

Dimension in Sound: A Multimedia Collaboration Experiment

Allyson Glenn

University of Saskatchewan, Canada

Abstract

Two short animation films were made in collaboration with the Saskatoon Jazz Orchestra (SJO), Canada, for a project called 'Dimensions in Sound', simulating the phenomena of sound synesthesia. This project investigated how synesthesia could inspire new music scores that in return could be interpreted by synesthete visual artist to develop animations. It builds on a previous collaboration between the author (a synesthete and visual artist) and the orchestra. The visual aspect of these projects – animations to simulate the experience of sound as seen in the author's mind's eye – was made with the intent to engage audiences to learn more about this neurological phenomenon and contemplate their own experiences of music. The project began with two music composers, Paul Suchan and Silas Friesen, presenting the author with a series of sounds to activate synesthesia-specific responses. With this information, the composers created scores that were recorded by the SJO. The films were created by first selecting open-source video footage capturing the floating, circling, and fluid shapes that resembled the visual sounds found in the music. Using a rotoscope animation method, the video footage was transcribed into thousands of drawings by the author and her team. The animations were shown in several international film festivals and received multiple awards. In June 2022, the project culminated with a live concert event hosted by the SJO during which the films were projected behind the orchestra who played the compositions. The *Dimensions in Sound* project was funded by the Canada Council for the Arts.

Keywords: Synesthesia, Art, Music, Film, Animation

Introduction

The way in which people understand and perceive the world is inherently different. This is true of many things including visual arts, music, films, and other art forms, and it is difficult to know and understand how others absorb and perceive these. In this project, we attempted to shed some light on the processing of sound and music by one synesthete (myself, also a visual artist) and share this in a way that can be understood, at least partly, by a wider audience. Synesthesia is a relatively rare condition of the senses and perception. Defined as the "fact of experiencing some things in a different way from most other people, for example experiencing colors as sounds or shapes as tastes, or feeling something in one part of the body when a different part is stimulated" (Oxford Dictionary, 2023). The main goal of the *Dimensions in Sound* project, was to gain new knowledge around how music is perceived by a synesthete – someone

who has synesthesia – and to put it into practice to see how it could improve artistic research and process. In particular, sound-synesthesia in which I experience was explored (it is described later).

This paper discusses a multi-disciplinary collaboration project called *Dimensions in Sound* involving the Saskatoon Jazz Orchestra (SJO), musician-composers, visual artists, and the author. Three artistic outputs were achieved; two short animated films entitled *Above the Deluge* and *In the Fray* (2021) and a live concert (2022). Our intent with this project was to better understand how sound-synesthesia responses could inform and initiate new ways of creating music, to create two animated videos that could effectively synchronize the music with the visuals, and to disseminate this artistic work to a wide and diverse audience.

This paper will describe the phenomena of synesthesia and include examples of artists who have this condition, and/or have addressed this topic in their work. I will describe the goals set out for *Dimensions in Sound* and the participants. Then the specifics of the project itself, its methodology, and outcomes will be discussed. Since understanding how sound-synesthesia can inform and initiate new ways of creating music, I will explain how this informed the artistic output – the musical compositions and the animations – and then the audience response. Lastly, since this was an initiative that occurred during the COVID pandemic, I will discuss logistics and how we successfully completed the artistic outputs and disseminated these to the public.

Synesthesia and Artists

Synesthesia is a phenomenon experienced by very few – one in ninety people exhibit some sort of overt form of this – and most people do not know what it is (Cytovic, 2018). Examples of well-known documented synesthetes include the visual artists David Hockney, Michel Basquiat, and musicians Jimmy Hendrix and Duke Ellington. Other artists who believed to be synesthete include the visual artists Wassily Kandinsky and Vincent Van Gogh (Taggart, 2019).

The causes of synesthesia are not fully understood but most researchers agree that it can have a genetic component. Most synesthete inherit it from their parents (one or both), while for others, occasionally, it can be the result of an injury (Day, 2022). In his 2022 publication *Synesthesia and Synesthetes*, Dr. Sean Day defines the phenomenon as "a personal trait like left-handedness, or having red hair or green eyes" (Day, 2022). According to his research, there are seventy-five types of synesthesia, however, each individual's experience of these can be quite idiosyncratic. Day, himself a synesthete, created an online community

chat in early 1990s where researchers and synesthetes could connect. Also fascinated by this topic is Dr. Richard E. Cytowic (M.D.). His and Day's research examine the many possible neurological factors that contribute to synesthesia including cross-activation when an activity in one region of the brain spills over into another resulting in a combination of usually separated senses appearing together (Day, 2022).

