOS 2	361	16	3 POD LEFT
450	MYTHOS 2	391	16	3 POD LEFT
451	MYTHOS 2	421	16	3 POD LEFT
452	MYTHOS 2	451	16	3 POD LEFT
453	MYTHOS 2	481	16	3 POD LEFT
454	MYTHOS 2	1	17	3 POD LEFT
455	MYTHOS 2	1	18	2 POD RIGHT
456	MYTHOS 2	31	18	2 POD RIGHT
457	MYTHOS 2	61	18	2 POD RIGHT
458	MYTHOS 2	91	18	2 POD RIGHT
459	MYTHOS 2	121	18	2 POD RIGHT
460	MYTHOS 2	151	18	2 POD RIGHT
461	MYTHOS 2	181	18	2 POD RIGHT
462	MYTHOS 2	211	18	2 POD RIGHT
463	MYTHOS 2	241	18	2 POD RIGHT
464	MYTHOS 2	271	18	2 POD RIGHT
465	MYTHOS 2	301	18	2 POD RIGHT
466	MYTHOS 2	331	18	2 POD RIGHT
467	MYTHOS 2	361	18	2 POD RIGHT
468	MYTHOS 2	391	18	2 POD RIGHT
469	MYTHOS 2	421	18	2 POD RIGHT
470	MYTHOS 2	451	18	2 POD RIGHT
471	MYTHOS 2	481	18	2 POD RIGHT
472	MYTHOS 2	1	19	2 POD RIGHT
473	MYTHOS 2	1	20	2 POD LEFT
474	MYTHOS 2	31	20	2 POD LEFT
475	MYTHOS 2	61	20	2 POD LEFT
476	MYTHOS 2	91	20	2 POD LEFT
477	MYTHOS 2	121	20	2 POD LEFT
478	MYTHOS 2	151	20	2 POD LEFT
479	MYTHOS 2	181	20	2 POD LEFT
480	MYTHOS 2	211	20	2 POD LEFT
481	MYTHOS 2	241	20	2 POD LEFT
482	MYTHOS 2	271	20	2 POD LEFT
483	MYTHOS 2	301	20	2 POD LEFT
484	MYTHOS 2	331	20	2 POD LEFT
485	MYTHOS 2	361	20	2 POD LEFT
486	MYTHOS 2	391	20	2 POD LEFT
487	MYTHOS 2	421	20	2 POD LEFT
488	MYTHOS 2	451	20	2 POD LEFT
489	MYTHOS 2	481	20	2 POD LEFT
490	MYTHOS 2	1	21	2 POD LEFT
491	MYTHOS 2	1	22	1 POD RIGHT
492	MYTHOS 2	31	22	1 POD RIGHT
493	MYTHOS 2	61	22	1 POD RIGHT
494	MYTHOS 2	91	22	1 POD RIGHT
495	MYTHOS 2	121	22	1 POD RIGHT
496	MYTHOS 2	151	22	1 POD RIGHT
497	MYTHOS 2	181	22	1 POD RIGHT
498	MYTHOS 2	211	22	1 POD RIGHT
499	MYTHOS 2	241	22	1 POD RIGHT
500	MYTHOS 2	271	22	1 POD RIGHT

