LAYERED LIGHT - exploring dynamic light patterns with textile as medium

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1 Abstract

1.1 Images
1.2 Abstract

Layered light is a textile design project aiming to explore light as a design variable and its abilities to - in combination with layers of laser cut textiles - create dynamic patterns. The reason being to explore how light can be used to create the very pattern itself and what the textile quality can bring to the expression. Through a practice based working method, laser cutting has been used to manipulate different textile materials, that in combination with movement have resulted in range of design examples displaying various effects of the technique. Three of the found effects have been used to take forth a collection of patterns drawing inspiration from the elusive beauty of light in nature. One of which has been produced in a larger scale, exemplifying how the expression could be used in a spacial context. The result implicates the usefulness of integrating light early on in a design process and how textile and light can be combined to enhance each other all well as displaying a whole new expression for laser cut textiles.

1.3 Keywords

Dynamic pattern, textile, design, light, layers, textile embellishment, laser cut, movement
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2 Introduction, motive and aim

2.1 Introduction to the field

*Light as a design variable in art, design and architecture*

Light has an extraordinary impact on human beings. It has an undeniable presence in much that we humans find beautiful or emotional. A lot of art throughout history has revolved around trying to catch the beauty, the essence of natural light - be it the Dutch Baroque painters’ obsession with light and shadow or the Impressionist strive to catch the play of light with their brushes (Honour & Fleming 2009).

Light also plays a significant role in architecture. It is sometimes used to create decorative patterns. One example is the artist Chris Ofili who, in cooperation with architect David Adjaye, worked with patterned glass in the Stephen Lawrence Centre that, by the means of the outdoor sun, projects dynamic patterns on the interior walls (Spankie 2009). (Figure 1)

Another example of how light can be used to enhance a space is Olafur Eliasson (2015), an artist who is known for his spacial installations where light is constantly present. His work often includes a combination of light, space and movement where the visitor is rarely just a beholder but is instead surrounded by the work, experiencing it rather than just watching it. This is often done by bringing nature into a room through extorting it or amplifying it. An example of this is his installation *Beaut* where light interacts with water, creating a spectrum of colours. (Figure 2)

*Paper cutting*

The art of paper cutting has a long history with the earliest examples being found in China over 1500 years ago. While the original Chinese cutouts are decorative 2-dimensional ones, the craft has evolved and today it is spread all over the world and also includes 3-dimensional means of using the material such as the Japanese origami or artist Mia Pearlman, who works with paper.
cutting in a 3-dimensional, spacial context. With her space specific paper installations she uses white papers qualities to create swirling landscapes with warm and cold light adding depth to the pieces. (Heyenga 2011) (figure 3)

Laser cutting
Today laser cutting offers new possibilities of cutting, the technique does not only cut paper but also other materials such as plexiglas or textile.

Tord Bontje (2015) is one designer that has seized the opportunities that the laser cutting technique has brought and uses it to cut in everything from textile to metal to create furniture, lamps and interior textiles. His floral motives brings to mind traditional paper cutting motives and he often uses 2-dimensional cut shapes in layers to create shadow effects as in his lamp Midsummer (see figure 4).

Textile and light
Within the field of interior design, light has a long history of being combined with textile. Lamp shades and curtains has been used to filter, spread or close out light in our homes for or centuries.

A company today that integrates light in a spacial context is the Dutch technical company Philips (2015). Their soft cell kvadrats gives the possibility of bringing dynamic light pattern into a space, by playing with colour, texture, light and movement. In addition to this being an example on how light can affect textile, it is also an excellent example on how textile affects light. Textile in this case collects and smoothes out the light as well as making it tangible, even giving it texture. (figure 5)
2.2 Motive and Idea discussion

Where Philips uses textile to enhance light and uses artificial light to create dynamic patterns, Akane Moriyama (2015), Swedish-Japanese textile designer and architect, uses natural light when introducing textile to interior environments. She often takes advantage of the textiles being see-through and of their movement, and uses these qualities to capture the beauty of natural light. Her work often exists in a grey-zone between architecture and textile design. One example being her Blue Bricks (figure 6 & 7), a wall made from see-through textile bricks that challenge our preconceived thoughts on what a wall can be as well as showing how textile and light can enhance each other in a spacial context.

