CONCEPTUALIZING THE AURORA: AN EXPLORATION OF PERFORMATIVE UNDERSTANDING THROUGH INTERACTIVE ART

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Abstract

Aurora – Connecting Senses is a multimodal, interactive art installation which explores the ideas of the Northern Lights through sound, light, colour, and interaction. The installation creates a space where the colours, magic, and mystique of the aurora are brought down to earth and into people's everyday lives. It is inspired by popular and scientific representations of the real aurora and invites audiences to create yet another interpretation of the natural wonder. In doing so, audiences are also invited to reflect upon the nature of the aurora and on the act of interpretation and exploration. In this article, we provide a thorough description of the ideas and development of the installation, along with photo and video documentation, and offer a critical discussion of the installation as a performative art piece with certain affordances for interaction, performativity, and active reflection. Our discussion is grounded in our observations of audiences engaging with the installation, aspiring to relate the theoretically available affordances for interaction with the differences in observed audience behaviour. The theme and reflective potential of the installation is further compared to other contemporary art pieces dealing with conceptualizations of nature or natural phenomena. By doing this, we aim to use the aurora installation as a stepping stone for addressing the potential of interactive art to highlight or even construct certain understandings of a natural 'reality' and for engaging audiences in a further negotiation of these understandings.

Keywords
Aurora; *Performativity*; *Performance*; *Interactivity*; *Interpretation*; *Transmediation*

Video illustrations of Aurora - Connecting Senses

Introduction

The aurora borealis, also known as the Northern Lights, is often described as an almost fantastical phenomenon. The aurora is a magical dancing of lights which for most people around the globe is only known through different means of representation, such as paintings, verbal descriptions, and photographs. Thus, for most people, the aurora exists as a 'network' of interpretative representations which are detached from the original natural phenomenon, and knowledge about the original, sensorial phenomenon is only obtained through these representations. As the historian Ulrike Spring says, referring to the aurora itself and paraphrasing Derrida, 'there is no presence behind representations, only the trace of one' (Spring 2016, 157).[1]

In this article, we explore the act of mediation and interpretation by taking a reflexive and critical look at our own interactive art installation *Aurora - Connecting Senses.* The installation is inspired by our observations of 'mainstream' mediated knowledge of the aurora, which we consider to be 'representations without presence'. As the primary author of this article is herself a Scandinavian, who has never seen the aurora, she found it fascinating, and somewhat paradoxical, how other people and media would talk about the phenomenon, assuming that they could get to see it more or less everywhere in Scandinavia, while also conceptualizing it as something almost mystical. Thus, the idea of making an art installation as an interpretation of the aurora solely based on 'mediated' knowledge rather than first-hand experience sprang from a fascination with this paradox, but also from the intriguing associations of mystique and beauty found in these representations.

The aurora installation originated as an art piece meant to provide an alternative, aesthetic, and sensorial experience at a popular-scientific event organised by the Linnaeus University Centre for Intermedial and Multimodal Studies (IMS). Since then, it has been set up and commissioned both for other events around Linnaeus University, and also for the international *Hämelinna Street Art Festival* in Finland.[2] With a foot in both the artistic and the academic world,[3] we, as artists and authors, originally intended the installation only to be an aesthetic and interactive exploration of the aurora. When offered the opportunity, however, we chose to take the installation a step further and use it as a stepping stone to discuss the potential of interactive art in highlighting an interpretative and constructivist form of understanding, hence this article.

Whether *Aurora – Connecting Senses* is an art piece or not is a matter of definitions. Given the context of its origin, it might be argued that the installation is not sufficiently anchored in an 'artworld' (cf. Dickie 2001) to pass within an institutional theory of art. *Aurora – Connecting Senses* is, however, created with an intention for it to be an aesthetic object for contemplation and reflection with no other function (the theoretical reflection being a later development), and the primary artist, Cristina Pop-Tiron, is trained as an artist. Both artists/authors are further trained in aesthetic theory. Another point to make is that in some strands of aesthetic theory, *aesthetic quality* is considered

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[1] Spring is referring to the aurora as a representation of a scientific principle, but the quote holds true for representations in general.

[2] As this exhibition of the installation came late in the writing of this article, the installation is not further discussed here.

[3] Cristina Pop-Tiron is currently undertaking a PhD project which involves an artistic approach and is trained as both an academic and an artist. Signe Kjaer Jensen is mainly trained as an academic, but also has practical training in soundscape composition.

independently of art institutions, in terms of whether or not an object works to prompt a 'dialogue' with its recipient and which

> creates a dialectical exchange between processes of immediate experience and processes of reflection in the recipients, and expands their sensuous, emotional and intellectual capacity to competently deal with modern life in all its complexity (Nielsen 2005, 65).

As we will argue in this article, we believe *Aurora – Connecting Senses* has this potential, but we cannot control whether or not individual audience members actually reach this level of reflection, just as one cannot force anybody to see Marcel Duchamp's *Fountain* (1917) as anything but a pissoir. Thus, whether or not *Aurora – Connecting Senses* is considered an actual 'artwork', we argue that it is at the very least an aesthetic object which should be evaluated in accordance with this broad definition of aesthetic quality.

As *Aurora – Connecting Senses* provides the foundations of our discussion, we provide a thorough description of the ideas and development of the installation, before offering a critical reflection on the installation as a performative art piece with certain affordances for interaction and interpretation. Our discussion is grounded in our observations of audiences, aspiring to relate the theoretically available affordances for interaction to the differences in observed audience behaviour. The installation is further compared to other contemporary art pieces dealing with conceptualizations[4] of nature or natural phenomena.

The aurora as a transmedial network of popular and scientific conceptualizations

The aurora is a phenomenon which has fascinated humankind throughout history. In the following, we wish to highlight a few illuminating examples of how the aurora has inspired similar interpretations in different contexts and through different types of media, but we do not aim to construct a thorough review of historical or modern mediations of the aurora, which would be beyond the scope of this article. Our aim here is to provide a rough sketch of how the aurora has been conceptualized as an aesthetic experience in Western culture, a conceptualization which in one way or another has influenced us in our own ideas of the aurora and accordingly in our artistic work.[5]

In folklore traditions, the aurora has often been understood in mythological terms as something related to fire, divine beings, or omens, such as the Nordic Valkyries,[6] Inuit ancestral spirits, heavenly reflections from bountiful sources of prey, or even as representations of celestial battles (Brekke and Egeland 1983, 1–6). These beings that have been associated with the aurora could either possess prophetic capabilities, or they were seen to somehow bridge the heavenly life of gods and departed ancestors with the

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[4] Conceptualization is here understood as forming ideas and knowledge about an object or phenomenon through mediation in general and not just through verbal and written language.

