

Luminous fountains and fairies

Fin-de-siècle colourful lighting techniques and mutating scenography

Evelien Jonckheere

Recently, the organization that runs the Křižík's Luminous Fountain, a well-known tourist attraction in Prague, announced the end of its performances, 128 years after the fountain's first luminous projections.¹ This luminous fountain was named after its creator, František Křižík, the Czech inventor, electrical engineer, and entrepreneur who built this fountain as a main attraction at the General Land Centennial Exhibition of the Austro-Hungarian Empire in 1891 (Česálková & Svatoňová 384). In that year, the Křižík Fountain's many visitors to the exhibition marveled at "colours changing in rapid succession, each mutation was welcomed by thunderous applause, and a veritable storm was unleashed upon the display of a composition comprised of the hues of the tricolour: red, blue, and white".² Other visitors perceived the fountains as enormous bouquets of multi-coloured flowers or precious stones (Česálková & Svatoňová 392).

The installation was refurbished in 1991 in honour of the Universal Czechoslovakia Exhibition.³ It survived until recently as a tourist attraction with computer-controlled lights, synchronized with the tones of Dvořák's *New World Symphony* as well as more popular tunes by Abba, the Scorpions, and Queen. However, reports by contemporary audiences testify to reduced enthusiasm:

We were a little bit disappointed. The show was OK - beautiful lights and sound but the arena looks ruined. It needs refreshing. If you haven't seen anything like that before then it's a "must see" attraction :) Otherwise you should consider spending your money elsewhere.⁴

It is evident that the experience of watching luminous fountains (or "magic" or "fairy" fountains) nowadays is far removed from the astonishment they produced in 1891. This is the result of profound changes in discourse and perception over time. The "magic" of 1891 was partly due to the sensation caused by its novelty, but at the same time, there was more at stake. Luminous fountains were embedded in discourses of education, nationality, the promotion of new engineering systems and the advent of electricity, which gradually changed human perception during the late nineteenth century.

In this contribution, I aim to investigate how these discourses influenced late nineteenth-century lighting techniques and scenography within spectacular contexts. By laying bare a problematized position towards coloured light in theatre scenography and by demonstrating colourful visual experiments related to the fountain, such as *la fée d'électricité* by Loïe Fuller, I will illustrate how new conceptions of theatre lighting and scenography gradually found a way to the stage towards the turn of the twentieth century.

As such, a new dimension is brought to studies on stage lighting, which are traditionally written from the perspective of light sources, such as candles, oil, gas and electricity. At the same time, I will demonstrate how the evolution of theatre lighting was closely connected to the development of human perception and optical devices such as the “magic” or “optical” lanterns.⁵ In brief, by shedding light on the genealogy of the luminous fountain, this article at the same time re-investigates theatre lighting and its slow embracing of colour in scenography.

The Luminous Fountain as educational device: making the invisible visible

The Křížík Fountain made electromagnetic waves visible as dynamic water jets, and in doing so, it praised the enormous advances in technology. The visualization of these electromagnetic waves had long been problematic, until improved optical devices such as the “scientific lantern” or “optical lantern” were able to visualize vibrations and waves in liquids or water jets, resulting in a “luminous fountain”. This invention is usually attributed to the Swiss engineer and physicist Jean-Daniel Colladon who was famous for developing several improvements to the technology of hydraulics that were used in techniques to tunnel the alps and to expand the mining industry. The invention of the luminous fountain was said to be an accidental discovery made at the moment he was teaching the physics of water flow in 1841 (Hecht 12). To enhance the visibility of the water jet for his students, a scientific light projector was added to make the natural law of total internal reflection of light in water visible. As light has a higher refractive index than water, it seemed to be locked in the water jet and was therefore propelled in a water jet, following the water in all possible directions.

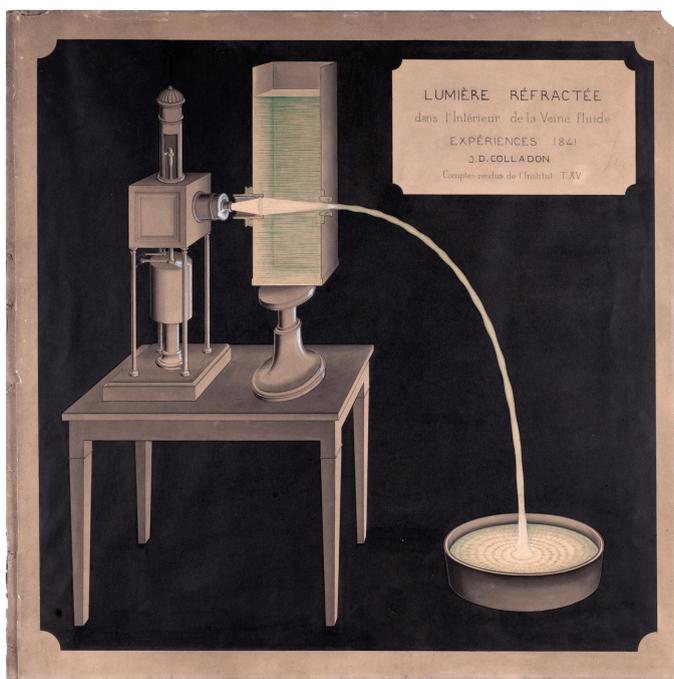


Fig. 1. *The Colladon Fountain*, s.d.
Private Collection Patrice Guérin

Colladon gave an illustrated lecture with the luminous fountain at the Conservatory of Arts and Sciences of Paris in October 1841, and probably gave another demonstration in London too. Only the following summer did Colladon publish anything on this invention, probably after a rumour was spread that a Belgian scientist, Joseph Plateau, was developing something similar (Hecht 14). Abbé Moigno, a famous French populariser of science, made mention of another inventor of the luminous fountain, Jacques Babinet, and claimed that Colladon merely extended its design (Moigno 132).