501	MYTHOS 2	301	22	1 POD RIGHT
502	MYTHOS 2	331	22	1 POD RIGHT
503	MYTHOS 2	361	22	1 POD RIGHT
504	MYTHOS 2	391	22	1 POD RIGHT
505	MYTHOS 2	421	22	1 POD RIGHT
506	MYTHOS 2	451	22	1 POD RIGHT
507	MYTHOS 2	481	22	1 POD RIGHT
508	MYTHOS 2	1	23	1 POD RIGHT
509	MYTHOS 2	1	24	1 POD LEFT
510	MYTHOS 2	31	24	1 POD LEFT
511	MYTHOS 2	61	24	1 POD LEFT
512	MYTHOS 2	91	24	1 POD LEFT
513	MYTHOS 2	121	24	1 POD LEFT
514	MYTHOS 2	151	24	1 POD LEFT
515	MYTHOS 2	181	24	1 POD LEFT
516	MYTHOS 2	211	24	1 POD LEFT
517	MYTHOS 2	241	24	1 POD LEFT
518	MYTHOS 2	271	24	1 POD LEFT
519	MYTHOS 2	301	24	1 POD LEFT
520	MYTHOS 2	331	24	1 POD LEFT
521	MYTHOS 2	361	24	1 POD LEFT
522	MYTHOS 2	391	24	1 POD LEFT
523	MYTHOS 2	421	24	1 POD LEFT
524	MYTHOS 2	451	24	1 POD LEFT
525	MYTHOS 2	481	24	1 POD LEFT
526	MYTHOS 2	1	25	1 POD LEFT
527	MYTHOS 2	1	26	SCENIC ARCH FLOOR RIGHT
528	MYTHOS 2	31	26	SCENIC ARCH FLOOR RIGHT
529	MYTHOS 2	61	26	SCENIC ARCH FLOOR RIGHT
530	MYTHOS 2	91	26	SCENIC ARCH FLOOR LEFT
531	MYTHOS 2	121	26	SCENIC ARCH FLOOR LEFT
532	MYTHOS 2	151	26	SCENIC ARCH FLOOR LEFT
533	MYTHOS 2	181	26	STAGE FLOOR
534	MYTHOS 2	211	26	STAGE FLOOR
535	MYTHOS 2	241	26	STAGE FLOOR
536	MYTHOS 2	271	26	STAGE FLOOR
537	MYTHOS 2	301	26	STAGE FLOOR
538	MYTHOS 2	331	26	STAGE FLOOR
539	MYTHOS 2	361	26	STAGE FLOOR
540	MYTHOS 2	391	26	STAGE FLOOR
541	MYTHOS 2	421	26	STAGE FLOOR
542	MYTHOS 2	451	26	STAGE FLOOR
543	MYTHOS 2	481	26	STAGE FLOOR
544	MYTHOS 2	1	27	STAGE FLOOR
545	MYTHOS 2	31	27	STAGE FLOOR
546	MYTHOS 2	61	27	STAGE FLOOR
601	PIXBAR DTW PRO	68	13	UPSTAGE POD
602	PIXBAR DTW PRO	117	13	UPSTAGE POD
603	PIXBAR DTW PRO	166	13	UPSTAGE POD
604	PIXBAR DTW PRO	215	13	UPSTAGE POD
605	PIXBAR DTW PRO	264	13	UPSTAGE POD
606	PIXBAR DTW PRO	313	13	UPSTAGE POD
607	PIXBAR DTW PRO	31	15	3 POD RIGHT
608	PIXBAR DTW PRO	80	15	3 POD RIGHT
609	PIXBAR DTW PRO	129	15	3 POD RIGHT
610	PIXBAR DTW PRO	178	15	3 POD RIGHT
611	PIXBAR DTW PRO	227	15	3 POD RIGHT
612	PIXBAR DTW PRO	276	15	3 POD RIGHT
613	PIXBAR DTW PRO	31	17	3 POD LEFT
614	PIXBAR DTW PRO	80	17	3 POD LEFT
615	PIXBAR DTW PRO	129	17	3 POD LEFT
616	PIXBAR DTW PRO	178	17	3 POD LEFT
617	PIXBAR DTW PRO	227	17	3 POD LEFT
618	PIXBAR DTW PRO	276	17	3 POD LEFT
619	PIXBAR DTW PRO	31	19	2 POD RIGHT
620	PIXBAR DTW PRO	80	19	2 POD RIGHT
621	PIXBAR DTW PRO	129	19	2 POD RIGHT
622	PIXBAR DTW PRO	178	19	2 POD RIGHT
623	PIXBAR DTW PRO	227	19	2 POD RIGHT
624	PIXBAR DTW PRO	276	19	2 POD RIGHT
625	PIXBAR DTW PRO	31	21	2 POD LEFT
626	PIXBAR DTW PRO	80	21	2 POD LEFT
627	PIXBAR DTW PRO	129	21	2 POD LEFT
628	PIXBAR DTW PRO	178	21	2 POD LEFT
629	PIXBAR DTW PRO	227	21	2 POD LEFT
630	PIXBAR DTW PRO	276	21	2 POD LEFT
631	PIXBAR DTW PRO	31	23	1 POD RIGHT
632	PIXBAR DTW PRO	80	23	1 POD RIGHT
633	PIXBAR DTW PRO	129	23	1 POD RIGHT
634	PIXBAR DTW PRO	178	23	1 POD RIGHT
635	PIXBAR DTW PRO	227	23	1 POD RIGHT
636	PIXBAR DTW PRO	276	23	1 POD RIGHT
637	PIXBAR DTW PRO	31	25	1 POD LEFT
638	PIXBAR DTW PRO	80	25	1 POD LEFT
639	PIXBAR DTW PRO	129	25	1 POD LEFT
640	PIXBAR DTW PRO	178	25	1 POD LEFT
641	PIXBAR DTW PRO	227	25	1 POD LEFT
642	PIXBAR DTW PRO	276	25	1 POD LEFT
701	RUSH PAR 4 UV	454	3	H BORDER
702	RUSH PAR 4 UV	457	3	H BORDER
703	RUSH PAR 4 UV	460	3	H BORDER
704	RUSH PAR 4 UV	463	3	H BORDER
705	RUSH PAR 4 UV	466	3	H BORDER
706	RUSH PAR 4 UV	469	3	H BORDER