[5] For a more elaborated historical account of mythological, artistic, and scientific depictions and descriptions of the aurora in Scandinavia up until the twentieth century see Brekke and Egeland (1983).

[6] It is a common popular belief that Nordic mythology explained the Northern Lights as being light reflected on the shields of the Valkyries. This interpretation has been challenged by modern Edda scholars, but as a popular belief it still persists (Brekke and Egeland 1983, 113–16).

earthly mundane life, highlighting the aurora as something connected with fate, the supernatural, or the spiritual.

Scientific attempts to describe the aurora, on the other hand, can be dated back at least to Aristoteles (384-322 BCE), possibly with several ancient philosophical descriptions predating him (Brekke and Egeland 1983, 34–35), but still the ideas of a mystical aurora are seen to live on even through 19th century aurora research. Ulrike Spring thus locates a common trend in historical aurora representations of trying to balance the science of the phenomenon with the feelings of wonder, exemplifying her claims with discussions of descriptions and drawings made by members of Carl Weyprecht's 1872–1874 aurora expedition (Spring 2016, 141–43). She argues that scientific attempts to represent the aurora, before the invention of cinematographic tools, often relied on a 'subjective', artistic discourse through drawings, paintings, and even poetic descriptions. This in order to attempt to capture the *experience* of a phenomenon which for a long time seemed to defy rational explanations, and which was 'constantly counterbalancing attempts at scientific objectification and disenchantment' (Spring 2016, 142). By combining a scientific discourse of classification and objective description with visual and literary imagery, heavy on metaphors and similes, explorers and scientists tried to capture the aurora both as a fleeting *memory* of an *aesthetic* experience and as a representation of some hidden scientific principle, showcasing the aurora's double identity as both natural phenomenon and wonder (Spring 2016, 156).

Today we know what the aurora is. Science has taught us that the aurora is created by electrical particles from solar wind, which enter the earth's atmosphere and collide with gases. Particles from the gasses are energized and discharged from their molecules, and when they return to their stable state, they emit a photon of energy perceivable as a flash of light. The type of molecule making up the gas determines which colour is emitted from the meeting. Having this scientific explanation, which in itself constitutes a type of mediation of the aurora, one that focuses on the physical and chemical properties of the phenomenon, does not, however, make the aurora any less beautiful or awe-inspiring. Add to this that the aurora can normally only be observed close to the magnetic poles, at night in clear weather during winter, and the aurora becomes something 'exclusive', a natural wonder which people are willing to travel far to see.[7]

Even today, media representations still tend to conceptualize the aurora as something mythical associated with the far north – a land of fantasy and aesthetic beauty rather than a harsh Arctic. This can for example be seen when Disney lets waves of purple and green colours flow over the sky in the opening of *Frozen* (Buck and Lee 2014). Together with the Sámi-inspired opening song, the aurora is here used for setting the scene for a film about magic and beauty in the north. Björk's song 'Aurora' (Björk 2001) is a further example of mediating the phenomenon of the aurora by pointing to associations with the heavenly, magical north. In the song, Björk's voice is accompanied by a music box, a harp, and the sound of footsteps in the snow, while Björk sings about the 'Aurora / Goddess sparkle', thus linking the bell-like sound of the music box and harp (which is also a cultural symbol of the heavenly), the sound of snow, and the heavenly with the aurora through the musical piece.

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[7] Several recent articles and statistics document that 'aurora tourism', both in Europe and Canada, is a growing industry, and that the elusive lights are one of the main reasons for tourists from around the world to travel to the far north. See: Goverment of Northwest Territories: The Department of Industry (2018); Heimtun, Jóhannesson, and Tuulentie (2015); Heimtun and Lovelock (2017); Óladóttir (2018).

All of these different types of scientific and artistic descriptions and depictions of the aurora, which have only been briefly exemplified above, can be considered to form a *transmedial[8] network*. According to intermedial scholar Lars Elleström, the concept of *transmediation* should be used to signify the transfer of media characteristics (such as story content) from one type of medium (e.g. a book) to another (e.g. a film) (Elleström 2014, 25–26). Strictly speaking, the aurora phenomenon is not a mediation (at least not in the traditional sense where mediation is commonly understood to be man-made with an artistic or communicative purpose) and cannot therefore be the source medium of a transmediation. But what all the actual mediations of the aurora (drawings, verbal descriptions, video recordings, photographs) have in common is that they all attempt to transfer a selection of characteristics, either from the original aurora phenomenon or from already existing mediations, similarly to Lars Elleström's definition of transmediation. Furthermore, because none of these mediations exist in a vacuum but rather side by side, any one of them may be the source material for new mediations, and any one of them can in turn be experienced by a given reader/spectator and thereby influence his or her understanding of what the aurora is. Thus, aurora mediations constitute a transfer of characteristics relating to the aurora, and these mediations are all connected and relate to each other via a thematic connection.[9] This is what we understand by the term *transmedial network*.

In this transmedial network of aurora mediations, the human understanding of the aurora is negotiated, interpreted, and even constructed as a mediation necessarily always involves a form of human intervention and interpretation. Even modern scientific descriptions or photographs leave something out. They will always be selective and aim to translate and stabilize a dynamic phenomenon that breaks the scales of what human representations can reproduce. Even when advanced digital and scientific equipment is brought in to create representations of the aurora (such as radar equipment providing detailed insights into physical parameters of the phenomenon), the

Figure 1: Image of the fog filling the interactive space for creating a multi-sensorial experience of *Aurora – Connecting Senses.*

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[8] We understand the term *transmedial* in a broad sense as something that involves two or more different media types (such as a book or a film). In our understanding of media, we draw on Lars Elleström's work on media transformation, where media is understood as a communicative entity that can be split into *mediation*, the material mediating basis (the 'physical realisation of entities'), and a semiotic content (understood as the interpretation or representation conjured up in the mind of the beholder) (Elleström 2014, 12).