Petra Blaisse (2010)(2007) shows further examples on how light and textile interact within modern interior design. In many of her designs, textile acts as a director of light. By working with reflective materials or consciously positioned holes in blackout materials, she uses textile to reposition light - as a mirror, a projector, or a canvas where light is projected upon. The light is in the hands of the textile which is blocking out, letting through or reflecting it. Examples of this are her light and space regulating curtains in Villa Watté, Leefdaal, Belgium or her synagogue project in Amsterdam. (figure 8 & 9)

**Dynamic pattern**

The term dynamic textile pattern refers to a textile pattern that possess the quality of changing between two or several expressions during its use. This differs from a static textile pattern which is designed to keep the same expression (form, colour, structure-wise) during its entire calculated lifetime. (Worbin 2010, p. 28)
2.3 Aim

This project aims to explore light as a design variable within the field of textile design; thus, how light and cutting techniques such as laser cutting in combination with layered textile can combine to create dynamic patterns.

Gap

The projects mentioned above presents certain approaches to light as a design variable within the field of textile design, all of which are relevant to the degree project presented here. They do not, however, consider the role of light as creating the very pattern itself by the means of a manipulated fabric, but merely as enhancing the textile in question. Light as a creator of pattern is something that can be found in architecture as in the example of Chris Ofili’s work (Spankie 2009). This project thus positions itself in the gap between the architectural way of using light to create dynamic pattern images and the many qualities textile possesses to manipulate and enhance the effects of light.
3 Method and development

3.1 Design method & design of experiment

Jones (1992) states that any design process consist more or less of three stages: divergence, transformation and convergence. He describes the different phases as ”... ’breaking down the problem into pieces’, ’putting the pieces together in a new way’ and ’testing to discover the consequences of putting the new arrangement into practice’”. Designing does not necessarily follow the straight sequence described but may very well cycle the three stages several times, each time more detailed than before.

The phase of divergence is about opening up the search. This is where the boundaries are still undefined and where evaluation is postponed. The aim of the phase is to widen the designers perspective to help avoid presumptions and to collect all information that might be of use. Transformation is the stage where the brief is set, critical variables are defined and where boundaries are identified. It is where identification of what is relevant and what can be discarded is done. It is a phase of experimentation, where sketching and thinking is not enough but where different alternatives must be tested. Convergence is about reducing the options and deciding on a final design. (Jones 1992, pp. 61-73)

The method for this study can be divided as follows:
Divergence
- Analysis of pre-study
- Research - What have been done on the subject in the field of textile design?
  - In other design areas?
Transformation
- Set variables - What are the boundaries? What variables should be further explored and which ones should be discarded?
- Material exploration
- Concept exploration
- Pattern exploration
Convergence
- Evaluation of design examples
- Development of design examples
- Making of final design
- Production

Delimitations
The finished piece was to be a prototype and aspects such as flameproofness and durability was therefore not taken into account.ändra. The project was foremost to be a material exploration and that given focus excludes making it space-specific or directing it towards a specific target group.
**Pre-study**

The foundation of this project derives from a pre-study examining light in combination with various sketching techniques working in paper. After an inventory of the samples made, it was decided that a two-dimensional multilayered sketching technique was the one responding the best to light interaction and that it would be further explored. Working in layers meant light could be manipulated by either extracting material in one or several layers or by adding material. Distance between layers, quality of the paper and light direction and intensity were found to be four key variables. (figure 10 & 11)
3.2 Developments & Design rationale