707	RUSH PAR 4 UV	472	3	H BORDER
708	RUSH PAR 4 UV	475	3	H BORDER
709	RUSH PAR 4 UV	208	4	G BORDER
710	RUSH PAR 4 UV	211	4	G BORDER
711	RUSH PAR 4 UV	214	4	G BORDER
712	RUSH PAR 4 UV	217	4	G BORDER
713	RUSH PAR 4 UV	220	4	G BORDER
714	RUSH PAR 4 UV	223	4	G BORDER
715	RUSH PAR 4 UV	226	4	G BORDER
716	RUSH PAR 4 UV	229	4	G BORDER
717	RUSH PAR 4 UV	232	4	G BORDER
718	RUSH PAR 4 UV	235	4	G BORDER
719	RUSH PAR 4 UV	238	4	G BORDER
720	RUSH PAR 4 UV	1	31	THRUST STAGE TRUSS
721	RUSH PAR 4 UV	4	31	THRUST STAGE TRUSS
722	RUSH PAR 4 UV	7	31	THRUST STAGE TRUSS
723	RUSH PAR 4 UV	10	31	THRUST STAGE TRUSS
724	RUSH PAR 4 UV	13	31	THRUST STAGE TRUSS
725	RUSH PAR 4 UV	16	31	THRUST STAGE TRUSS
726	RUSH PAR 4 UV	19	31	THRUST STAGE TRUSS
727	RUSH PAR 4 UV	22	31	THRUST STAGE TRUSS
728	RUSH PAR 4 UV	25	31	THRUST STAGE TRUSS
729	RUSH PAR 4 UV	28	31	THRUST STAGE TRUSS
730	RUSH PAR 4 UV	31	31	THRUST STAGE TRUSS
731	RUSH PAR 4 UV	34	31	THRUST STAGE TRUSS
732	RUSH PAR 4 UV	37	31	THRUST STAGE TRUSS
733	RUSH PAR 4 UV	40	31	THRUST STAGE TRUSS
801	K-EYE K10 HCR	1	28	SCENIC ARCH TRUSS
802	K-EYE K10 HCR	33	28	SCENIC ARCH TRUSS
803	K-EYE K10 HCR	65	28	SCENIC ARCH TRUSS
804	K-EYE K10 HCR	97	28	SCENIC ARCH TRUSS
805	K-EYE K10 HCR	129	28	SCENIC ARCH TRUSS
806	K-EYE K10 HCR	161	28	SCENIC ARCH TRUSS
807	K-EYE K10 HCR	193	28	SCENIC ARCH TRUSS
808	K-EYE K10 HCR	225	28	SCENIC ARCH TRUSS
809	K-EYE K10 HCR	257	28	SCENIC ARCH TRUSS
810	K-EYE K10 HCR	289	28	SCENIC ARCH TRUSS
811	K-EYE K10 HCR	321	28	SCENIC ARCH TRUSS
812	K-EYE K10 HCR	353	28	SCENIC ARCH TRUSS
813	K-EYE K10 HCR	385	28	SCENIC ARCH TRUSS
814	K-EYE K10 HCR	213	30	THRUST STAGE TRUSS
815	K-EYE K10 HCR	245	30	THRUST STAGE TRUSS
816	K-EYE K10 HCR	277	30	THRUST STAGE TRUSS
817	K-EYE K10 HCR	309	30	THRUST STAGE TRUSS
818	K-EYE K10 HCR	341	30	THRUST STAGE TRUSS
819	K-EYE K10 HCR	373	30	THRUST STAGE TRUSS
820	K-EYE K10 HCR	405	30	THRUST STAGE TRUSS
821	K-EYE K10 HCR	437	30	THRUST STAGE TRUSS
822	K-EYE K10 HCR	1	33	CIRCULAR STAGE TRUSS
823	K-EYE K10 HCR	33	33	CIRCULAR STAGE TRUSS
824	K-EYE K10 HCR	65	33	CIRCULAR STAGE TRUSS
825	K-EYE K10 HCR	97	33	CIRCULAR STAGE TRUSS
826	K-EYE K10 HCR	129	33	CIRCULAR STAGE TRUSS
827	K-EYE K10 HCR	161	33	CIRCULAR STAGE TRUSS
828	K-EYE K10 HCR	193	33	CIRCULAR STAGE TRUSS
829	K-EYE K10 HCR	225	33	CIRCULAR STAGE TRUSS
830	K-EYE K10 HCR	257	33	CIRCULAR STAGE TRUSS
831	K-EYE K10 HCR	289	33	CIRCULAR STAGE TRUSS
832	K-EYE K10 HCR	321	33	CIRCULAR STAGE TRUSS
833	K-EYE K10 HCR	353	33	CIRCULAR STAGE TRUSS
901	SHARPY	1	29	SCENIC ARCH TRUSS
902	SHARPY	21	29	SCENIC ARCH TRUSS
903	SHARPY	41	29	SCENIC ARCH TRUSS
904	SHARPY	61	29	SCENIC ARCH TRUSS
905	SHARPY	81	29	SCENIC ARCH TRUSS
906	SHARPY	101	29	SCENIC ARCH TRUSS
907	SHARPY	121	29	SCENIC ARCH TRUSS
908	SHARPY	141	29	SCENIC ARCH TRUSS
909	SHARPY	161	29	SCENIC ARCH TRUSS
910	SHARPY	181	29	SCENIC ARCH TRUSS
911	SHARPY	201	29	SCENIC ARCH TRUSS
912	SHARPY	221	29	SCENIC ARCH TRUSS
913	SHARPY	157	31	THRUST STAGE TRUSS
914	SHARPY	177	31	THRUST STAGE TRUSS
915	SHARPY	197	31	THRUST STAGE TRUSS
916	SHARPY	217	31	THRUST STAGE TRUSS
917	SHARPY	237	31	THRUST STAGE TRUSS
918	SHARPY	257	31	THRUST STAGE TRUSS
919	SHARPY	277	31	THRUST STAGE TRUSS
920	SHARPY	297	31	THRUST STAGE TRUSS
921	SHARPY	317	31	THRUST STAGE TRUSS
922	SHARPY	337	31	THRUST STAGE TRUSS
923	SHARPY	163	32	CIRCULAR STAGE TRUSS
924	SHARPY	183	32	CIRCULAR STAGE TRUSS
925	SHARPY	203	32	CIRCULAR STAGE TRUSS
926	SHARPY	223	32	CIRCULAR STAGE TRUSS
927	SHARPY	243	32	CIRCULAR STAGE TRUSS
928	SHARPY	263	32	CIRCULAR STAGE TRUSS
929	SHARPY	283	32	CIRCULAR STAGE TRUSS
930	SHARPY	303	32	CIRCULAR STAGE TRUSS
1001	STAGE BLINDER IP RGBW	241	29	SCENIC ARCH TRUSS
1002	STAGE BLINDER IP RGBW	248	29	SCENIC ARCH TRUSS
1003	STAGE BLINDER IP RGBW	255	29	SCENIC ARCH TRUSS