Sound-synesthesia is often referred to as chromesthesia, which more specifically addresses the perception of colour with music. Also called auditory-visual synesthesia, this is described as "colour fields, shapes and/or forms are activated by sound – a stimuli not normally associated with colour" (Colman, 2015). Like many types of synesthesia, this one can be perceived in either the synesthete's mind's eye or spatially in front or around their body. The Canadian musician and composer Greg Jarvis "involuntarily and instantaneously perceive all sounds as abstract visual shapes surrounding him" writes Robert Everett-Green (2010). He further explains how Jarvis's "shapes don't block or intrude on his normal sight, he says; they occur in 'a whole different field of vision'. They're present whenever any sound is audible, but he doesn't always notice them" (Everett-Green, 2010). Well-known visual artists suspected to have had chromesthesia include Vincent van Gogh, who in a letter to his brother wrote that "some artists have a nervous hand at drawing, which gives their technique something of the sound peculiar to a violin." (Taggart, 2019).

Using a more generalized term sound-synesthesia, Day may use this to address the numerous ways in which sound can be experienced. Allowing for different variations, chromesthesia can be generalized as experiencing colour fields with sound. For example, in his text, what he categorizes as "timbre" is the perception of specific shapes, textures, and tones for each instrument. He explains that a "musical passage will syn-esthetically look different if played on a violin as opposed to a saxophone" (Day, 2022). Personally, the shape, texture, special orientation and movement (rather than colour exclusively) appear in my mind's eye when I hear sound (music or not). The tone (how dark it is) of the shape is often lighter with higher keys. For example, a snare drum for me looks like bundle of wheat or feather-like (examples of this can be seen in *Bewitched, Bothered, and Bewildered* discussed below). The shape and its length is sometimes determined by the duration of the sound. Having contacted Sean Day many years ago, he interpreted my descriptions as timbre but noted how uncommon it is to perceive these shapes as monochromatic. I also experience the reverse of sound synesthesia, where I can 'hear' shapes moving. For example, seeing tree branches moving in the wind will activate a sound in my "mind's ear".

Since synesthesia is relatively unknown, many individuals who experience this phenomenon sometimes get mixed responses when sharing it with non-synesthetes. Synesthete visual artists, however, may be good "ambassadors" to share their perceptions and to unveil more about the idiosyncrasies of the

variations as suggested by Pelowski et al. (2020) who wrote that the art "is seen as allowing individuals to share 'how it feels' or 'what it is like' to be somewhere, in some time, or in the shoes of another, and to feel or appreciate their affective experience" (Pelowski et al., 2020 quoting Swanger, 1993).

While not always synesthetes themselves, some early artist pioneers like Wassily Kandinsky and John Cage linked sound with visual art throughout their careers. Kandinsky, one of the earliest non-representational painters and modernist, published books on his theories that included *Concerning the Spiritual in Art*, *Art of Spiritual Harmony*, and *Point and Line to Plane*. Encouraging non-objective art making, he examined the relationships, mediums, systems, and the universality of these towards visual aesthetic whether it be in nature, science, art or music. For example, he describes the double bass (string instrument) as having the colour blue and how certain colours could affect movement within a visual composition. For example how the colour blue theoretically moves outwards from the picture plane while red moves inwards towards the center of the composition (Kandinsky, 1911).

John Cage, music composer and visual artist, used interventions to emphasize and demonstrate connections between the senses. Often cross-pollinating between fine art and other art forms, he experimented with how music could inform art, poetry, philosophy, and theatre and vice versa. Cage is most known for his collaborations with modern dance choreographer and life-long partner and choreographer Merce Cunningham. Both shared an interest in the art movement Fluxus and invited chance operations using other senses to inform the artistic practice. For his 1978 piece *Seven Day Diary (Not Knowing)*, Cage drew his pieces with his eyes closed using a strict structure (meditating on the philosophy and poetry of Henry David Thoreau) (Cage, n.d.). More recently, his music composition for 96 watercolors was re-created at the Arter Museum in Istanbul (2021) called 'For Eyes That Listen'. For this exhibition, Curator Meilih Fereli selected twentieth century artworks that overlap senses, like sight and hearing. In his statement Fereli refers to Cage's special prints of engraving and etching as "avant-garde musical notation" (Hanson, 2021).