*Inspiration*
To have a starting point in the sketching-process, six mood boards were made that would be used to develop one pattern each. Since the foundation of this project is a wish to bring the experience of natural light inside, different natural light phenomenas was used for each of the six mood boards. The six themes were: *Norrsken* (northern light), *Nysnö* (new snow), *Spindelväv* (spiderweb), *Dimma* (mist), *Sjödis* (mist and water reflections) and *Bokskog* (beech forest). Images and key words were added to the moodboards. (see figure 12)
Scaling up
After the pre-study, further exploration in paper continued. This time in form of scaling up to A3 format and varying thickness of paper, cut out patterns and distance in between the different layers. The reason for choosing to work with paper in this stage was that fast pattern sketches could be done by using scissor, needle or knife - something that was not possible in textile. Thus giving an idea of what kind of patterns would be interesting to explore further in the more time consuming technique required for textile. (figure 13-19)
Translating into textile

The aspects found most interesting in the paper research was now to be translated into textile in order to explore what textile qualities - such as movement, drape and texture - could bring to the expression.

Different qualities of fabric were chosen to be used in further exploration (figure 20). Level of translucency, behaviour of movement and texture were qualities that were taken into consideration in the selection. Fabrics having a close resemblance to paper, as well as fabrics that had qualities such as paper lacked (such as texture or movement) were picked. The exploration was done as before by layering textile with scissor cut patterns and lightning it from behind. (figure 21-31)

Five aspects were found that affected the outcome.
- Light (direction, brightness, hue)
- Material
- In which order the fabric hanged (what pattern is on what layer? How translucent is each layer?)
- Distance between fabrics (is the projected pattern in focus or out of focus?)

It was discovered that 3 - 4 layers of textile were the ideal amount as it created a layered effect without blocking out to much light.

Found effects

Three categories of effects were discoverd; glitter, depth and projection. Glitter was created by having small holes in the middle or front layer. The effect occured either as the observer moved along the textile or by moving the middle or back layer in any direction. This effect is best viewed in figure 22. By having the layer furthest in the back be a dens fabric (e.g. a dim-out fabric) with holes in, it could make light projections on the middle and front layer as seen in all examples, figure 29 being the best example. When having semi-sheer fabric (e.g. Glacier Satin Polyester) in all layers a misty effect with a feeling of depth emerged as seen in figure 24.
Figure 21-30. Tests in textile
**Other means of blocking out light**

After this concluded that further explorations on how light can be shut out or let through needed to be done. An idea emerged that print could be used to block out light. Two different sketches were printed onto transparent polyester to see if patterns with high contrast in light and dark areas would give an effect. (figure 31-32) The wanted result was not reached. Instead of directing the light, the printed pattern took away focus from the light pattern and it was decided that further experimentation with printed patterns would be excluded.

*Figure 31 & 32. Test to see if transferprint can be used to block out light.*
**Pattern**

The key to the expressions laid - above all - in the combination between layers. That is, what material is combined with what pattern, in which order do they lay and what is the distance between each layer? The variation of size of the holes creating the pattern gave - due to the variable of light - very different expressions. Even more so than a difference in scale would do in a traditional printed pattern. The exploration of pattern was therefore to be focused on exploring a few selected patterns and the combination between these rather than creating a wide range of patterns. In the earlier stages of exploration the sizes of holes in relation to material and order were explored. The focus here did not lay on creating a final pattern but rather on finding out what effects could be achieved by varying the scale of the pattern, the order of layers and the material.