1004	STAGE BLINDER IP RGBW	262	29	SCENIC ARCH TRUSS
1005	STAGE BLINDER IP RGBW	269	29	SCENIC ARCH TRUSS
1006	STAGE BLINDER IP RGBW	276	29	SCENIC ARCH TRUSS
1007	STAGE BLINDER IP RGBW	283	29	SCENIC ARCH TRUSS
1008	STAGE BLINDER IP RGBW	290	29	SCENIC ARCH TRUSS
1009	STAGE BLINDER IP RGBW	297	29	SCENIC ARCH TRUSS
1010	STAGE BLINDER IP RGBW	304	29	SCENIC ARCH TRUSS
1011	STAGE BLINDER IP RGBW	311	29	SCENIC ARCH TRUSS
1012	STAGE BLINDER IP RGBW	318	29	SCENIC ARCH TRUSS
1013	STAGE BLINDER IP RGBW	325	29	SCENIC ARCH TRUSS
1014	STAGE BLINDER IP RGBW	332	29	SCENIC ARCH TRUSS
1015	STAGE BLINDER IP RGBW	339	29	SCENIC ARCH TRUSS
1101	S4 LUSTR 10° @140W	1	11	FLY BRIDGE ABOVE RIGHT
1102	S4 LUSTR 10° @140W	10	11	FLY BRIDGE ABOVE RIGHT
1103	S4 LUSTR 10° @140W	19	11	FLY BRIDGE ABOVE RIGHT
1104	S4 LUSTR 10° @140W	28	11	FLY BRIDGE ABOVE RIGHT
1105	S4 LUSTR 10° @140W	37	11	FLY BRIDGE ABOVE RIGHT
1106	S4 LUSTR 10° @140W	46	11	FLY BRIDGE ABOVE RIGHT
1107	S4 LUSTR 10° @140W	55	11	FLY BRIDGE ABOVE RIGHT
1108	S4 LUSTR 10° @140W	64	11	FLY BRIDGE ABOVE RIGHT
1109	S4 LUSTR 10° @140W	73	11	FLY BRIDGE ABOVE LEFT
1110	S4 LUSTR 10° @140W	82	11	FLY BRIDGE ABOVE LEFT
1111	S4 LUSTR 10° @140W	91	11	FLY BRIDGE ABOVE LEFT
1112	S4 LUSTR 10° @140W	100	11	FLY BRIDGE ABOVE LEFT
1113	S4 LUSTR 10° @140W	109	11	FLY BRIDGE ABOVE LEFT
1114	S4 LUSTR 10° @140W	118	11	FLY BRIDGE ABOVE LEFT
1115	S4 LUSTR 10° @140W	127	11	FLY BRIDGE ABOVE LEFT
1116	S4 LUSTR 10° @140W	136	11	FLY BRIDGE ABOVE LEFT
1201	S4 LUSTR 19° @140W	145	11	4 LADDER RIGHT
1202	S4 LUSTR 19° @140W	154	11	4 LADDER RIGHT
1203	S4 LUSTR 19° @140W	163	11	3 LADDER RIGHT
1204	S4 LUSTR 19° @140W	172	11	3 LADDER RIGHT
1205	S4 LUSTR 19° @140W	181	11	2 LADDER RIGHT
1206	S4 LUSTR 19° @140W	190	11	2 LADDER RIGHT
1207	S4 LUSTR 19° @140W	199	11	1 LADDER RIGHT
1208	S4 LUSTR 19° @140W	208	11	1 LADDER RIGHT
1209	S4 LUSTR 19° @140W	217	11	4 LADDER LEFT
1210	S4 LUSTR 19° @140W	226	11	4 LADDER LEFT
1211	S4 LUSTR 19° @140W	235	11	3 LADDER LEFT
1212	S4 LUSTR 19° @140W	244	11	3 LADDER LEFT
1213	S4 LUSTR 19° @140W	253	11	2 LADDER LEFT
1214	S4 LUSTR 19° @140W	262	11	2 LADDER LEFT
1215	S4 LUSTR 19° @140W	271	11	1 LADDER LEFT
1216	S4 LUSTR 19° @140W	280	11	1 LADDER LEFT
1301	18WRGBB		34	G BORDER