However, less important than the exact attribution of its inventor is the fact that the luminous fountain spread rapidly in scientific circles. In the second half of the nineteenth century the luminous fountain was marketed by lantern producers. These scientific lanterns were sold to schools, associations and private individuals, so that they could magnify all kinds of physical objects and visualize natural phenomena, including the “total reflection” by means of a luminous fountain. How teachers should educate a group by means of the scientific lantern was described in accompanying manuals such as the handbook *Les projections scientifiques et amusantes* (Scientific and entertaining projections) by lantern constructor Georges Massiot, dating from 1907. Massiot emphasized that demonstrations with a fairy-like character such as the luminous fountain or colourful rainbows were extremely interesting for introducing children to the scientific world. The enchanting character of the luminous fountain is compared with colourful gems:

The jets start to sprinkle, they cross and break, matt like silver jets, red like bloody rockets, purple like amethyst flows, yellow like gold like the persistent trace of miraculous topazes. (Massiot 35).

On the continent, a man named Louis Jules Duboscq played a major role in the optimization and dissemination of the scientific lantern (Moigno 73). This French optician and lantern manufacturer had a shop with Jean-Baptiste Soleil at the Rue de l’Odéon in Paris (Robinson, Herbert and Crangle 95). He was specialized in manufacturing lenses and optical devices and had been selling the *lanterne photogénique* since 1850. This lantern projected microscopic particles and with the right accessories, one could demonstrate physical laws of *phénomènes naturels*, such as reflection, refraction, dispersion, spectra, recomposition of light, et cetera (Manoni 228).

One can state that these scientific lanterns contributed enormously to the

knowledge of the natural composition of light and colour. In addition to the luminous fountain, experiments with transparent glass prisms made it possible to visualize and investigate in detail the refraction of white light beams into colour prisms and rainbows (Chadwick 115-138). In this way, knowledge concerning the composition and properties of light and colour increased rapidly. This knowledge made it possible to further develop the colour theories of Goethe, who had laid bare the subjective nature of colour. The existence of deceptive after-images of colours and the role of the retina's response to the perception of colour, illustrated that the perception of colour could not be regarded as 'stable' and was a result of an interplay of biological, chemical, physical and psychological elements, which were further explored by scientists such as Joseph Plateau, Jean Purkinje, Gustav Fechner and many others throughout the nineteenth century.⁶ They illustrated what Jonathan Crary described as 'subjective' or 'embodied' vision, in which vision became dependent on the complex and contingent physiological makeup of the observer, rendering vision faulty, unreliable, and arbitrary. This broke with a classical regime of visibility and grounded the truth of vision in the materiality of the body (Crary 12).

The luminous fountain at the Exhibition: promoting national technology

However, the luminous fountain was not limited to the classroom. It was at the World Fairs that the popularity of the luminous fountain reached its greatest heights. In addition, national competition at the World Exhibitions may have contributed significantly to the development of the luminous fountain. At the World Fair, the luminous fountain was seen as a powerful means to convey the wealth of a nation, symbolized by the display of the colours similar to beautiful gemstones, as illustrated in following description of the luminous fountain in a catalogue of the World Fair of 1889 in Paris:

This illumination is, in fact, magical and well placed to provoke the amazement of the crowds. We had never experienced these plays of light and these rapid colour changes; nothing as wonderful as these sparkling jets of such bright yet soft colours, as this continuous rain of diamonds, pearls, sapphires and emeralds! These flowing jets glow as if on fire, these silver sprays, these sparks, these sequins, all this water that seems inflamed, boiling, gushing, cascading down with dazzling scintillations, this orgy of light that seduces the eyes. It is like being in fairy-tale world (*Exposition Universelle 1889 Paris* 392).

This Paris exhibition was designed to celebrate the 100th anniversary of the French Revolution and attracted hundreds of people a day around the fountain located in the vicinity of the brand-new Eiffel Tower, at the heart of the exhibition. As soon as the sun went down, a spectacle of colourful floating water jets was launched at the Paris exhibition. The exhibition presented the latest innovations in science, technology and their industrial applications. As an exhibit, the luminous fountain in this context was an illustration of the latest trends in hydraulics linked to new techniques in the field of coloured light. Since the world exhibitions in London (1884), Manchester (1887) and Glasgow (1888), luminous fountains had become regular crowd pullers, with each new exhibition intended to surpass the previous one and glorify nationalistic sentiments (*Exposition Universelle 1889* Paris 392).