From making an evaluation of the handmade samples done in this early stage, four themes from the moodboard were chose as a base to make laser-cuts; Nysnö, Norrsken, Sjödis and Bokskog. Each inspiration was matched with one of the discovered effects. It was decided for example, that Nysnö would consist of small holes in the second layer (in order to create a glittering effect) and larger holes in the back layer (in order to create a blurred overall pattern image to illustrate soft shadows - which was one of the keywords from the moodboard). In Bokskog there was no need for a glittering effect, but rather a feeling of depth with glimpses of bright light (resembling the sun) - meaning big holes in both the back layer and the middle layer, which needed to overlap. Knowing these factors, the sketching for the patterns could take place. This was done by once again looking at the keywords and images from the original moodboards. After making some trial sketches using different painting and drawing techniques, it became clear that returning to the sketching technique used in the pre-study was the best way to go. (figure 33-34) Sketching by making holes in a pattern had several advantages one being the traces of the hand bringing the pattern more life that a sketch done in illustrator would. Another was that, by making holes rather than using a pen or pencil, it came clear directly which patterns would make a durable construction and which would weaken the fabric too much and make it sag. After making the sketches and transferring them to illustrator the patterns were laser cut in several different materials. These samples were again tested in different combinations, with different light, movement, order and direction. Some of the patterns were developed and laser cut once more. This could be done due to different reasons. It could be that a very sheer fabric needed smaller holes in order not to sag or that a pattern needed bigger holes to let more light through.
**Trying out colour**

In the beginning of the exploration all samples had been made in white. Try-outs in colour also needed to be made to see if the expression would benefit from this. Four ways of introducing colour was attempted. Coloured light, space dye, digital print and transfer print. The coloured light gave a flat result with too vivid colour in comparison with the wanted tranquil expression. The space dye gave a better result due to a more varied colour spread, but still it did not bring anything to the expression. The best result was found in a transfer printed water colour sketch that had a varied but mild expression. (figure 35-43) However, in comparison, the white samples were still at advantage due to the fact that they displayed the pattern of light better than any of the coloured samples.
Spacial context
After working in the material and exploring layering, light and movement by itself, it was time to evaluate how the findings could be used in a spacial context. A range of variables were written down; embellishment, functional, small, medium, big, one or several. Should the piece be towards a specific space or something that would later be tried out in several spaces? Should the light source be artificial light or natural light? Should the piece be interactive? Out of this a set of suggestions on how the finding could be presented in a space were developed. (figure 46 & 47)
Choosing light

Through a cooperation with company Elkedjan a range of different lamps were tested. (Figure 48-54) The lamps varied in both hue and brightness - the brightness stretching from 800 - 4500 lumen (correspondent to an incandescent light bulb of 60 W- 300 W). In a dark room, all levels of brightness gave a desirable effect but in a lit room the pattern effect was too vague when using a lamp with low brightness (e.g. correspondent to an incandescent light bulb of 60 W) which lead to the conclusion that the bulb needed to be of a brightness of 1600 lummen or higher. Since coloured light had already been excluded, the search now stood between warm and cold white light. After trying both in relation to the different patterns it was clear that they both served a purpose, the colour of light was therefore to be chosen specifically as to which suited the inspiration for each pattern the best. The result was cold light for Nysnö, Sjödis and Norrsken and warm light for Bokskog.)
Figure 52. Cold light

Figure 53. Warm light

Figure 54. Warm and cold light
Scaling up once more

Working in A3 had been a good method of exploring different means of achieving various light effects and trying out pattern images. The final piece however, needed to be of a bigger size. This was due to a wish for the viewer to be more than a viewer, to be experiencing rather than observing the piece. A smaller scale means that the viewer is distanced from the object and therefore becomes an observer, where as if the scale is closer to that of the body, this makes the viewer a part of the piece, thus experiencing it rather than merely observing it. Since the fabric is weakened by holes, the cut-outs making out the pattern could not be endlessly enlarged. The play of the light also changes as the size of the holes do. Changing scale does therefore not necessarily mean enlarging the pattern image, but rather working with placement on a bigger format. Tests were made with two of the patterns (Norrsken and Nynö). Scaling up the overall pattern but keeping the components (cuts) small was successful.

(figure 55-56)

![Figure 55. Norrsken](image)

![Figure 56. Nynö](image)
Setting the collection
A final exploration of each pattern was made to fix the variables for each one (figure 57-65), thus the final selection of material, pattern, light, distance, order and movement were set. This was done by returning to the moodboards and weighing the decisions towards images and keywords, yet also keeping in mind a desire to have as broad a spectra of expressions as possible. After some consideration Norrsken was excluded from the collection as it had an effect close to that of Sjödis - only inferior.