[9] This definition also has affinities with Lars Elleström's concept of simple transmediation (Elleström 2014, 21–22).

representations still remain partial and to some degree dependant on human knowledge, interest, and presuppositions due to the process of designing and programming the equipment.

Aurora – Connecting Senses joins this existing transmedial network of conceptualizations. It is a multimodal interactive art installation which explores the *ideas* of the Northern Lights through sound, light, colour, and interaction. The installation creates a space where the characteristics of the colours, magic, and mystique of the aurora representations are brought down to earth and into people's everyday lives. It invites audiences to co-create yet another interpretation of the natural wonder in interaction with the installation; to reflect upon the nature of the aurora and on the act of interpretation itself by giving audiences the opportunity to stimulate a projection of different colours and sounds, inspired by the transmedial aurora network, when moving around in the installation.

Description of the installation

Figure 2: Illustration of a set-up of *Aurora - Connecting Senses* with light beams and projections.

Aurora – Connecting Senses is an audio-visual, interactive performance installation, which has active audience participation as a constitutive part. We choose *audience* as a broad concept for people experiencing the installation. As has been argued in some strands of audience and reception studies (particularly in reception aesthetics (herein the work of Eco) and qualitative audience reception studies), we consider meaning in media, communication, and art to be the result of an interplay between a media product and its audience(s). In this line of thinking, audiences are always active in the sense that meaning is never communicated in a straightforward way but requires an active engagement and interpretation from the individual audience member whose socio-cultural knowledge and interests shape the perceived meaning of a text or media product.[10] This line of thinking is also compatible with the social semiotic approach to multimodal communication (pioneered by Gunther Kress), which considers communication to be a social interaction between the communicator and the communicatee, where meaning making is the result of an active interpretative process both dependent on the communicative *prompt* (the features of the media product) and on the interest and resources of the interpreter (Kress 2010, 36–37). We do, however, find it necessary to distinguish between *audience* as a general term for the people who are present to hear and see what goes on in the art installation, and the individual audience member who

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[10] For a brief review of the active-passive discussion in audience studies see Carpentier 2011, 191–92.

chooses to *participate* in the installation by entering the interactive space and move around. *Aurora – Connecting Senses* has in all instances been set up in a room larger than the defined interactive space, allowing for people to both observe the installation *from the outside* and as *participants in* the installation. Thus, when we in the following refer to audiences it includes both the audience members that choose to participate and those who do not, and when we refer to *audience participant* or simply participant, it only includes those members of the audiences who are moving around in the interactive space.

Although certain elements of the installation exist independently of the audiences (an atmospheric sound design, artificial fog, and the general set up), the installation also has a number of interactive features (colours, lights, and certain sounds), which are only unlocked once an audience member chooses to enter the interactive space and move around. These interactive features only respond to movement, so if an audience member enters the interactive space but keeps still, the interactive potential of the installation will also be still.

Because of the flexible affordances of the components of the installation, one could set it up in a smaller or larger space, extending from one to more than ten participants at the same time. The designs discussed in this article were spacious enough for one to four people to interact together. *Aurora – Connecting Senses* is consequently a medium-sized artwork, which offers a personal, even intimate, relation for the participants through light projections on artificial fog, where one

Figure 3:Illustration of a set-up of *Aurora - Connecting Senses* with light beams.

can experience an embodied feeling of touching the lights, in a similar vein to the *solid-light* art experiments of Anthony McCall.[11]

The idea of the installation is that the audience members who choose to interact with the installation become part of creating a unique interpretation of the aurora through exploring its interactive and aesthetic potential. Movement within the interactive space activates predefined colours of the aurora and associated musical notes. Thus, the experience is both characterized by certain constraints and by a measure of freedom, and the individual audience members are given the chance to play around to make melodies, rhythms, and activate different colours, essentially co-constructing an artistic version of the aurora with their own presence and movement.

A looped atmospheric sound is played throughout, and the interactive coloured light beams are projected onto a stream of fog. Music has territorial properties due to the spatial restrictions of sound waves on the one hand, and to its framing of a specific

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[11] See for example McCall's webpage: http://www.anthonymccall.com (McCall 2019).

social space on the other. Because music has affective capabilities, and because musical genres are strongly tied to different social groups and types of consumption, music works as a device to frame audience behaviour and experience.[12] Accordingly, the placement of the fog machine and of the speakers playing the atmospheric sounds *construct* the interactive space for the individual, and the immersive and territorial potentials of both fog and sound create an almost invisible border, allowing the audience participant to be 'submerged' into the artistic space, even when not moving. Thus, *Aurora – Connecting senses* can be set in an empty space focusing the experience on the unique and direct meeting of the human and artistically mediated natural worlds, or it can be set up in a regular living room, emphasizing the meeting of the mystical and the everyday.

The magical, mystical associations – or media characteristics – of the aurora that can be derived from the transmedial network discussed above, are sought in transmediated form mostly in the atmospheric sound design, while the main function of the coloured lights is to create an iconic relation to the real phenomenon of the aurora. Both popular associations and empirical observations of the aurora are thus referenced in different ways. While the real aurora has often been observed to emit a crackling or rustling sound,[13] we do not consider this sound to be a major characteristic of artistic and popular cultural representations, and it was not something that we were aware of at the time of designing the installation. Accordingly, the sound design of *Aurora – Connecting Senses* aims to represent the scientific and popular *ideas* about the aurora as produced by electrical charges on the one hand, and as something transcendental and magical on the other, but has not sought to include the observed 'rustling' sound.