Inspired by the luminous fountains presented at previous expositions, one of the three basins was provided with the English Galloway light projection system whereas two other basins were provided with an innovative French projection system, more specifically one with the Bechmann and the other a Sautter-Lemonnier light projection. By adding reflecting devices, the French light projections were able to lighten up greater volumes of water, coloured by shifting combinations of five superimposed coloured glass slides, positioned in between a lantern or spotlight and the water jet (*Exposition Universelle 1889* Paris 330-333). These projection and colour devices were operated in a subterranean room, where machinists changed the colour slides in front of the lantern by pulling levers in order to achieve several combinations of the red, blue, green, gold and white glasses, by means of a mechanism that was said to be based on a railway signalling system. In addition, an above-ground observation room in the vicinity of the water basin was equipped with a mechanism of levers to control the water activity and with a so-called *porte-voix*, to correspond with colleagues in the subterranean room about the colour shifts (*Exposition Universelle 1889* Paris 339-348).



Fig. 2. Georges Garen, *Embrassement de la Tour Eiffel*. The Eiffel tower and luminous fountain during the World Exposition in 1889 Wiki Commons



Fig. 3. A lantern technician in the underground of the Luminous Fountain in: C.-L.Huard (ed.), *Livre d'Or de l'Exposition*, Paris: Boulanger, 1899

stimulant pour cette façon, se allions. Car si le amables, il saurient en mots clairs, pour ce qui est dans le grigot accédera l'auguste visi instant devant tion et s'est en- il a demandé a par sourant ha- m belge, est ar- ou Sa Majesté a aux et les sculp- noie à personne, des Roaix-Arts est tellement oc- cation du cata- vrière le matinal at compliments ofifs accessoires bassin de l'al- s'est pronon- des cimaises, le grosse de plu- sies M. le baron dans la section pé- mt, piquant de- ntre qu'on s'at- les instruments re attitudes di- sans sans d'uso- onneur, dit-il, l'usage m'acade- ble, qui aurait tel, répondit: l'pardon, mais l'cède que j'ai l'audacités par-

Union syndicale de l'in- jeure. 20. — Congrès de neurologie, de psycholo- gie. Les entrées du 11 mai à l'Exposition : 2,323 entrées à 1 franc; 105, à 50 centimes; 3,090 abonné. Recette totale : fr. 2,371.50.

Figurez-vous une cave en forme d'étoile, dans laquelle on a accès par un escalier fort roide, qui paraît être l'entrée de catacombes. Dans ce sous-sol très vaste, on aperçoit une quantité d'instruments aux cuivres polis et de petites lampes à incandescence, suspendues aux voûtes de béton. Pour bien vous l'emploi de ces di- verses machines, il faut que nous remontions au principe même des fontaines lumineuses, prin- cipal qui consiste simplement à faire jaillir une gerbe d'eau dans un rayon lumineux. La première difficulté qu'on ait rencontrée au Pavé du Cinquantième pour l'installation de cette fontaine, c'est l'insuffisance de débit et de pression d'eau, lorsqu'on la prend directement à l'Éca- location de la Ville.

Successivement et alterna- ble façon à produire une spect dans les gerbes liqui- En face de chacune de- maint les angles du gros posée une gerbe qui se con- traux et de six jets la- de telle sorte que l'eau s- de leur mouvant et grac- De la grande des chime- de centre du bassin, s'écha- horizontale qui retomben- que la chambre placée au- s'effera une énorme gerbe. De la base du nocher, ja- jets qui, en enveloppant les M. Vander Stappen. Voilà- lique. Examinons à présent les reils qui devront fournir le Sous chaque gerbe doit, en l'entrouvert, est électrique envoyant des fai-

Les Dessous de l'Exposition

Voici la partie sculpturale de la fontaine de M. Vander Stappen — complètement terminée.

M. Masirey, ingénieur en chef, faisant fonctionner son prototype.

maintient, placées en bronze vert, les chaudières l'auront été, pour se accorder au ton-rouge- l'abrupt.

Il a fallu y suppléer en substituant un appareil spécial qui produise une pression suffisante. Cet appareil se trouve au lieu de l'installation

UNE VI

A LA

SECTION DFS

La section des sciences d'honneur. Le visiteur pé- sion par l'entrée principal et aperçoit par une ouverture drapée les photographi- plans, les bocaux que nos tronomes, nos naturalistes groupés dans la partie de leur disposition. La section des sciences plètement achevée. La pa- que le Roi a traversée lui à l'Exposition de l'art qui que les sections latérales. Le compartiment des de fort en retard, mais il y e- bon augure, présageant l'avenir. Occupons-nous donc en- s'agit de ce qui est au accessi- on ne peut dire qu'il y a dans me- nous nous à l' l'après-midi de l'après-

Fig. 4. "Les Dessous de l'Exposition" in: *Petit Bleu de l'Exposition*, 12 May 1897

In its turn, the Parisian fountain inspired many other expositions such as Křižík's Luminous Fountain and the presentation of a fountain at the Brussels exposition of 1897 with similar "lumière merveilleux, apparaissant féériques."⁷ Corresponding to the Parisian precursor, attention was given to the subterranean mechanics. However, in Brussels, a different technique was used to provide colour to the water jets. An illustrated Belgian press report entitled *Les Dessous de l'Exposition* designed and described the arc lamps and mentioned how colour in the Brussels fountain was produced by revolving discs, divided into triangles of red, green, blue and yellow, making it possible to shift colours more easily.⁸ The fact that various World Fairs competed in surpassing each other by making the luminous fountain larger and using the latest techniques in the field of colour projection, stimulated the progress of both hydraulics and lighting techniques.