Bewitched, Bothered, and Bewildered

My first collaboration with the Saskatoon Jazz Orchestra (SJO) occurred in 2018 (Image 1). For this performance, the theme of synesthesia fit nicely with the orchestra's mandate to explore diversity and how individual the experience of music can be. This performance built from successful collaborations between other artists and researchers and the SJO. Guests are invited to present on their area of specialization and intersect this with the music. Both entertaining and informative, the SJO quarterly performances at the Broadway Theatre in Saskatoon are often fully booked with audiences eager to participate while learning something new.



Image 1 – SJO Performance with 3D Animation (2018)

For this first collaboration I created a time-based piece using digital media: a 3D animation in Unity (a 3D animation software) that represented my sound-synesthesia experience of a pre-existing piece of music, a showtune called *Bewitched, Bothered, and Bewildered* (Rodgers and Hart, 1940). While my area of specialization was entirely different – in more traditional forms of painting and drawing, I chose to create a digital artwork because like the researcher Katharina Gsöllpointner suggests in her 2015 journal article called *Digital Synesthesia, the Merge of Perceiving and Conceiving*, I believe that digital art is the ideal modality from which to communicate synesthetic responses (Gsöllpointner, 2015). Quoting McLuhan (1994) who believed that any extension, whether of skin, hand, or foot, affects the whole psychic and social complex, Gsöllpointner supports this theory by summarizing that media is an “extension” of “normal” perception (Gsöllpointner, 2015). Furthermore, she proposes that digital art can “provide synesthetic experiences for non-synesthetes – due to its digital” nature. She describes a higher probability of communicating synesthesia responses through digital forms because of its ability to convey multiple modal platforms (e.g., sound, visual).

Before this first collaboration with the SJO, I knew of few contemporary artists engaged in interpreting music through their visual art. The complexity of capturing split second changing sound into one ‘still’ image can be incredibly difficult, but not impossible demonstrated by the one artist I knew of – Stanley Donwood, known for his collaborations with Thom Yorke and alternative electronica rock band Radiohead. His many collaborations include creating their album art. In his book *There Will be No Quiet*, Donwood describes how he works alongside the band, using highly experimental approaches to address his current investigations or new ones (Donwood, 2019). His images, though still, often capture a sense of motion, encapsulating the sometimes jagged or fluid shapes found in Radiohead’s music (from my synesthete perspective). For example, the *Kid A* album is a visual orchestra in my mind’s eye and Donwood was able to capture this in his ‘still images’.

In this first attempt to visually capture sound, I structured the many instruments in *Bewitched, Bothered, and Bewildered* into three categories to

simplify the music composition: percussion, brass, and saxophone. For these, I made three-dimensional objects using Tilt Brush (a computer program to make objects from drawing and painting in virtual space). They were made in colour despite my monochromatic chromesthesia experience of sound. The shapes, however were made to closely match the volume, texture and movement of the generalized instruments. Imported into Unity, the forms moved in around a three-dimensional box-like space.

A tick-track was added to the animation for the conductor to assist the musicians in keeping time between the music and the animation. Unleashing the shapes, textures, tones, and movement in my mind’s eye onto the theatre screen with the music was indescribably satisfying. Also out of the ordinary for the audience, many attendees remembered the performance and expressed their interest in attending another. This gave us grounds to follow-up with a second show, which became the *Dimensions in Sound* project of 2021-2022.

Dimensions in Sound: Above the Deluge and In the Fray

For the *Dimensions in Sound* project, my second collaboration with SJO, we had more time than *Bewitched, Bothered, and Bewildered* to fully develop the project. Our goals included: (1) to better understand how chromesthesia responses could inform and initiate new ways of creating music, (2) to create two animated videos that could effectively synchronize the music with the visuals, and (3) to disseminate this artistic work to a wide and diverse audience.

The partners involved in *Dimensions in Sound* collaboration included two musician composers (Paul Suchan and Silas Friesen), Professor Dean McNeill (University of Saskatchewan and Director of the Saskatoon Jazz Orchestra [SJO]), SJO musicians, three visual artists (Shelby Lund, Lucy Zhou, Nicole Leroy), and myself. The project took one year from initiation, to completion, and dissemination to the public (local, national and international audiences). The creative output included two new jazz compositions, two short animated films (*Above the Deluge* and *In the Fray*), and a live performance.