In film music, connotations to magic are often made by the use of bells. This can for example be heard in many Disney films such as *Frozen* (Buck and Lee 2014) where bells are frequently used as sound effects to Elsa's magic, or in Hedwig's theme (the main theme of the Harry Potter films) (Williams 2001) which starts out with a melodious celeste with a characteristic bell-like sound. Besides being associated with magic by convention, bell-like instruments can be considered to be musical icons of sparkling ice. There is a
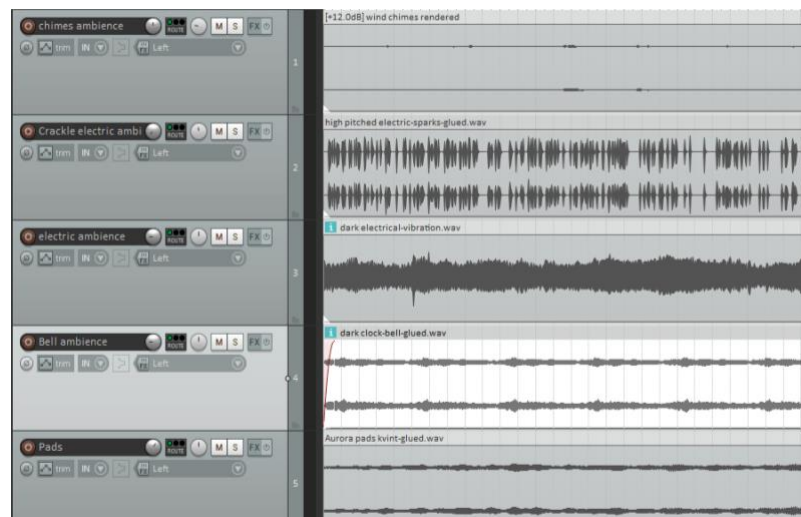

Figure 4: Screenshot of components in the atmospheric sound design of *Aurora - Connecting Senses.*

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[12] For a similar discussion on the use of music in shopping centers see Sterne 1997.

[13] For a historical critique of the ideas of the aurora sound see Brekke and Egeland 1983. For an updated, popular-scientific discussion on research concerning the aurora sound see Fazekas 2016.

structural congruence between the reflection of ice crystals or water and the reverberating sound of a metallic bell – the reverberation and timbre are determined by the metallic material which, similarly to water or ice, reflects light. Reverberation can thus be considered the musical analogue to light reflection – both of which act as waves thrown back at the spectator or listener by way of a reflecting material. Hence, the seemingly fragile character of the high frequencies and the slender timbre of bell-like instruments are easily associated with something sparkling, cold, beautiful, and, by convention, magical. These kinds of associations also seem to be at work in the Björk song 'Aurora' mentioned above, which makes extensive use of a music box and a harp alongside what sounds like recordings of a person walking in snow.

These cultural associations aside, the aurora is a physical natural phenomenon created by electrical charges in the atmosphere. Thus, aiming to reference both cultural associations and scientific principle, the sound design in *Aurora – Connecting Senses* is based on a mix of recordings of dark and bright bells and very subtle recordings of electrical currents and crackles – which can be considered icons of the actual electrical processes of the aurora – as well as synthesizer pads that create a broad texture to implement all of these elements into a coherent whole. In order to not break the enchantment of the sound design, however, the recordings of electricity are mixed very low, and only an attentive listener would notice them consciously. The sounds are there to help build up the mix, however, and add both to the darkness of the atmospheric sound and also give a sense of activity in the higher frequencies.

Each colour in the installation is randomly linked to one section of the interactive space and is triggered when the audience participant moves in that section. When a certain colour is activated, it colours all the generated beams of light. The shape and direction of the light beams are also determined by the movements in the space, with the light beams projecting in the area of activity, independent of the designated sections. Unlike the colours, however, the light beams stay active for a while, enabling the possibility to have any number of light beams at the same time. In contrast to the real aurora phenomenon, the participant in our installation can thus determine the colour of the aurora by switching from one place to another. Only one colour is active at a time, but most of the time, the switch of the colours is so quick that one has the impression that there are several colours in the visual composition.

Besides the ever-present atmospheric sound, the installation also has pre-recorded interactive bell-like sounds. These sounds are singular musical notes which come from a sampled music box, and they are edited to enhance the bell-like character – once again emphasizing the magical element. In addition, a childlike playfulness is encouraged through the auditive reference to a music box, which is something that is often used in children's toys or children's jewellery boxes, aligning with our intentions for the participants to 'play around' and explore the possibilities of the installation.

Unlike with the colours, the participant(s) can trigger more than one bell-sound at a time by moving through the designated spaces, and when doing so, the people present hear each sound at the time of its activation, lasting from one to two seconds. The same bell sound cannot be produced again until the first instance of it has come to a natural fade. This makes it possible to play around to create musical rhythms and melodies.

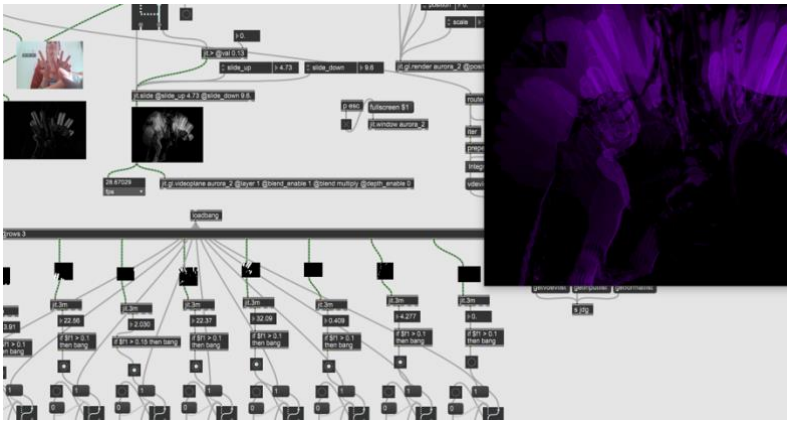**The specificity of interactive performance**

Figure 5: Screenshot of components in the interaction software, combining the movement, colour and sound of *Aurora - Connecting Senses.*

Aurora – Connecting Senses is an interactive performance installation. *Performance*, in the context of *performance art*, generally refers to art that focuses on the live presence of a performing body and/or on processes over product (Dennis 2014). This body is usually that of the artist, but in interactive installations, characterized by taking up larger spaces and requiring the audience to enter into this space (Bishop 2005, 6), the performer actualizing the artwork can also be an audience participant, as in *Aurora – Connecting Senses*. In addition, technological devices and interaction have generally become increasingly important to performances in more recent decades (1980s to present), and as in *Aurora – Connecting Senses,* artists can choose to use technical devices as extensions or replacements of their body, or as tools for interaction.[14]