The luminous fountains were technical highlights and their magical character was further enhanced by the impressive technology, invisible behind the visible fountain. As in theatre, the audience of the fountain at the world's fair was fascinated by the machinery that was set in motion at invisible levels and through impressive mechanical suspension systems. However, compared to theatre, they offered an immersive spectacle, as the spectator could walk freely around the fountain and feel the freshness of the water jets. The synesthetic quality of the fountain, combining visual spectacle with tactile experience, probably explained the popularity of the luminous fountain in many other spectacular domains such as municipal festivals, hotel lobbies and foyers in theatres or summer gardens, and even private living rooms.⁹

Luminous fountains on stage: limited special effects

A festival of food, drink, mechanical merry-go-rounds, waxwork models and spectacular attractions characterized the multisensorial local fairground in the late nineteenth century. In this synesthetic environment, where taste, smell, touch and vision blended together in one happening, luminous fountains were a regular feature. First staged by illusionists,¹⁰ and later by fairground showmen such as the French A. Casti, who demonstrated luminous fountains at French and Belgian fairs in 1890 and referred in his announcement to those at the Paris World Fair from the year before.¹¹ Casti staged them as the 'apotheosis' of a *féerie*, the genre of spectacle that most used new techniques to stage fairy-tale-like stories.

The *féerie* originated in the Baroque courtyard theatre where, from the eighteenth century onwards, an allegorical and illusory phantasy world of fairies, caves, rocks, fires and fountains was unveiled with the help of impressive machinery

and quite dangerous lighting techniques such as Bengal fire (Ginisty 12-24). The dramaturgy of the *féerie* was therefore completely subordinate to the effects or attractions (Kessler 74). The spectacles belonged to the so-called “boulevard genre”, named after the famous Boulevard du Temple in Paris, where *féerie* spectacles were mainly located. They attracted a large and diverse audience. In the second half of the nineteenth century, the popularity of the *féerie* declined sharply as it was increasingly dismissed as a children's spectacle (Kessler and Lenk 117-127). Nevertheless, the genre continued to exist and the famous Parisian Théâtre du Châtelet almost acquired a monopoly at the end of the nineteenth century (Kessler 72). In addition, the genre continued to live on at the fairground as well.

While in the first half of the nineteenth century the *féerie* mainly relied on mechanics in which, with the help of gears, ropes and hydraulic systems, two-dimensional decor pieces were set in motion, more and more optical experiments were added in the second half. The so-called *phénomènes physiques*, simulating a rising sun, a rainbow and lightning, spread out from the *féerie* across the more traditional theatres.¹² These *phénomènes physiques* on stage were again closely connected to color experiments as demonstrated in illustrated lectures with the scientific lantern. It is not a coincidence that many of these *phénomènes physiques* were made to perfection by Jules Duboscq who was not only the inventor of highly sophisticated scientific lanterns, but also a technician in charge of *le service de l'électricité* in the Paris Opera since 1855. Duboscq commercialized the *phénomènes physiques* as theatrical effects, as illustrated by the *Catalogue des appareils employés pour la production des phénomènes physiques au théâtre* in Paris 1877.¹³ This catalogue contains a pricelist with the prices quoted for each apparatus, which theatres in the provinces or abroad could order from the author. It illustrates the abundance of lanterns of various kinds and their dimensions in theatre as early as the 1870s (Bergman 279).

In addition to suns, rainbows and lightning, a popular “fairy” effect presented in the Duboscq catalogue was the luminous fountain. This fountain was already introduced on stage in the ballet *Elia and Mysis* in 1853, with the help of Colladon's advice (Alglave & Boulard 424-425), and in many more similar *pièces à grand spectacle* where the luminous fountain often appeared as an apotheosis (Bergman 280). Moynet mentions in *Trucs et Decors* (1893) the role of the fountain in theatre as nothing more than a special effect (Moynet 296). Nevertheless, the popularity of similar special effects continued to grow during the nineteenth century. This was partially due to the spread of electric light,

which was much stronger and had a greater range than gas or oil. The electric lamp was introduced in 1849 at the Paris Opéra in Meyerbeer's opera *Le Prophète* to achieve a unique sunrise effect (Bergman 275-278). In the following years, electricity was employed to stretch a rainbow across the stage or to achieve electric moving projections (Alglave & Boulard 418-420). In Wagner's *La Walkyrie* in the Paris opera in 1893, floating clouds were designed with the aid of five electric projectors, projecting the clouds against veils, which were synchronized and placed behind set pieces (Moynet 359-376). These floating images were the result of revolving discs with transparent colours, representing clouds with varying lights and shades (Bergman 282).