Building on our previous collaboration around the theme of synesthesia, Prof. McNeill and I commissioned two composers to create new scores. For the visual aspect of the project, instead of making a 3D animation (done for the earlier project above), I chose to make 2D animations. Both practical and strategic, 2D animation meant we could build momentum around the project through film festival outreach until live performances could return – this project was initiated during the COVID pandemic. To support the project, the partners applied for and successfully received a one-time *Digital Now* grant from the Canada Council for the Arts. This funding enabled us to provide honorariums for the music composers, pay the orchestra musicians and the main animator, and for the SJO to purchase equipment to live-stream concerts indefinitely.

With the first goal in mind (i.e., to better understand how chromesthesia responses could inform and initiate new ways of creating music), we began with an exchange of knowledge. Paul Suchan and Silas Friesen, the commissioned composers, developed a set of questions and sounds for me to react to. Their intent was to gather 'data' about my specific sound-synesthete responses. The tests included approximately twenty pre-recorded sounds which I listen to and recorded my synesthete perceptions in writing (as best as one can describe these experiences) (USask, Media Production, 2022). Once they received my feedback, they used this 'data' to inform how they created the compositions. In describing his process Suchan said that "he re-used certain motifs in the music in order to 'activate' my brain, knowing the visual outcome would be repeated" (Suchan, 2022).

Once the scores were complete, the composers delivered to me two computer-generated recordings. These were temporary until the recorded music could be made (pandemic restrictions prohibited musicians from gathering and documenting the music together). In April 2021, the SJO musicians were given access to equipment and new recording software, which they used to record their sections individually. Singular sections were then assembled and mixed together and this final recording was then given to me.

Suchan and Friesen gave me complete freedom to develop the animations. For example, they did not discuss their preferences, themes or ideas of what it should look like. I began preparing by researching ways to visually manifest the sound, because it is challenging to match live visuals to the speed of sound. Having spent much of my youth watching music videos on Much Music and MTV, I returned to one of my favorite music videos: A-ha's iconic "Take on Me" animation directed by Steve Barron (Take on me, 1985). Borrowing from animators Michael Patterson and Candace Reckinger's drawing strategies, I used a rotoscoping method to transcribe video footage (tracing/drawing over the video frame by frame).

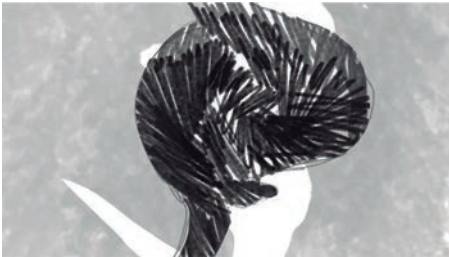
With the second goal in mind (i.e., to create two animated videos that could effectively synchronize the music with the visuals) traditional preliminary work was abandoned, such as thumbnail sketches and storyboarding, or even establishing a narrative structure. Since these structures could complicate the objective I decided that the sound would determine what stock footage could be used. For example, I watched stock footage without the sound to select videos that mimicked my sound-synesthete experience for certain melodies and motifs in the compositions.

Hand-drawn animation can be quite laborious. Tasked with completing thirteen minutes of animation in ten months was a multi-person job and I also needed help (*Above the Deluge* was approximately 3,700 drawings and *In the Fray* was 5,700 drawings). To assist me, local artists and former students of the University of Saskatchewan were hired; including lead drawer Shelby Lund (MFA), followed by Lucy Zhou (BSc) and Nicole Leroy (MFA). Instead of traditional rotoscoping method (drawing on and scanning multiple pieces of paper) used

by Patterson and Reckinger, the scenes were drawn digitally using Photoshop and a Wacom Cintiq Pro, a relatively new technology allowing artists to draw directly on the screen. For video editing the stock video footage, I learned how to use Premiere Pro and After Effects. This was primarily done prior to drawing frames. Not being synesthete themselves, my assistants did not "see" the music in the same way. This meant I had to be thoughtful about how to communicate exactly how to draw the imagery (to synthesize with the sound). Borrowing from the visual artist Sol de Witt, I created artist instructions for the assistants to carry out. These were paired with example drawing frames for the beginning of each scene. As a result, the drawings were consistent, efficiently made, and synchronized with the sound. On occasion, I gave 'carte blanche' to their drawing approach but then quickly reverted to strict instructions because I observed that the scene resulted in 'noisy' visuals (less in sync with the sound). As the lead animator, Shelby Lund had more opportunity to experiment, but this was discussed with me prior to implementation.