Furthermore, as a performance is a 'live' event, it always involves a specific spatial-temporal anchor, i.e., the specific performance event will always be anchored in a precise moment of the here and now. Performances can be 're-staged', however. They are not necessarily unique events in terms of their design, but each of the performed events affords and offers a unique *experience* dependent on the specific space, time, and performer(s). Consequently, the concrete output created by a (repeated) artistic performance will to some degree be fluid and ever changing. In this sense, *Aurora – Connecting Senses* constitutes a performance-art product as the formal setup creates a framing prompt for a performance carried out in the interaction between audience member(s) and the installation – the interactive performance both *actualizes* and *constitutes* the work. Subsequently, the interactive performance is *performative* – the sister concept to performance. *Performativity*, a concept derived from linguistic theory associated with the philosopher J. L. Austin, refers to an utterance that is *generative*, *productive* (von Hantelmann and Rinner 2014), or even *transformative* (Bal 2013, 11), and following work in reception aesthetics it can be understood in the same way as *reading* or *actualizing* – in the sense of reading as *producing* a work through experiencing and interpreting it (von Hantelmann and Rinner 2014) – a performative act is an act that produces what it articulates. This concept once again points to the fluidity and processive character of interactive art installations with their lack of a stable signified and their tendency to dissolve the boundaries between (art) object and (audience) subject in the performance, as Mieke Bal has shown for the artist Ann

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[14] For an extensive discussion of different categories and approaches to digital interactive performance art see Mocan 2017.

Veronica Janssens' abstract mist rooms (Bal 2013, 11).[15] Similar to Bal's description of the mist rooms, *Aurora – Connecting Senses* is a performative installation that both stages and generates an audience performance, but at the same time this audience performance becomes performative as it both articulates and produces the art piece through the response to the prompt of the installation.

In accordance with our definition of the active audience above, it has been suggested that all art should be considered as interactive as it always entails an active reception process for the meaning potential to take hold (Bouko 2014, 255). In this sense, all art, and all media for that matter, is also performative as it always creates an affordance or a prompt for a performative actualization by an audience member, and all art generates an effect on its audience (von Hantelmann and Rinner 2014). What is different about interactive artworks such as *Aurora – Connecting Senses* is that this effect made on the audience produces a visible rather than a simply cognitive interaction, and that the performativity in the meaning making is made explicit by foregrounding the audiences' role in constructing the art piece. In *Aurora – Connecting Senses,* this foregrounding is sought as extended to the construction of an artistic experience of the aurora due to the scripted elements of the installation described above, including the title of the work.

We can thus distinguish between an artwork where the material composition is static and predetermined by the artist and hence only interacts with the viewer/audience on a cognitive level (such as a painting or sculpture), and the kind of interactive performances we are discussing here, where the presence and actions of participating audience members play a constitutive part in the artwork by modifying the appearance or content of the work. Yet, even 'truly' interactive artworks differ in the degree of interactivity offered to audience participants. It is thus fruitful for discussions concerning interactive art performances to operate with a categorization regarding the level of interactive potential. To this end, the artist and performance scholar Steve Dixon has proposed a model with four levels of artistic interactivity: 1. Navigation, 2. Participation, 3. Conversation, and 4. Collaboration (2007, 563).[16] We would argue that one could fruitfully think in terms of an additional level, a level 0, the observational level, to include the 'static' artworks discussed above, where no bodily participation is required for the work to unfold.

Dixon's model is a hierarchical one; the levels are proposed in an ascending order in relation to the art design and its openness to user interaction. The hierarchy does not imply aesthetic quality, however. The different levels address the *depths* of interaction *offered* by the artwork, with each level giving the audience participant still more possibilities to interact and change the outcome. An example of the first level, navigation, would be Olafur Eliasson's *Weather Project* (2003)*,* or the above-mentioned mist rooms by Ann Veronica Janssens, where the participant has to choose their path through the art piece. The participant literally navigates in and through the artwork. In non-immersive artworks, this navigational aspect can be reached by offering the participant choices of how the work should proceed, as in some hypertexts that offer different paths through their stories. To reach the second level of interactivity, participation, the artwork has to offer more freedom for the audience-participant to

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[15] For an example of Janssens' mist rooms, see Lousiana Channel 2016.
[16] It should be noted that the borders between these categories are fluid, leaving grey areas of interactivity in between each. The categorization of a specific artwork is therefore always subjugated to 'judgment calls and matters of opinion' (Dixon 2007, 565).

influence the content rather than simply choosing between a number of predefined paths. An example of this is Yayoi Kusama's *Obliteration Room* (2002 – present), where the audience participant is actively engaged in the construction of the artwork by sticking colourful dots on the walls and furniture of the room. The level of interactivity is still quite constrained, however, as the kinds of stickers and actions available are limited to this one act. *Aurora – Connecting Senses* belongs to the third level of interactivity, conversation. Here both the actions of the audience participants and of the artwork influence each other in real time, giving immediate feedback to each other and creating a unique development dependent on the particular interaction unfolding. The range of choices available to the audience participants is nevertheless still constrained by the installation design, precluding the possibility of reaching the fourth level of interactivity. An example of an artwork belonging to this category, collaboration, is *Le sacre du printemps* (2006) by Klaus Obermaier, where he collaborates in real time with a dance performer on stage in order to create the projected visuals.

By delineating *Aurora – Connecting Senses* to the third level of interactivity, it is implied that although audience participation is an essential part of the installation and of the creative potential, the audience participation, or performance, is still relatively scripted, given that they can only work to co-create a certain type of outcome within the restraints set by the artists. In this case, the 'conversation' that it is possible for the audience members to have in the interaction is necessarily a peaceful one framed by the predefined range of colours and sounds. We will return to how this level of restraint is designed to be peaceful and how it affects audience interaction below.