One of the patterns was chosen to be produced in a larger scale, Nysnö. It was chosen because it displayed several of the found effects. This meant it had the ability of showing a varied pattern, which was desirable when on a larger surface.

Figure 57-65. An assortment of samples from the exploration to find the final expressions for Nysnö, Bokskog and Sjödis
Adding movement
As stated in the introduction, the definition of a dynamic pattern is a pattern that is not static, thus movement or change needed to be introduced to the patterns. After a brainstorming over what movement or change could be, it was concluded that there were two main directions that could be taken. The first was through the light, by either having it move or using a dimmer for the artificial lights or by its natural change during the day if using natural light. The other way was by introducing motion in the textiles themselves, which could be done either as an indirect motion (natural such as the wind or as a byproduct of function such as a door closing or people moving) or as a direct motion (such as a fan or a motor). (figure 66)

Through experimentations it had been made clear that the light source needed to give an effect of such brightness that bright sunlight would be necessary to achieve this. Since natural light is impossible to control and to be able to ensure that the effect would be visible when exhibited - artificial light was chosen. After trying out the difference between having the light source move or dim and having the textiles move, it was concluded that having the textile move gave a much stronger dynamic expression as it enabled the pattern to actually change rather than just move or dim.

As for the natural motion vs. the artificial motion - throughout the exploration movement had been added manually to test different ways of moving the layers and it had been found that the speed of the movement played a significant role for the expression. This led to the elimination of any natural movement which, as natural light, would be impossible to control. What was left was then the artificial movement, which could either be done by fan or by motor. After trying both separately, a combination was decided upon - a fan moving by the aid of a motor. This gave a pulsating, seemingly coincidental movement unlike the more static movements made from using just one of the two. This corresponded well with the pattern that was chosen to be produced in larger scale.

Figure 66. From sketch book
**Working in a model**

In order to decide the form of the final piece, a model was built to explore the shape and size in relation to body and space. The model was built after the room in the Textile museum were the exhibition of the degree work would later take place, but the tryouts were made with the thought in mind that the aim was not to make a place specific piece and that the piece would have to work in several places. (figure 67-72) After trying out different shapes and sizes in the model, two favourites were picked; the tall cylinder (figure 72) and the box (figure 71). They both interacted well with body and space in terms of scale and shape. These two then needed to be tried out in full scale and two mockups were built to see how the fabrics responded to the size and shape but also to be able to really experience the size in an actual room and in relation to body. Both worked well but, it was found, would be impossible to produce since they contained too big pieces of fabric which would not fit in the laser cutter. Scaling down the cylinder would mean losing spatiality but the box could go down in size without doing so. Thus, the box was picked for the final piece. (figure 68-69)

*Figure 67-72. Test in model scale 1:20*
Figure 68. Mockup of corner of box scale 1:1

Figure 69. Mockup of circle displaying half of its length in scale 1:1
4. Result, presentation, conclusions and discussion

4.1 Result

The result consist in both a physical result - where several design examples are presented - and in knowledge of how light, layers and movement interact and can be combined to create dynamic patterns. The knowledge includes how variables (such as brightness of light, material or number of layers) can be combined to create various effects. Three different effects were found during the exploration; glitter, projection and depth. These were used to take forth a collection of three dynamic patterns, one which was produced in full scale and two shown as smaller examples. (figure 70, 71 & 72)
4.1 Result

Bokskog (figure 73 & 74) Smaller example
Back layer: Dim-out fabric (unknown synthetic fibre), big cut-outs
Middle layer: Glacier Satin Polyester, big sized cut-outs
Front layer: Silk crêpe de chine, untreated
Distance between Layers: approximately 2 cm
Movement: back and forth
Light: Warm, approximately 4500 lumen
Effect: Focus on projection
4.1 Result