Considered traditional, hand-drawn animation is a bit of a novelty. Less common, this type of animation can immerse the viewer into the aesthetic of an earlier time and nostalgia. For me, what comes to mind are Canadian short animated films like the *Log Driver's Waltz* (1974) or more American examples like *Bugs Bunny and the Road Runner Movie* (1979). Other pieces I referred to before beginning *Above the Deluge* included the short animation *Icarus* by Paul Bochner available on the National Film Board of Canada (*Icarus*, 1974). Carried out with highly skillful drawing, without a spoken narration, using music and imagery alone, *Icarus*, a Greek tragedy, explores the complexity of the artist Dedilus's and his creations that lead to tragedy (wax wings and the labyrinth). In this film, Bochner uses a range of drawing including line, value, shape form, texture, and space, all of which presented beautifully in this film.

Specialized in figurative painting and drawing, I chose to use these skills for this first film. In responding to *Above the Deluge*, audiences commented on their appreciation for traditionally drawn animation, but also the synthesis between the traditional aesthetic and the subject matter. Wanting to capture a lack of gravity – the floating, circling, and fluidly moving and repeating melody in the music, I chose stock video footage of underwater scenes. Beginning with a swimming figure (whose body folds in and moves downwards – Image 2), this is followed by sea creatures (otters, seals, fish, and water snakes – Image 3) and deep-sea divers. Recognizing how my stock video collage approach could lead to a barrage of unrelated content, I maintained the underwater theme throughout the film. Near the completion of *Above the Deluge*, a significant change to the animation was made because previously dominant sounds in the preliminary recording became less audible in the final recorded music. To address my observation of the visuals being out of sync with the music, I enlarged the scenes to make the previously dominant shapes smaller. This unexpectedly added depth and dimension to the subsequent compositions.

Image 2- Still from *Above the Deluge* (2021)Image 3 – Still from *Above the Deluge* (2021)

When I received the music for *In the Fray* I observed that it was more abstract and less smooth than the music for the previous song. This piece had many uncontained shapes and textures. To research ideas on how to tackle this new music, I returned to Radiohead to see their latest innovations with collaboration. In the last few years, they teamed up with time-based multi-digital media artist Tarik Barri who has created time-based performative visuals to enhance Radiohead's live performances. Barri, a computer programmer, developed his own software paired with gaming tools. Using a gaming stick, for example, he alters the projected image (in real time) with the sound. How he touches or moves the stick changes the shape, colour, and scale of the moving projected image. While he says he did not design the program to re-create the synesthesia experience, using the gaming tool is a physically intuitive way to create visuals in tandem with the music (Barri, 2009).

Many of the textured sounds I could see in the music *In the Fray* was visually similar to Barri's projections (Image 4). While the medium used to make his projections are significantly more advanced (than 2D animation), his work gave me ideas of what reference stock videos would offer the right shapes and textures. The most relevant footage for this song included scratched reel to reel films, tunnels, architecture and geometrical shapes. Like *Above the Deluge*, thematically the piece seemed to also be 'diving into' something, whether this be into another dimension or an imaginary world. As a metaphor for entrapment in another place or world, I borrowed from Bochner's animation of *Icarus* (1974), including a sketch of a labyrinth in the introduction. Next, I used archival footage of *Alice in Wonderland*, a 1903 silent film directed by Cecil Hepworth and Percy Stow

(*Alice in Wonderland*, 1903). Drawing from this, the opening scene of Alice and the rabbit disappearing into an underground train tunnel quickly shifts to analogue and digital abstractions. The title phrase *In the Fray* means a "struggle" and when making this work I meditated on the term 'internet rabbit hole'. This refers to the experience of being led on infinite search engine paths leading to disorientation, obsession and frustration. Although my approach was to avoid narrative structures that could hijack the main goal of visually interpreting the music, themes of getting lost or analogue versus digital percolated throughout my creative process. To appeal to the abstracted sound, *In the Fray* was made to look more 'digital' than the previous film. At 5,700 frames, it was a much longer than *Above the Deluge* and the sketching methods were replaced with paint applications. Despite its more digital appearance, ninety percent of the frames in the second film were created using Photoshop tools.