Despite the fact that coloured light projections had a spectacular character on stage, coloured light was not yet institutionalized in theatre before the turn of the twentieth century for several reasons. Electric light was mainly limited to a few special effects, as well as the illumination of the exterior of public buildings, as its generators, steam engines and battery cells, took up a lot of space that was often lacking in the local theatres (Essig 17). Furthermore, for a long time electric lamps were considered too bright and too white, as indicated by Paul Lindau in the following quote from the 1880s:

The disproportionately strong and intense light washes out all the surrounding colours and because theatrical devices become crudely apparent in the bright light, it destroys all illusion. Instead of a tree one sees the painted canvas and instead of the sky, a sail cloth. (Baumann 199-200)

This quote exposes another underlying problem at the same time, namely the dominant visibility of the painted backdrop as interface, which could not tolerate too much light because it damaged the pictorial illusion of central perspective (Schivelbusch 193-195). According to theatre historian Linda Essig in *A Primer for the History of Stage Lighting*, theatre lighting first had to revolutionize the "tug-of-war between art and technology". Too much bright light could expose the inaccuracies in the canvas and break the illusionist effects. A luminous fountain was, however, even worse than stage lighting. Being a three-dimensional prop, the luminous fountain on stage disturbed the pictorial illusion of the painted backdrop much more with its illusory central perspective and liberated the spectator from the inflexible, subject-object positions of classical subjectivity, which was associated in the perception of classic pictorial illusion with central perspective (Yumibe 267).



THE SKIRT DANCE.

Fig. 6. *The Skirt Dance*
In: Albert Hopkins, *Magic, Stage Illusions and Scientific
Diversions* (1897)

Fuller and Fireworks: Towards a new scenography

Appia, according to Essig, was the first director to radically opt for an expressive use of stage lighting and to overturn the classic pictorial illusion with a rejection of two-dimensional scenery (Essig 12). In *Music and the art of the theatre* Appia wrote:

lighting is the more expressive (than spatial arrangement). This is so because it is subject to a minimum of conventions, is unobtrusive, and therefore freely communicates external life in its most expressive form. (Essig 17)

The most influential of Appia's ideas was his rejection of two-dimensional scenery. He felt that the three-dimensional human form, lit three-dimensionally by electric lights, should not appear in front of flatly painted illusionist scenery. In addition to Appia, Craig is also regularly referred to as a decisive influence in scenography within academic studies, as are Reinhardt and Meyerhold, who in turn would also profoundly influence Diaghilev's views on staging (Jackson 3).

In my opinion, Essig's claim that "the tug-of-war between art and technology" was unleashed by directors like Appia or Craig needs some qualification. I would suggest that the path was smoothed by light projection effects such as the rainbow, moving clouds and fountains, as indicated above. In my view, these fairy-tale-like spectacles, and especially the luminous fountains, were the first manifestations of colourful synesthetic effects on stage, challenging the classic pictorial illusion with expressive lighting and a rejection of two-dimensional scenery and backdrops with their inflexible subject-object perception.

In addition to these light projection effects, the influence of the American dancer Loïe Fuller on classical scenography needs to be taken into account as well. Fuller's dance was closely intertwined with light projection effects and especially with the luminous fountain. Fuller swapped the water of the luminous fountain for dust, as it were, and in this way, she created a similarly magical spectacle in which vibrant reds, blues and yellows merged together into mauves and greens in a constant flux. Projectors beamed coloured lights from several sides, above and beneath the dancer, resulting in colourful kaleidoscopic images on her white dress (Albright 52-61). To project from below, lantern operators were situated under the stage, directly beneath a glass plate on which she stood. The positioning of these coloured light sources is sketched in Albert Hopkins' famous book *Magic. Stage Illusions and Scientific Diversions* (1897) in which this dance is

described as the result of a magical interplay with light, space, colour and fabric (Hopkins II and 342-344).



Fig. 7. *Loïe Fuller at the Folies-Bergère*, s.d.
Collection Vleeshuis/Letterenhuis Antwerpen

According to Richard and Marcia Current in *Goddess of Light* (1997), Fuller saw an illuminated fountain for the first time in the Grand Hotel on the eve of her Folies-Bergère debut. "There was a female figure in it, and it was lighted from below. The effect struck me at once. I said to my mother: 'I can use that in my dance'" (Current and Currant 96). Although the above-mentioned quote probably says more about the mythologizing of Loïe Fuller as a self-proclaimed *fee d'électricité* since the Paris Exposition of 1900 (Albright 90), the parallels between Fuller's serpentine or skirt dances and the luminous fountains are inevitable. Since her debut at the Folies-Bergère in 1892 in Paris (Albright 33), Fuller achieved international fame for her idiosyncratic interpretation of the popular but often considered to be vulgar skirt dances that made the moulin rouge an iconic place. By adding substantially more fabric to the width of the skirt and by introducing novel lighting effects, she created an innovative 'free' dance and conquered stages all over the world. At first, her spectacle was based on the effect of light on the movement of the brilliant white material itself and the billowing patterns she produced. Gradually more and more colour-wheels were added to the projection, similar to those used in the luminous fountains at the world exhibitions in Brussels and Prague.

Fuller was, just like the luminous fountain at the World Fair, a 'theatrical' promotor of science and technology. In her autobiography, Fuller presents herself primarily as a scientist with a great interest in chemistry, physics and biology. She consulted Thomas Edison, Pierre and Marie Curie on developments in electric lighting, phosphorescent salts and the use of radium on stage.¹⁴ Although the use of radium on stage could never be realised, it typified her search for continuous technological innovation. This constant search for innovation in lighting techniques and treatments of the canvases in which she was dressed, ensured that Fuller staged colour with remarkable intensity. This desire for innovation resulted in the creation of a theatre of her own at the world exhibition of Paris in 1900.