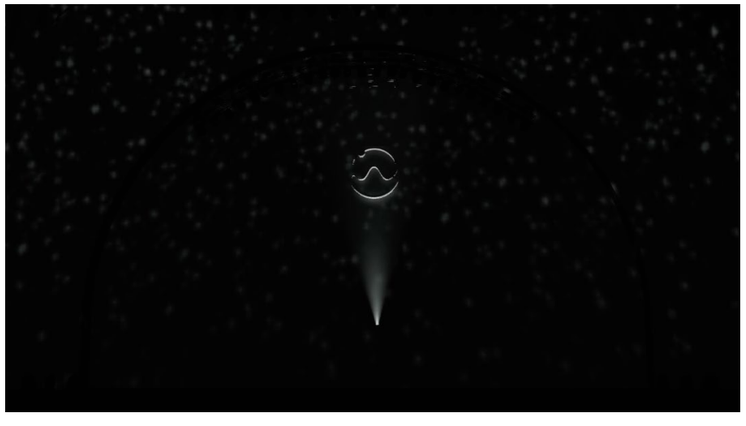
1302	18WRGBB		34	G BORDER
1303	18WRGBB		34	F BORDER
1304	18WRGBB		34	F BORDER
1305	18WRGBB		34	E BORDER
1306	18WRGBB		34	E BORDER
1307	18WRGBB		34	THRUST STAGE TRUSS
1308	18WRGBB		34	THRUST STAGE TRUSS
1309	CYCLONE		35	CIRCULAR STAGE TRUSS
1401	COLOR FORCE 12"	1	36	MOUNTAIN PERIMETER
1402	COLOR FORCE 12"	10	36	MOUNTAIN PERIMETER
1403	COLOR FORCE 12"	19	36	MOUNTAIN PERIMETER
1404	COLOR FORCE 12"	28	36	MOUNTAIN PERIMETER
1405	COLOR FORCE 12"	37	36	MOUNTAIN PERIMETER
1406	COLOR FORCE 12"	46	36	MOUNTAIN BALCONY 2
1407	COLOR FORCE 12"	55	36	MOUNTAIN BALCONY 3
1408	COLOR FORCE 48"	64	36	MOUNTAIN PERIMETER
1409	COLOR FORCE 48"	88	36	MOUNTAIN CAVE 1
1410	COLOR FORCE 48"	112	36	MOUNTAIN CAVE 1
1411	COLOR FORCE 48"	136	36	MOUNTAIN PERIMETER
1412	COLOR FORCE 48"	160	36	MOUNTAIN PERIMETER
1413	COLOR FORCE 48"	184	36	MOUNTAIN PERIMETER
1414	COLOR FORCE 48"	208	36	MOUNTAIN PERIMETER
1415	COLOR FORCE 48"	232	36	MOUNTAIN STORAGE
1416	COLOR FORCE 48"	256	36	MOUNTAIN STORAGE
1417	COLOR FORCE 48"	280	36	MOUNTAIN PERIMETER
1418	COLOR FORCE 48"	304	36	MOUNTAIN PERIMETER
1419	COLOR FORCE 48"	328	36	MOUNTAIN STORAGE
1420	COLOR FORCE 48"	352	36	MOUNTAIN BALCONY 1
1421	COLOR FORCE 48"	376	36	MOUNTAIN BALCONY 1
1422	COLOR FORCE 48"	400	36	MOUNTAIN CAVE 2
1423	COLOR FORCE 48"	424	36	MOUNTAIN CAVE 2
1424	COLOR FORCE 48"	448	36	MOUNTAIN CAVE 2
1425	COLOR FORCE 48"	472	36	MOUNTAIN BALCONY 2
1426	COLOR FORCE 48"	496	36	MOUNTAIN BALCONY 3
1427	COLOR FORCE 48"	1	37	MOUNTAIN BALCONY 3
1428	COLOR FORCE 48"	25	37	MOUNTAIN BALCONY 3
1429	COLOR FORCE 48"	49	37	MOUNTAIN BALCONY 3