Image 4 – Still from *In the Fray* (2021)

With the third goal in mind (i.e., to disseminate this artistic work to a wide and diverse audience), the animations were submitted to film festivals. Screened for nine months, they showed at twenty six festivals in ten countries. *Above the Deluge* was screened at the prestigious 2022 Cinequest Film Festival (USA) and received five awards including the London Movie Awards (UK), Five Continents Film Festival (Venezuela), Independent Shorts Awards (USA), IndieX Film Festival (USA). *In the Fray* was shown at the Canadian Film Fest and received recognitions from Independent Shorts Awards (USA) and the Indie Short Fest (USA). Both films continued their circuit of festivals until December 2022, when they were made public on the SJO's YouTube channel (see links to films in the bibliography). Mid-way through the festival schedule, a live concert event was held at the Broadway Theatre in Saskatoon, SK, Canada. Hosted by the SJO the films were projected behind the orchestra while playing the compositions. The concert included guest artist Larnell Lewis (Canadian drummer, composer, producer, educator, and member of the fusion jazz band Snarky Puppy). The event was livestreamed and available on the SJO's website making it available to anyone wanting to social distance or who simply live outside the city.

Since the concert explored sound through other senses, members of the Saskatchewan Deaf and Hard

of Hearing Services (SDHH) were invited and provided free tickets to the show. It was an opportunity to reach this audience, in particular that may not otherwise participate in the orchestra's events. In the months leading up to the concert, in consultation with SDHH, they recommended that we consider adjusting the set up and expand on the delivery of communication at the show. To do this effectively, the orchestra positioned speakers to capture amplified frequency vibrations in specific seating and sign language interpretations was offered for verbal elements of the concert.

Conclusion

Collaborations can be extraordinary, whether it be a sharing of knowledge, experimentation, or being in the right company. Sometimes it is the ideal context to test new approaches and modalities. This particular collaboration led the musician-composers Paul Suchan and Silas Friesen to develop scores that they would not otherwise have made. Suchan and Friesen continue to collaborate recording music long-distance and will soon release their new album, supported by a Creative Saskatchewan grant. For myself it was another opportunity to develop artwork around visual sound. It led me to expand my repertoire of mediums to include 2D animated film and I discovered innovative ways to develop projects with other visual artists. For the visual art assistants, they had a chance to apply their drawing skills while taking part in a larger multi-media project. For the orchestra, it was an opportunity to use new recording technology and with Canada Council for the Arts funding have access to live streaming equipment for all future shows.

Beginning with the philosophy that performance should be both entertaining and experiential learning, the orchestra's principles not only benefited audience members, but also those who partook in the collaborative process with them.

One of the benefits of sharing the animations with film festivals was that the audiences sometimes offered feedback. One film festival in which *Above the Deluge* was screened, called L.A. Animated Film Feedback provided video recordings of audience responses to the film. Audience members consistently commented on how the music score fit perfectly with the visual animation. Even though the synopsis describing the intent was provided, it was obvious those who watched the films simply appreciated how well its elements, music and animation, fit together regardless of the premises of the film. This suggests that more people than expected might unknowingly have some form of synesthesia!

Even though *Dimensions in Sound* specifically examined my synesthesia experience, in the future, I hope to continue collaborating with musicians and sound artists to further the awareness of this condition to the wider audience. I also encourage others to initiate such collaborations. These works can contribute to an overall deeper understanding that we all encounter and perceive the world differently.

Acknowledgment

This project was supported by a *Digital Now* grant from the Canada Council for the Arts (2021). I would like to specifically thank Professor Dean McNeill, Paul Suchan, Silas Friesen, Shelby Lund, Lucy Zhou, Nicole Leroy, David Hannah, David Sanscartier, and John Ogresko.

Bibliography

Above the Deluge. (2021)., Directed by Allyson Glenn., SJO YouTube Channel: <https://www.youtube.com/watch?v=KT58A-B-yDo&feature=youtu.be>. Last access 14/05/2023.

Alice in Wonderland. (1903)., Directed by Cecil M. Hepworth and Percy Stow. Silent Cinema Film starring May Clark based on Lewis Carroll's 1865 novel. British Film Institute. <https://player.bfi.org.uk/free/film/watch-alice-in-wonderland-1903-online>. Last access 01/06/2021.