In addition, Fuller also performed experiments off stage, with light and coloured glass and with her own body as a scientific instrument to absorb and register the effects of pure colour. This is how she detected that yellow causes enervation and mauve engenders sleep (Trainor 103). In transferring this knowledge to the theatre, Fuller demonstrated that the use of coloured light in theatre was a synesthetic spectacle in which more than just one sense was stimulated. Consequently, Fuller's shows could be perceived as the performative counterpart of modernist painting. Like Fuller, modernist painters renounced pictorial illusion in favour of synaesthesia.

The synesthetic power of Fuller's dances was beautifully expressed in the poetic ode to Loïe Fuller by the symbolist Belgian poet, Georges Rodenbach. In this poem, Rodenbach depicts the synergy of colour with natural phenomena, of science and various sensory perceptions. Fuller's colourful experimental shows not only attracted the attention of poets and world-famous artists such as Toulouse-Lautrec, but also of men of science such as the famous astronomer Camille Flammarion, with whom Fuller shared the fascination for exploring the effects of coloured light on the natural world. Fuller's findings were also investigated by contemporaries such as the experimental psychologist Charles Féré who conducted medical experiments in Chromotherapy in 1895. This therapy claimed to cure madness by administering precise doses of coloured rays to mentally disturbed people (Trainor 109).

The interest of late nineteenth-century scientists and artists in colour and synaesthesia was an interplay between arts and science and encouraged both a scientific debate on colour as well as numerous Fuller imitators (Heard 3), preparing the audience for a radical new positioning of lights and their synesthetic effects on stage.

Conclusion: towards a new perception and scenography

Today, the luminous fountain is still in use in amusement parks such as De Efteling, where it constitutes the closing attraction after a long day of marvels in a fairy-tale world. However, traditional luminous fountains like Křížík's Luminous Fountain no longer attract the same number of spectators as they had done at the end of the nineteenth century. By then, their success was embedded in a rich discourse of scientific discoveries and technological progress, illustrating faith in 'a new world', rooted in modern experience with its taste for enchantment, science, technology and spectacle.

By exhibiting a synesthetic scenography, the luminous fountain, as well as Fuller's dances, symbolized a modern sensorium of synaesthesia. This modern sensorium initiated growing ambivalence towards the reign of ocular-centrism and, according to Martin Jay's "Scopic regimes of modernity," "the disincarnated Cartesian spectator" (Jay 8). Eventually, with innovators such as Appia and Craig, theatre lighting began to dominate in a more effective non-naturalistic stage picture (Jackson 6). With the breakthrough of switchboards or light organs in the first decades of the twentieth century, the amplification of light and the use of coloured light was simplified considerably.¹⁵ It is no coincidence that mainly optical lantern manufacturers began to commercialise both coloured lights and

associated control panels in the first half of the twentieth century.

We can conclude that the late-nineteenth-century luminous fountains and their scenography at exhibitions or on stage reflected a fundamental shift in perception, prepared by visual innovations in lecture halls, fairgrounds, theatre stages and world exhibitions. This shift was embedded in a change in perception where vision moved from an inflexible subject-object position of classical subjectivity towards embodied subjective vision. This shift reflected the evolutions in colour theories used during the nineteenth century and resulted in new scenographical choices. Classic pictorial illusion with central perspective and two-dimensional backdrops were exchanged for empty stages with coloured light and movement as the main décor, as already illustrated by the luminous fountains and Loïe Fuller.

La Loïe Fuller by Georges Rodenbach

Déchirant l'ombre, et brusque, elle est là: c'est l'aurore !

D'un mauve de prélude enflé jusqu'au lilas,

S'étant taillé des nuages en falbalas,

Elle se décolore, elle se recolore.

Alors c'est le miracle opéré comme un jeu :

Sa robe tout à coup est un pays de brume ;

C'est de l'alcool qui flambe et de l'encens qui fume ;

Sa robe est un bûcher de lys qui sont en feu ;

Dans ses chiffons en fleur du clair de lune infuse ;

Ensuite, il émane une fraîcheur d'écluse ;

Et, comme l'eau tombant qui s'engendre de soi,

Les gazes ont jailli par chutes graduées ;

Telle une cataracte aux liquides nuées !

Or, dans ces tourbillons, son corps s'est tenu coi :

Tour qui brûle, hissant des drapeaux d'incendie ;

Cep d'une vigne aux clairs tissus en espalier.

Un repos. De nouveau, voici qu'elle irradie !

Une chimie en fièvre a su multiplier

Ces jaunes en halos, ces affluents de rouge,

Que c'est presque un vitrail en fusion qui bouge,

Presque une éruption qui pavoise la nuit.

Or, comme le volcan contient toutes ses laves,

Il semble que ce soit d'elle qu'elle ait déduit

Ces rivières de feu qui la suivent, esclaves,
Onduleuses, sur elle, en forme de serpents
Arbre du Paradis où nos désirs rampants
Senlacent en serpents de couleurs qu'elle tresse !

Un repos. La voilà, prodige d'irréel,
Qui, pour se rassurer en émergeant du gouffre,
Toute s'est habillée avec de l'arc-en-ciel.
Seuls ses cheveux, un peu d'orage encor les souffre
Mais le jardin en fleur de sa robe est calmé ;
Sa robe est jardin exclusif d'azalées
Où, dans les plis qui sont de l'ombre en des allées,
Des papillons brodés mettent un temps de mai ;
Cependant qu'avec des envergures nouvelles,
Déployant ses tissus, soi-même se créant,
Elle aussi se transforme en papillon géant
Et n'est plus dans le soir qu'un rêve de deux ailes.