In addition to the foregrounding of performativity, a major distinction and qualifying aspect of interactive performance art is that since the performance is delegated to the audiences, this type of art necessarily shakes the audience(s) out of their passivity and challenges the still prevalent idea of art as passive consumption. If you only look at an interactive piece nothing much happens – the real beauty comes from people interacting, and the individual audience member has to expose themself to get to know the true potential of the artwork. This is both the strength and the weakness of an interactive performance, as we will return to below.

Stages of the installation and the inherent possibilities for interactive and reflexive reception

The installation has been designed and developed through an iterative organic process. The first instalment of the installation was designed specifically for a small-scale, public event during the 2018 European Researchers' Night, where the installation served as an artistic and aesthetic materialization of an *intermedial*[17] and *multimodal*[18] idea, aligning

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[17] Transmediation is often considered to be a subcategory of intermediality (Elleström 2014, 5), which is the study of relations between media products and artforms (also sometimes thought of as a media conscious intertextuality). Thus, by being conceptualized as a transmediation of popular and scientific ideas about the aurora, *Aurora – Connecting Senses* can be used to illustrate an intermedial idea of diachronic media relations. For a general discussion of what constitutes intermedial studies, see Clüver 2007.

[18] Multimodality as a research field studies how different expressive means (such as speech, music, and image) interact to create meaning potential in communication. As *Aurora – Connecting Senses* is dependent on sound design, colour, light projections, and movement to unlock its full meaning potential, it can be considered a multimodal installation (in fact, all audiovisual media are multimodal). For an overview of multimodal studies and approaches see Jewitt, Bezemer, and O'Halloran 2016.

with the major research themes undertaken at the Linnaeus University Centre for Intermedial and Multimodal Studies, which was the organiser of the event. The installation was placed in a room in a bar with old furniture, lamps, and a large carpet, making the room resemble a cosy living room. This living-room setting could easily have been created in a more formal museum set-up, but given the informal context and the location in a bar, the installation here came to function as an intermediary between academic research and the public, and an intermediary between formal art and casual entertainment. As an interactive installation that encourages play and movement through its sounds and bright colours, the installation here posed an amusing alternative to the more traditional talks by the researchers at the event. Even though the installation does not explicitly aim to 'teach' audiences about intermedial and multimodal processes, as an academic talk would, the installation does function as an opportunity to achieve an embodied experience relevant to these research themes. By knowing that the installation is called *Aurora – Connecting Senses*, people are encouraged to think about how and why their experience with the installation relates to the real aurora (the intermedial, transmediation perspective), and the part *connecting senses* directly encourages audiences to be aware of the use of multiple senses (sight, hearing proprioception – perhaps even touch and smell) in their interaction (the multimodal perspective). At this event, the installation thus functioned as a 'learning through play' complement to the more 'static' and less inclusive academic talks concerning similar aspects of the research fields.

This first setup of the installation involved the sound design, the interactive bell-sounds, and the projection of colourful beams of light onto fog, which partly filled the interactive space. Accordingly, the focus was exclusively on the sound and the colourful beams of light and on being *in the moment* with the installation. The installation gave an immersive and tangible experience to those audience members at the bar at the European Researchers' Night, who chose to interact in order to understand the potential of the installation. The carpet was there in the room from the beginning, but was perceived by the audience to be a designated part of the installation and as a guide to show the borders of the interactive space. This example shows how the performance experience is somehow fluid and adaptable, and that audiences use whatever is available to them in their meaning-making processes, making each instalment unique in terms of both the interactive and the meaning-making potential.

Aurora – Connecting Senses seemed to hit a nerve with people who experienced the installation or later heard about it. Due to this interest, the installation was set up again at a semi-public event at Linnaeus University with the intention of learning more about the technicalities of the installation as well as to further investigate its artistic and critical potential. The installation was this time set up in a small room with no furniture and without the use of a fog machine, but instead with a screen onto which the light was projected in shapes made by the movements of the audience, in a similar fashion to a shadow play. With this new technical setup, new affordances for interaction also came about, as audiences could now create 'drawings' on the screen in addition to playing with melodies

Figure 6: Projection screen from the second instalment of
Aurora - Connecting Senses.

and colours. Having a more tangible visual structure to relate to seemed to encourage many audience members to be more interactive than when they were acting in relation to light beams and sound alone. This might be due to the dominance of visuality in culture, and the different set ups of the installation suggest that people feel more confident exploring their creative capabilities with a concrete visual 2-D experience than with sound or with the more abstract potentials of the fog.

During this instalment, the installation was further commissioned as an art piece for guests to enjoy during an interlude at the Linnaeus University Academic Ceremony 2019. At this event, the installation was set up in an empty room with both a screen and a fog machine. This version of the installation thus incorporated most of the affordances of the two previous instalments, but within a more formal context mainly created by the choice to have an empty room with no visual distractions. This instalment clearly suggested what already seemed to be implied by the comparison of the two earlier instalments: that different groups of audiences interact in different ways and respond to different affordances. Still, the main part of the audience responded primarily to the potential of making illustrations on the screen. A few, however, paid more attention to the sound or to the light beams projected onto the fog. This suggests a potential strength of creating multimodal artistic installations as they will have a wide range of appeal through providing different options for interaction while also allowing people to experiment with modes they are less comfortable with, e.g. music, against the background of something familiar, e.g. illustrations.

This difference between the potential of the light beams and the projections is also relevant because it is due to the fog that the light beams become visible. Whereas most people in modern societies are more than used to looking at light projections, the actual paths that light takes to create these projections are normally not seen. This kind of experience of the light is therefore uncommon to most people, which might also explain why they at the outset prefer to interact with the projections. The fog, however, creates a three-dimensional space where the aurora is all around and one can almost touch it. Without the fog a participant can only see the traces of their manipulations with the light beams, the traces they leave behind, but with the fog, the natural phenomenon of light is 'materialized', allowing the audiences to reflect on their experience of light.

Based on these three instalments of *Aurora – Connecting Senses*, we have observed four different audience positions dependent on the audience members' approach to the artwork, which can be related to Dixon's four levels of afforded interactivity discussed above and to the idea of performativity. It should be noted that the

Figure 7: Light beams and projection from the third instalment.

audience positions, and the associated responses to performativity suggested below, are

derived from our observations of this particular artwork and cannot be generalized to all types of interactive performances. Thus, even though we relate Dixon's level one to a low degree of observed performative awareness below, it does not mean that this is the only type of audience response that a level-one interactive artwork can offer, only that a low performative awareness has most often been observed (to the extent that this *can* even be observed) in relation to audiences responding to a level-one interactive potential in our particular case. Furthermore, the suggested audience positions are not mutually exclusive in the sense that audience members can and do change between the positions during their time with the installation.