Nysnö (figure 75-76) Produced in full scale
Back layer: Dim-out fabric (unknown synthetic fibre), medium sized cut-outs
Middle layer: Glacier Satin Polyester, small sized cut-outs
Front layer: Fine Silk, untreated
Distance between Layers: approximately 2 cm in back, 5 cm in front
Movement: back and forth
Light: Cold, approximately 1600 lummen
Effect: Glitter, projection

Figure 75. Technical sketch, Nysnö
Figure 76. Nysnö, detail
4.1 Result

*Sjödis (figure 77-78) Smaller example*
Back layer: Glacier Satin Polyester, big cut-outs
Middle layer: Glacier Satin Polyester, big cut-outs
Front layer: Silk crêpe de chine, untreated
Distance between Layers: approximately 2 cm
Movement: up and down or from side to side
Light: Cold, approximately 1600 lumen
Effect: Focus on depth
4.2 Presentation

Because the result is twofold - one side being the exemplifications and knowledge of how layers, material, light and movement can be combined to create different effects and the other being the purely aesthetic and expressive properties in the three design examples presented - it is important to display both parts. The project will be exhibited in two contexts one being as a bachelor degree project and the other at an exhibition, thus the focus of these two will be somewhat different. The focus on the examination should lay heavier on material exploration (of course without excluding the expressive properties). Here the work thus needs a background explanation which will be through a presentation. At the exhibition the focus will lie mainly on the expressive properties (of course without excluding the material exploration).

The result is presented as a collection of three design examples displaying a range of expressions that can be found when using the same variables. By showing a range of examples made with the same variables, the variables are accentuated and the many possibilities and expressions that can be found within the parameters are made visible.

The three design examples are - due to their qualities of depth, use of light and movement - best presented in themselves and not represented by photographs. A film or a demonstration of the movement will be necessary in order to show the dynamic aspects of the patterns. The larger piece puts the work in a spacial context and implicates how the findings could be used or commercialised.
4.3 Conclusion and discussion

The aim of this project has been to explore light as a design variable, that is to have light as an integrated part of a material exploration and having the light create the pattern itself rather than it being something added to a finished result. In the quest of doing this, light, laser cutting, movement and layered textiles have been used to create dynamic pattern images. During the exploration the conclusion has been reached that there are five key variables that affect the outcome or even the very occurrence of a dynamic pattern in layered textile - movement, light, material, order & distance. Light and movement are the two most important as they determine whether a dynamic pattern appear or not. Without movement the pattern becomes static and without light (or with too little light) there is no projection on the front layers rendering in a flat or a non-existing expression. Order and material are two sides of the same coin as the two variables interact with each other. The same three layers that work in one order does not necessarily - in fact, most certainly do not - work in another order. The best effect was achieved with a layer that had low translucency in the back and one with higher translucency in the two front layers. Distance between layers did not affect whether a dynamic pattern would occur but did however make a big difference to the expression.

The work presents a range of expressions and - being foremost a material exploration - does not point out to a particular use. The possibilities of the expression are however plentiful. One of the design examples from the result is exhibited as an embellishment, which is one area of application. Its size implicates it would be used for a public space, might it be a library or a City hall. The use could also be functional. Thoughts on other areas of applications could be a curtain for a theatre stage, a backdrop for a theatre stage or to be used in hospitals as bed curtain dividers that would - except for giving the patient privacy - also work as a piece of art displaying a beautiful play of light bringing thoughts to nature. The expressions could also be used in more private spaces as smaller pieces of art, lampshades or multilayered curtains that could block out more or less light depending on how many layers that were used. Early in the project the question of what a movement could be was raised. Could the movement for example be a byproduct of function (e.g. sliding doors)? The question was left unanswered in this project but would be interesting to explore further. Akane Moriyama (2015) who is mentioned in the introduction often combines textile and architecture. Her work also gives implication on further use for the found expression. In her way of working she often challenges what textile can be used for by applying textile to otherwise architectural elements. In line with Moriyamas way of working, I too see applications in architecture for the design examples presented in the result - maybe as walls or as multi-layered sunroofs?