7.11.4 Lighting programming

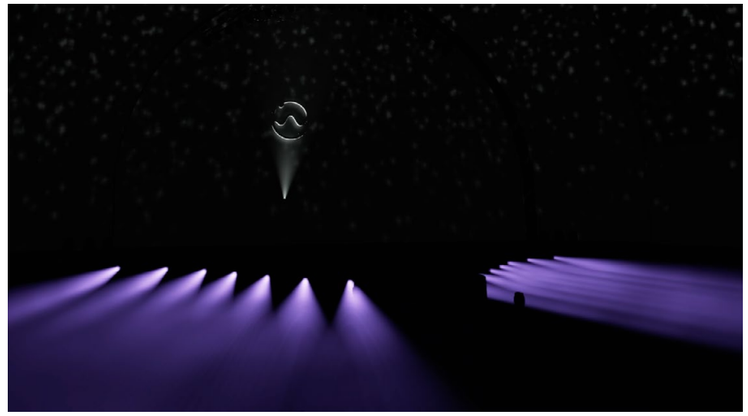
The final step of this phase consists of programming lights. Thanks to the help of experienced programmers (Marco Zucchinelli and Andrea Mantovani), light has been designed for 5 moments of the show: *Chromatica I, Alice, Poker Face, 911 and Shallow*. As emerged in the final considerations of the research (chapter 6), there are various approaches designers use when programming lighting at concerts. It can be purely aesthetic, it can be symbolic (mainly referred to the color of light) or it can be an intentionally emotional approach. In addition, the research developed a fourth, more scientific, methodology whose aim is to evoke and strengthen certain emotions in people during a peculiar moment of the show. When programming lights for these five songs, I managed to apply these different approaches that still share the same aim: to emote the audience.

Chromatica I* and *Alice

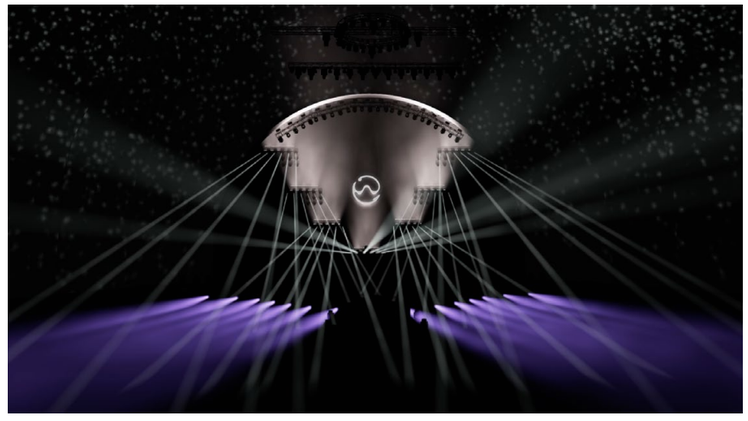
On *Chromatica I* and *Alice*, the artist is landing on the mysterious planet Chromatica. It is her planet and she somehow represents the royalty of the place. Therefore, I decided to mix the elegance of white with the mysteriousness of purple which, in addition, stands for royalty as well. In this case, it used a symbolic approach.