Barri, Tarik. 2009. *Versum: Audiovisual Composing in 3D in International Community for Auditory Display (ICAD)*, (editors unknown). <https://www.icad.org/Proceedings/2009/Barri2009.pdf>. Last access 14/05/2023.

Bugs Bunny and the Road Runner Movie. (1979)., Directed by Chuck Jones., Warner Bros Cartoons.

Cage, John. n.d. *Seven Day Diary (Not Knowing)*, *Day Five*. Smithsonian American Art Museum, Washington. <https://americanart.si.edu/artwork/seven-day-diary-not-knowing-day-five-74464>. Last access 03/05/2023.

Colman, Andrew. M. 2015. *A Dictionary of Psychology*. Boston, Massachusetts: Oxford University Press.

Cytowic, Richard E. 2018. *Synesthesia*. Cambridge, Massachusetts & London, England: MIT Press.

Day, Sean A. 2022. *Synesthesia and Synesthetes*. Las Vegas, NV: Self Published.

Donwood, Stanley and contributor Thom Yorke. 2019. *There Will be No Quiet*. Thames & Hudson, London, England.

Everett-Green, Robert. 2010. *For musician with synesthesia, the cello can sound too furry. Or too red* in *The Globe and Mail* December 3, 2010. <https://www.theglobeandmail.com/arts/music/for-musician-with-synesthesia-the-cello-can-sound-too-furry-or-too-red/article1318371/> Last Access 05/09/2022.

Gsoellpointner, Katharina. 2015. *Digital Synesthesia. The Merge of Perceiving and Conceiving*. in *The Moving Image Studies* 109-133.

Hanson, Matt. 2021. *To a synesthete: Arter's visualization of sound*. In *Daily Sabah*. <https://www.dailysabah.com/arts/reviews/to-a-synesthete-arters-visualization-of-sound>. Last access 02/05/2023.

Icarus. (1974)., Directed by Paul Bochner. Short Animation. National Film Board of Canada. <https://www.nfb.ca/film/icarus/>. Last access 14/05/2023.

In the Fray. (2021)., Directed by Allyson Glenn., SJO YouTube Channel: <https://www.youtube.com/watch?v=HqfJrOCb9zw>. Last access 14/05/2023.

Kandinsky, Wassily. 1911. *Über das Geistige in der Kunst (Concerning the Spiritual in Art)*. Munich: Benteli Verlags Ag; N.- A. (2004 Edition).

Log Driver's Waltz. (1974)., Directed by John Weldon., Short Animated Film. National Film Board of Canada. https://www.nfb.ca/film/log_drivers_waltz/. Last access 14/05/2023.

McLuhan, Marshall. 1994. *Understanding Media: The Extensions of Man*. MIT Press.

Oxford Dictionary. 2023. *Synesthesia*. https://www.oxfordlearnersdictionaries.com/definition/american_english/synesthesia. Last access 03/05/2023

Pelowski, Matthew., Eva Specker, Gernot Gerger, Helmut Leder, and Lauren S. Weingarden. 2020. *Do You Feel Like I Do? A Study of Spontaneous and Deliberate Emotion Sharing and Understanding between Artists and Perceivers of Installation Art in American Psychological Association: Psychology of Aesthetics, Creativity and the Arts*. 14(3): 276–293.

Rodgers, Richard and Lorenz Hart. 1940. *Bewitched, Bothered, and Bewildered*. A song written for the musical Pal Joey.

Swanger, David. 1993. *The Arts, Empathy, and Aristotle* in *Journal of Aesthetic Education* 27(1):41-49.

Suchan, Paul. 2022. Personal communication between the author and composer Paul Suchan.

Taggart, Emma. 2019. *Home/Art: 5 Synesthesia Artists Who Paint Their Multi-Sensory Experiences*. <https://mymodernmet.com/synesthesia-art/>. Last access 06/05/2023.

Take on Me. (1985)., Directed by Steve Barron., Music Video for Swedish pop band A-Ha. A-Ha YouTube Channel: <https://youtu.be/djV11Xbc914>. Last access 14/05/2023.

USask, Media Production. 2022. *The making of the animated film Above the Deluge (interview of artists)*. Saskatoon Jazz Orchestra YouTube channel: <https://www.youtube.com/watch?v=bkd054CgLEA>. Last access 13/05/2023.