Above, we characterized *Aurora – Connecting Senses* as a level-three interactive art installation affording a 'conversation'-like interaction. Just because an artwork is theoretically *able* to afford this type of interaction, however, does not mean that audiences necessarily *use* the full possibilities of the artwork, a perspective which Dixon's more 'object'-focused model doesn't consider. Thus, we find it necessary to not just discuss what our artwork *can* do, but also how actual empirical audiences use these possibilities. With this in mind, we can delineate the four audience positions as follows:

0) The observer: the audience member stays outside the interactive space, possibly too shy or uncomfortable to expose themself by interacting with the installation. Thus, the audience member does not experiment with the interactive potential, but can only observe what happens when others interact. Despite *Aurora – Connecting Senses* being a level-three interactive installation with the *potential* for conversational interaction, the audience member prefers to respond only to its level-zero potential – the potential for observation and cognitive engagement, which was not part of Dixon's model. This audience position still enables the audience member to get something out of the work, but only in the cases where other audiences are present to perform and thus actualize the work.

1) Technological curiosity: the audience member is curious to figure out how the installation works and asks questions or looks around to find a solution. The audience members here are mainly responding to the level-one potential of Dixon's model, navigation. They move around in the installation, but are more focused on *searching* for the technical elements of the installation than on *exploring* the aesthetic potential. The audience member is thus performing in the installation, but without paying attention to their actions as being a performance; the focus here is on finding the underlying performative principle – what makes the installation work – rather than on the performativity of creating representations in interaction.

2) Playful interaction: the audience member shows enjoyment in dancing around in the installation and in seeing and hearing the effects, but does not seem to want to explore possibilities or to create something coherent. The audience members here are mainly responding to Dixon's second level of interaction potential: participation. They move around and acknowledge that their movements create a change in the installation, but they do not actively seek to *create* something in tandem with the installation. Thus, the performative effect of the performance is highlighted in that the audiences show great enjoyment in creating representations through their movements,

disregarding any idea of 'script' in the sense of exploring possibilities and limitations.

3) Creative interaction: the audience member shows signs of consciously working to construct something *with* the installation by *playing* or *composing* with the tones, looking for different and specific colours, or by experimenting to create specific shapes and patterns on the screen. Only few audience members took this position and responded to the full level-three potential of the installation. Here, the performativity is fully highlighted in the audience participants showing interest in exploring the possibilities of the installation in order to know how to create their own intended output. Thus, although the playful interaction can be considered a freer interaction in that the audience participants here seem unaffected by the constraints of the installation, or seem not to care, it is only in this creative interaction that the audiences learn to take some control over the artistic output thereby gaining an *artistic* freedom.

In general, most of the people who experienced *Aurora – Connecting Senses* on these three occasions chose to actively interact, with the most common audience position being the playful interaction, and the second most common the position of technical curiosity. Few people took the time to explore the full potential. This might be due to several reasons. For one thing, even though the installation was foremost intended as an aesthetic object to reflect upon, it was not set up in a museum or other recognized art context[19] where prolonged contemplation is a more natural response. Rather, the installation on these occasions was in 'competition' with other, non-artistic events and came to be received mostly as an 'active break' from presentations, work, or socializing. Second, this non-artistic context also meant that the audiences had not sought out an art experience (the second instalment is an exception), but rather that the art experience was an 'extra' on top of the main attraction of the specific event. And third, although digital, interactive performances have gained increased interest since the 1980s, they are still not the norm for artistic experiences. Rather, the relatively more passive consumption of 'static' artworks is still dominant in many museums. Thus, it is possible that people are lacking an interactive, artistic literacy which prevents them from exploring an interactive artwork's full potential. This can be partially corroborated by our own observations during the instalments, and it is also in line with Dixon's argument: 'interactive users normally favor artworks that are relatively structured and constrained, where choice and navigation is focused rather than wide open: users only want a modest level of freedom' (Dixon 2007, 564).

Accordingly, audiences at the instalments of *Aurora – Connecting Senses* generally needed some explanation and encouragement to dare to enter the interactive space. There was no curatorial text in the installation room, but most audience members had had the chance to read the title and a few key words on posters or small invitation cards, which all mentioned that the installation was interactive. Still, most people needed the encouragement of the artists present in the room to start interacting.

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[19] With the exception of the exhibition at the *Hämelinna Street Art Festival*, which is not being considered here as the instalment came too late in the writing process of this article.

Transmediation as interpretation and critical reflection

In conclusion, it can be said that *Aurora – Connecting Senses* is at the same time self-reflexive and ever changing, the latter due to human interventions. The sound design and interactive beams of light are intended to actively transmediate and evoke human associations, or media characteristics, of the transmedial aurora network, and thus meant to emphasize the interpretative element in our discourses about this phenomenon; the installation is not aurora, but solely a re-representation based on how we, humans, talk and think about it. It is an interpretation of an interpretation.