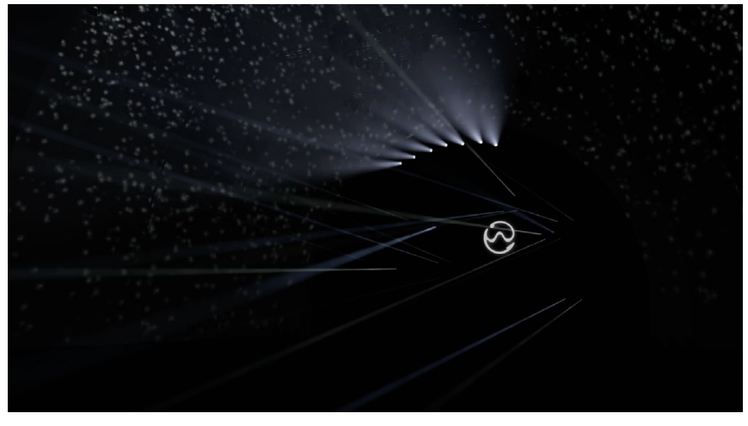
Chromatica I



Chromatica I



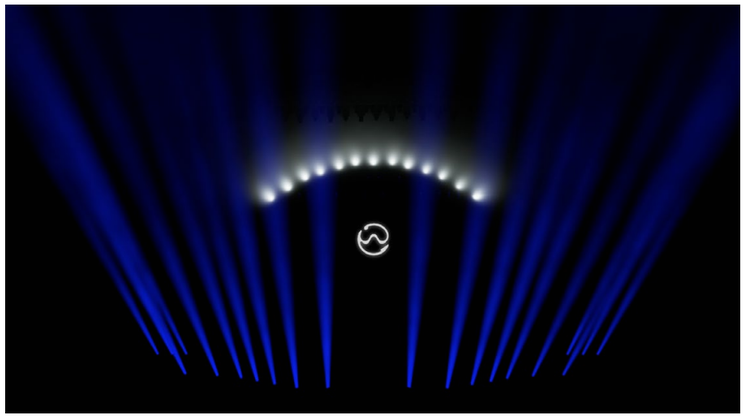
Alice



Alice

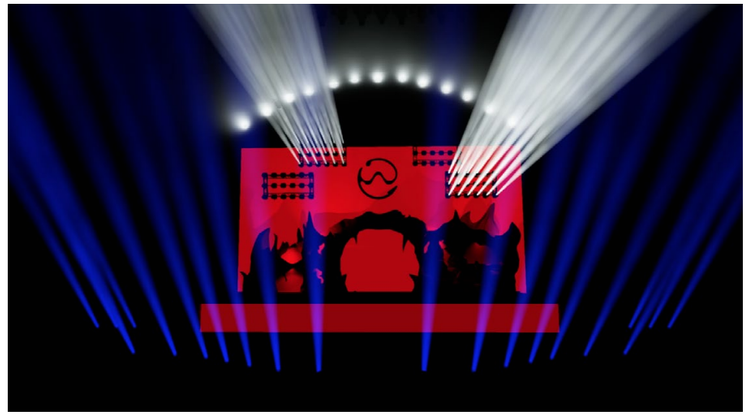
Poker Face

Poker Face is a crucial moment of the show. Not only because it is one of Lady Gaga's biggest hits, but also because the mountain, which is the main piece of scenography, shows up. This is a terribly powerful dance song that I paired with highly saturated colors: blue lights and red ledwall that underlines the shape of the mountain. In addition, white light coming both from the scenic arch truss and from 4 pods emphasize the aggressive rhythm of the song. The sine turns on and off nervously too. In the present case, I applied a purely aesthetic approach.



Poker Face

Poker Face



Poker Face

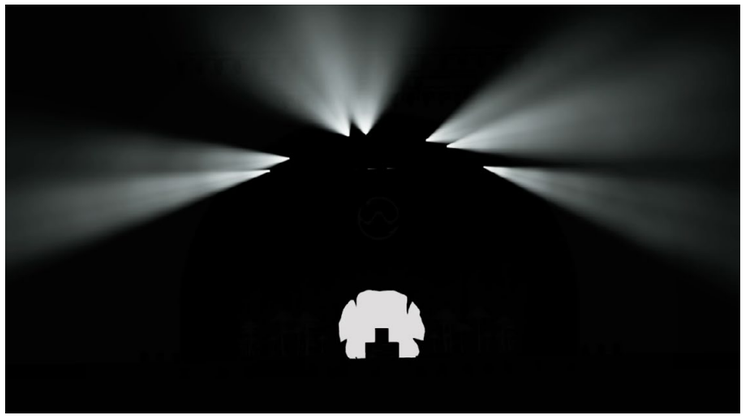
911

On 911, I used both a purely aesthetic approach and an intentionally emotional one. The first verse of the song features white lights (scenic arch truss) with some accents of red in the caves of the mountain. That is because during this part of the song lighting should not be distracting. Indeed, the audience's attention has to be driven to the center of the mountain where a white circle (on the back ledwall), that beats to the rhythm of the tune, highlights the artist's and dancers' silhouettes. Right before the first chorus, everything is turned off for a fraction of a second seeking a strong reaction in people. This trick, suggested both by lighting designers Campana and Renzi, can be framed into the intentionally emotional approach. When the chorus drops, everything is turned on and an explosion of colors creates a psychedelic and captivating picture (purely aesthetic approach).