Un repos. Elle vient, les cheveux d'un vert roux
Influencés par ces nuances en démente
On dirait que le vent du large recommence ;
Car déjà parmi les étoffes en remous,
Son corps perd son sillage ; il fond en des volutes
Propice obscurité, qu'est-ce donc que tu blutes
Pour faire de sa robe un océan de feu.
Toute phosphorescente avec des pierreries ?
Brunehilde, c'est toi, reine des Walkyries,
Dont pour être l'élu chacun se rêve un dieu
Mais comment, plongeur ivre en route vers la perle,
Traverser tant de flots de satin embrasé,
Et toute cette robe en flamme qui déferle ?

C'est fini. Brusquement l'air est cicatrisé
De cette plaie en fleur dont il saigna. L'étreinte
De l'Infini ne nous dure qu'un court moment ;
Et l'ombre de la scène où la fresque fut peinte
Est noire comme notre âme, pensivement.

Acknowledgements

This work was supported by the Research Foundation – Flanders - FWO (B-magic project) under Grant of Excellence of Science (EOS) project number 30802346.

Works Cited

Albright, Ann Cooper. *Traces of Light, Absence and Presence in the Work of Loïe Fuller*. Middletown: Wesleyan University Press, 2007.

Alglave, Em & J. Boulard. *La Lumière Electrique. Son histoire, sa production et son emploi*. Paris: Librairie de Firmin-Didot et Cie, 1882.

Current, Richard and Marcia Ewing Current, *Loïe Fuller: Goddess of Light*. Boston: North-eastern University Press, 1997.

Exposition Universelle 1889 Paris, *l'Exposition Universelle. Causeries Scientifiques, découvertes et inventions, progrès de la science et de l'industrie. Vingt-neuvième année, l'exposition universelle*. Paris: J. Rothschild, 1890.

Bergman, Gösta M. *Lighting in the Theatre*, Uppsala: Almqvist & Wiksell, 1977.

Blalock, Thomas J. "Stage Lighting Control Before Computer." *Theatre Design and Technology* (Spring 2008): 16-23.

Česálková, Lucie & Kateřina Svatoňová (2012) "Between painting and illusion: [Im]material imagery of Czech modernity." *Early Popular Visual Culture* 10:4 (2010): 383-406.

Chadwick, W.J. *The Magic Lantern Manual*. London: Frederick Warne & Co, 1878.

Crary, Jonathan. *Suspensions of Perception: Attention, Spectacle, and Modern Culture*. Cambridge/Massachusetts: MIT Press, 1999.

Duboscq, Jules. *Catalogue des appareils employés pour la production des phénomènes physiques au théâtre*. Paris: J. Duboscq, 1877.

Emeljanow, Victor. "Erasing the Spectator: Observations on Nineteenth Century Lighting." *Theatre History Studies* 18 (1998): 107-116.

Essig, Linda. "A Primer for the History of Stage Lighting." *Theatre Design & Technology*, (Spring 2016): 10-23

Hecht, Jeff. *City of Light: The Story of Fiber Optics*, New York: Oxford University Press, 1999.

Heard, Mervyn. "Pose Slides: The Sellers-Ray Collection," *The Magic Lantern*, 4 (2015). 1-6.

Hopkins, Albert A. *Magic. Stage Illusions and Scientific Diversions*, London: Sampson Low, Marston and Company, 1897.

Huard, C.L. (ed.) *Livre d'Or de l'Exposition*. Paris: Boulanger, 1899.

Howells, Bernard. "The Problem with Colour: Three Theorists; Goethe, Schopenhauer, Chevreul." In: Peter Collier and Robert Lethbridge, *Artistic Relations*, New Haven: Yale University Press, 1994, 76-93.

Jackson, Barry. "Diaghilev: Lighting Designer," *Dance Chronicle*, 14:1 (1991): 1-35.

Martin, Jay. "Scopic Regimes of Modernity" In: Hal Foster (ed.), *Vision and Visuality*, Seattle: Bay Press, 1988. 3-23.

Kessler, Frank. Dossier. "La féerie: un spectacle paradoxal" in: Andreas Gelz & Christian Papilloud, *Lendemains, La féerie autour de 1900 – une figure de la modernité?* *BD* 38:152 (2013): 71-80.

Kessler, Frank and Sabine Lenk. "Georges Méliès et la série Culturelle de la féerie" in: André Goudreaux and Laurent Forestier (eds.), *Méliès, Carrefour des Attractions. Suivi de Correspondance de Georges Méliès (1904-1937)*. Rennes: Presses universitaires de Rennes. 117-127.

Lefèvre, Henri. *L'électricité au théâtre*, Paris: A. Gelot, 1894

Manoni, Laurent. *The Great Art of Light and Shadow: Archaeology of the Cinema*. Exeter, Exeter University Press, 2000.

Massiot, G. *Les Projections Scientifiques et Amusantes*. Paris: Gauthier-Villars, 1907.