Furthermore, the sound, the colourful lights, and the shapes in the fog change as audiences move in the interactive space, basically taking control away from the *natural* processes supposed to produce the aurora and giving it to the audience, thereby questioning the power relations between the natural phenomenon and the human actors. The human actors are not in complete control, however. Some characteristics have been predefined by the artists – as some characteristics of the real aurora will be more or less objectively there before interpretation. In this case, the range of colours and sounds which the audiences can activate has been preselected, and the atmospheric sound design is independent of the audience members altogether. In this pre-selection, we drew on our knowledge of the aurora obtained through the transmedial network of representations, and as described earlier, we sought to both transmediate the contemporary scientific representations of the aurora as an electrical phenomenon, and the mythical and more recent popular representations of the aurora as something fantastical and magical. This constitutes a 'doubleness' which we in post reflection could trace back in the transmedial network to the earliest scientific descriptions. In relation to this matter of constraint, one audience member from the second set-up of the installation remarked upon the sound design that it created a very peaceful and enjoyable atmosphere, which she thought related well to the interactive potential, since the restrictions of the installation made it impossible for her to create an aggressive output, even when aiming to do so. Several audiences actually remarked upon the enjoyable calmness of the installation, although some (both adults and children) were anything but calm in their interactions. No matter the intensity of the interaction, however, the installation is designed so that it will always be in harmony. All tones of the music box will always be in harmony with each other and with the atmospheric sound, the colours are always projected by a soft light, and the shapes, which can be created on the fog and screen, always have soft edges. Constraining the *Aurora – Connecting Senses* experience to a peaceful one is part of the artistic intention described above to transmediate the enchanting conceptualizations of the aurora. The exchange with the audience member noted above also suggests something very important: that although few audience members seemed to interact directly with the sound, the sound can still frame and influence their experiences (as discussed above in relation to the framing and territorial potentials of sound), and the sound is what lead this particular audience member to reflect on the interactive and performative potential itself.

The aspects of nature, interpretation, and human interaction as intervention that we have tried to highlight here in relation to *Aurora – Connecting Senses*, moreover allows reflection on the status of reality and social construction. This is a theme which is also emphasized by other interactive installation artists such as Olafur Eliasson and Ann Veronica Janssens who, in different ways, point to art's capacity for destabilizing the

human perception of reality. In Louisiana Channel's written summary of their interview with Eliasson concerning his installation *Riverbed*, it says:

> The concept of reality intrigues Eliasson, who finds that the way we engage in the world is based on our 'model', whether it be a social, cultural or other type of model: 'The way we take in the world is not natural, it's cultural.' Thereby, it becomes a construction in which 'the authorship of reality lies within the beholder and the museum is constituted by the visitor.' In other words, reality becomes the way in which you choose to perceive or handle your model. 'Riverbed' is thus a part of this unreality, for as Eliasson concludes, 'There are no real things' (Louisiana Channel 2014, curator text with qoutations from Eliasson).

In a similar interview with Ann Veronica Janssens concerning her light installations, she says:

> It's a bit like a kind of evidence of a radiation that occurs, a radiation that... that allows me to show the manifestations of reality in a different way. I think that sometimes you have to erase reality[,] erase what's visible in order to see something else, to make the invisible visible in fact (Ann Veronica Janssens, in Louisiana Channel 2016, [00.00.25 - 00.00.41], [transcribed from the original English subtitles]).

What these two quotes show is that *Aurora – Connecting Senses* relates to a larger field of contemporary interactive performance art that concerns itself with nature or natural phenomena, and the way that these are perceived by humans. Interactive art must be considered suited to address these types of questions of social construction, even in areas which are most often the study object of the natural sciences and considered to be objectively understood, because interactive art constitutes a fluid and ever-changing performative potential dependent on the actions of the audiences. By insisting on an embodied and explicit performativity in constructing the work of art, the audience participant is faced with and challenged by a condition of all meaning making, the condition that it only comes into place through our own active performativity. Thus, interactive art is suited for pointing out not only the subjective understanding of nature, but also the human role in shaping conceptions about nature by allowing audiences access to a miniature 'model', cf. Eliasson, of a natural phenomenon, which is there for them to physically manipulate and cognitively engage with. But what happens then, when audiences seem to not yet be 'literate' in interactive art consumption, and when they prefer to stand on the side of the artwork not exposing themselves to the interactive performance? Does an interactive artwork *work* with audiences who 'only want a modest level of freedom' (Dixon 2007, 564)? Or would more scripted works working on the two lower levels of Dixon's scale function better, as they meet the audiences *where they are* in comparison with works designed for level-three or level-four interaction, which might have potential that will never be realized by audience participants?

We cannot speak for the cognitive or reflective effects of *Aurora – Connecting Senses*, but what we can say is that the artwork is to a large degree effective in engaging audiences bodily, in turning audiences into participants, and assumingly in making the

performative aspect explicit in the sense of making the different types of audiences aware of their own role in the construction of the artwork – and possibly through this even aware of the construction of an artistic version of the aurora and the interpretative nature of aurora conceptualizations. As is the case with art works, however, interpretation cannot and should not be completely restrained. In this article we have tried to describe and argue the aesthetic qualities of the work in the form of the sensorial address to the viewer (in our descriptions of the work) and its situatedness within a larger artistic tradition. Despite this, we cannot ultimately judge what meaning audiences will glean from the installation, as we cannot judge the installation as audiences ourselves. As Nielsen writes:

> Since we are always dealing with a specific dialogue between a specific individual and a specific work, one cannot determine in advance the potential of a work to catalyze a high-quality aesthetic experience, but it is possible to indicate the features that can initially serve as productive invitations for the dialgoue [sic] (2005, 64).

With this quote in mind, we cannot actually argue for the *specific potential* of the installation, as we have otherwise stated. But in providing our *own* reflections on the installation, and the thoughts and intentions that went into it, while also relating these to descriptions of audience reactions, we hope to have made the 'productive invitations' clear.

   This difficulty is perhaps the most essential problem of artistic research, the fact that we are at once artists with an intention and knowledge of the thought processes behind the work and at the same time critics, but without the distance that normally characterizes art critics. A further problem is that since the installation was originally aimed at artistic contemplation and not framed as a research object, we have not sought to carry out interviews or surveys, which could have provided us with a more 'authentic' audience perspective. In future research, this might prove a fruitful investigation.

   Ultimately, the only thing we might be able to conclude is that *Aurora – Connecting Senses* is an installation which sets up an encounter of people in a social space and an encounter of people with the objects, technologies, and conceptualizations that form our social reality, and which stem from other actors in our sociality. The fact that the interactive affordances of the installation were broad and unscripted enough to generate a number of different audience positions speaks for the performative potential of open-ended installations that do not presuppose one specific audience position, or one specific subject, but rather take the notion of audience participation and freedom seriously enough to allow for audiences to define their own meaning with the artworks, even if this meaning then moves the artwork in new and perhaps unpredicted directions. In order to highlight the performativity of actions, including the performativity in creating or recreating conceptualizations of the aurora, we must loosen the authoritative control and see what the audiences do with it.

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