It was found in the study that textile responds differently to light than sketching material; paper. Paper, being denser in construction, was able to project light onto the next layer even when being really sheer and see-through - whereas projection only occurred in the textile examples when a less see-through textile was used. If the study had included material development, developing superdense but see-through fabric could have lead to new interesting expressions with closer resemblance to paper.

Throughout the exploration, focus has not been on sustainability but solely on expression. The aim has been to investigate the possibilities of creating dynamic patterns by means of lighting, laser cutting and layering fabrics. Thus the result is seen as a set of examples and one prototype. This opens up the possibilities for a discussion of how the expressions found could be reproduced in a more sustainable fashion. The design examples presented in the result are namely all dependent on electricity to create the dynamic patterns. The movement is caused by a fan and a motor, the light source is a strong voltage lamp and the technique (laser cutting) in which the design examples have been produced is high on energy consumption. Improvements in terms...
of sustainability can thus be made by looking over other means of creating movement, light and cuts. Looking into the possibility of having the pattern being punched rather than laser cut could be one way of improving sustainability. As discussed earlier, movement and light could very well be indirect as in the example of Chris Ofili and David Adjaye (Spankie 2009) - who used the sun to create a pattern on a wall. This would result in dynamic patterns - although dynamic patterns with a slower cycle of transformation than of this projects design examples. Having a slower cycle presents both benefits and drawbacks. For a viewer only passing by the embellishment once it may appear static, however if the embellishment would be placed somewhere where people pass daily or several times a day (e.g. and office or a train station) the effect would be visible. While Ofilis and Adjayas example is dependent on a window there are ways to introduce light into a dark space as well. An embellishment like the one presented in the result could be used to distribute the light from a light tunnel directing the light from the roof down into the building. Using natural light could also be a health aspect as natural light has benefits for human health and wellbeing that artificial light commonly do not. This due to it including the whole wavelength spectrum as well as its constant changes in intensity. (Jansen 2009). It is therefor not enough to merely imitate natural light phenomena to invoke all of the same effects in us humans as natural light provides. While the wavelength spectrum is hard to imitate, the changeable aspects in intensity could probably aid wellbeing.

The project is not done by a technician or by a light designer and so it has been a difficult balance act between integrating these two variables in a relevant way and still realising my own limitations within these fields. With that said, it has not only been about realising my own limitations but also about figuring out what competences I as a textile designer have to bring to the project. As a textile designer my competence lays on material knowledge and on pattern knowledge. The focus has therefor laid foremost on exploring these two. Light and movement exploration has been important but been done with the limitations that comes from not being a light designer or a technician.

To conclude, a lot could still be developed in terms of light and movement. For further research it would thus be interesting if a collaboration could be done with a lightning designer and a technician that would bring the competence of controlling movement into a similar project. If these three competences were combined I believe something really extraordinary could occur.

The chosen method has worked well for the project. By laying a foundational research in the first step it was easier to define an interesting track to continue on and which aspects were relevant the project. A practice based working method has been crucial to the outcome. There is no way of predicting how light and movement will affect a pattern or a chosen material combination. Introducing light and movement as factors in the very beginning is thus what has made the given result possible. The work in this way exemplifies the benefit of adding light as a design variable early on in a design process. The result furthermore challenges the traditional expression of laser cut textiles. Bontje (2015) who is mentioned in the introduction is a good example of how laser cut textile patterns usually appear with their sharp edges and their floral or geometrical motives. The combination between layers and light has allowed an expression with depth and a variation in shades, thus displaying a whole new expression for laser cut textiles.
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Thanks to...

Anne Britt Torkildsby
Akane Moriyama
Elkedjan
David Mccallum
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