Barbara L. Miller, "'He' Had me at Blue: Color Theory and Visual Art" *Leonardo*, 47:5 (2014): 460-465.

Moigno, Abbé. *L'Art des Projections*, Paris: Gauthier-Villars, 1872.

Moynet, George. *La Machinerie Théâtrale. Trucs et Décors. Explication raisonnée de tous les moyens employés pour produire les illusions théâtrales*, Paris: La Librairie Illustrée, 1893.

Rees, Terence. *Theatre lighting in the age of gas*. London: Society for Theatre Research, 1978.

Robinson, David. Stephen Herbert and Richard Crangle (eds.), *Encyclopaedia of the magic lantern*. London: Magic Lantern Society, 2001.

Schivelbusch, Wolfgang. Angela Davies (transl.), *Disenchanted Night. The Industrialization of Light in the Nineteenth Century*. Berkeley/Los Angeles/London: University of California Press, 1988.

Trainor, Sebastian. "Loïe Fuller's 'Orgy of Color': Modernity, Eternity and the Folies-Bergère" In: Paul Fryer (ed.), *Women in the Arts in the Belle Epoque: Essays on Influential Artists, Writers and Performers*, Jefferson & London: McFarland and Cie, 2012, 97-117.

Yumibe, Joshua. "On the education of the senses: synaesthetic perception from the 'democratic art' of chromolithography to modernism" *New Review of Film and Television Studies* 7:3 (2009): 257-274.

¹ <https://www.krizikovafontana.cz/en>. Last consultation, 19 July 2019.

² *Národní listy*, 29 May 1891 supplement, 2 in: Česálková & Svatoňová, 392.

³ http://www.travel.cz/guide/597/index_en.html. Last consultation, 29 October 2019.

⁴ https://www.tripadvisor.com/ShowUserReviews-g274707-d1118764-r314207469-Krizik_Fountain-Prague_Bohemia.html. Last consultation, 20 September 2019.

⁵ Gösta M. Bergman's *Lighting in the Theatre* (Uppsala, Almqvist & Wiksell, 1977) is still a key reference work in the history of stage lighting. Others are Henri Lefèvre, *L'électricité au théâtre*, Paris: A. Gelot, 1894; Terence Rees, *Theatre lighting in the age of gas*, London: Society for Theatre Research, 1978; Linda Essig, "A Primer for the History of Stage Lighting" *Theatre Design & Technology*, (Spring 2016): 10-23; Victor Emeljanow, "Erasing the Spectator: Observations on Nineteenth Century Lighting" *Theatre History Studies* 18 (1998): 107-116; Not restricted to stage lighting but interesting regarding the discourse of light in the nineteenth century: Wolfgang Schivelbusch, *Disenchanted Night. The Industrialization of Light in the Nineteenth Century*. Angela Davies (transl.) (Berkeley/Los Angeles/London: University of California Press, 1988).

⁶ The following essays provide more background on the perception of ‘instability’ of color in art history and philosophy: Bernard Howells, “The Problem with Colour: Three Theorists; Goethe, Schopenhauer, Chevreul.” In: Peter Collier and Robert Lethbridge, *Artistic Relations*, New Haven: Yale University Press, 1994, 76-93; Barbara L. Miller, “He’ Had me at Blue: Color Theory and Visual Art” *Leonardo*, 47 nr. 5 (2014): 460-465; Joshua Yumibe, “On the education of the senses: synaesthetic perception from the ‘democratic art’ of chromolithography to modernism” *New Review of Film and Television Studies*, 7 nr. 3 (2009): 257-274.

⁷ “Les Dessous de l’Exposition” in: *Petit Bleu de l’Exposition*, 12 May, 1897.

⁸ “Les Dessous de l’Exposition” in: *Petit Bleu de l’Exposition*, 12 May, 1897.

⁹ *La Meuse*, 11 June 1884, *L’Indépendance Belge*, 28 February 1897, *Le Soir*, 6 August 1888, *Le Patriote*, 2 September 1897, *La Réforme: Organe de la Démocratie Libérale*, 4 February, 1893, *La Réforme: Organe de la Démocratie Libérale*, 13 September 1897, *Le Soir*, 4 August, 1890; *Le Soir*, 16 August, 1888; *La Meuse*, 2 March, 1895; *La Meuse*, 29 October, 1889 et cetera.

¹⁰ *Nieuwe Rotterdamsche courant : staats-, handels-, nieuws- en advertentieblad*, 10 August, 1867.

¹¹ *Le Grand écho du Nord de la France*, 14 december 1890.

¹² A good overview of these *phénomènes physiques* and their technicality can be read in the following publication: Em. Alglave & J. Boulard, *La Lumière Electrique. Son histoire, sa production et son employ*. Paris: Librairie de Firmin-Didot et Cie, 1882, 417-428.

¹³ Jules Duboscq, *Catalogue des appareils employés pour la production des phénomènes physiques au théâtre*. Paris: J. Duboscq, 1877.

¹⁴ <https://www.nypl.org/blog/2012/04/03/150-years-loie-fuller-modern-dance-pioneer>. Last consultation: 29 October 2019.

¹⁵ Essig, “A Primer for the History of Stage Lighting,” 17 - 18. For more information on light organs, see: Thomas J. Blalock, “Stage Lighting Control Before Computer,” *Theatre Design and Technology* (Spring 2008), 16-23.