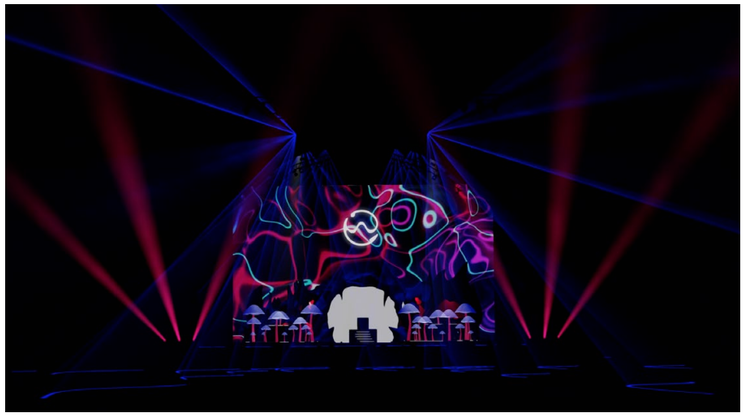
Shallow

Finally, Shallow is the song where I applied the scientific approach. This is a sad and heartfelt ballad that the artist plays at the piano. According to Russell's graphs, the song should be matched with cold colors and slow movements (or no movements at all). Indeed, I opted for neutral white and cold white light and the rock, on which the piano

911



911



911

Shallow

Shallow

stands, is illuminated with the UV lamps so that it shows the blueish fluorescent paint it is covered with. On the chorus, a smooth rotation of gobos gives life to the scene.

8

Conclusions

The objective set at the beginning of this body of work was to investigate the relationship between stage lighting design and emotions. That is because I wanted to better define whether (or not) the stage lighting designer can literally *design* light to evoke emotions in the audience during a concert, improving the overall emotional experience of people. I have been driven to develop this kind of research by the lack of studies in this field. Indeed, the current literature about emotions and lighting is primarily related to architecture. Conversely, the scientific research about the human responses to production lighting is scarce, at the very least, with incoherent results.

Over the last few decades, technology has transformed show lighting considerably. Indeed, compared to the past, nowadays light fixtures for entertainment are much more complex since they feature loads of parameters whose changes allow to give infinite appearances to the light beam and therefore create equally infinite light layouts. To explore something so wide, I condensed light to just two parameters: color and movement, the two predominant visual attributes of light. This means that alterations in these two aspects of show lighting can be caught effortlessly by the inexperienced eye of those in the crowd and can therefore generate emotions. It is fundamental to highlight that in this research, “movement” does not refer to the physical extension of the light fixture in the space only, but in general to every kind of visual change that occur in the scene.

Particularly, these are the questions I intended to give an answer to with this work:

1. Do color and movement of light have an emotional impact on people during concerts?

2. To what extent can the stage lighting designer actually play with light color and light movement to arouse emotions in the audience during concerts?

To give a complete response to these questions, the research put together several studies and theories directly and indirectly related to show lighting. It emerged that both the color and the movement of light strongly affect the audience during a show on an emotional level. This was resolutely confirmed by the interviews with 5 show lighting designers (Giovanni Pinna, Carlotta Renzi, Mamo Pozzoli, Jo Campana and Jacopo Ricci) that were carried out in order to give additional reliability to the outcome. Therefore, the first question received a clear and unique affermative answer.
At this point it seemed legit to think that lighting designers can design these two parameters of light to arouse emotions in the audience. On the basis of the studies analyzed by this research, an analytical methodology that could be used by stage lighting designers to scientifically design lighting to stimulate certain emotions was developed. Indeed, it turned out that the feelings that the color and the movement of light evoke in people can be described by Russell's emotional model. This model allows to "measure" emotions according to the two dimensional axes of Arousal and Valence. Music emotions can therefore be placed on this graph as well. Consequently, it appeared reasonable to suppose that, in order to enhance a particular feeling, a song should be matched with a color and movement of light that convey the same emotion as the tune. According to this methodology, a happy-sounding song should be matched with yellowish colors and high-energy movements of light. In contrast, a sad-sounding song should be paired with cold colors and low-energy movements of light. This approach to stage lighting design was discussed with the 5 designers during the interviews specifying that the graphs shown are

not meant to substitute their already structured personal method. Yet, it was proposed as a scientific way to enhance and stress a certain emotion during a particular moment of a show. Pinna do not support the effectiveness of the scientific approach proposed. Renzi, Campana and Ricci think it works in most cases. Pozzoli believes it might work if some adjustments to it are made. Indeed, he considers this method too elementary since it does not consider the complexity of nowadays productions which are much more that just lighting (for instance, led walls play a big role in today's live shows). Giving a clear and distinct answer to the second question was not possible. Therefore, this research leaves the door opened to further exploration in this direction.
What is more, beside developing the scientific approach to stage lighting, this work highlighted 3 main approaches show lighting designers use. These are: *purely aesthetic approach*, *symbolic approach* (mainly referred to the color of light) and *intentionally emotional approach*. However, it is has to be pointed out that all approaches share the same aim to emote the audience.
The knowledge developed was translated into *The Chromatic Experience*. It is a hypothetical concert to present Lady Gaga's latest album, *Chromatica*, for which I worked on the stage design, show design, and finally on the stage lighting design. Particularly, I applied the scientific methodology developed and the other three approaches to design lighting for a few songs of the show.

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