

*PLAYING WITH SHADOWS*: TOOLS FOR INTERACTIVE DMX DESIGN IN MAX/MSP  
FOR MUSICAL COMPOSITION

by

BRYAN MICHAEL WYSOCKI

(Under the Direction of Peter Van Zandt Lane)

ABSTRACT

This document provides an overview of interactive lighting design in musical compositions – including the history, implementation, and development of original works. The document outlines how composer Bryan Wysocki developed a set of tools, known as the *Toolbox*, for interactive lighting design in Max/MSP. With the *Toolbox*, composers are able to incorporate lighting design into their compositions and performers can now realize and perform older and modern compositions that use interactive lighting. The document outlines the functions of the *Toolbox*, and how Bryan Wysocki has used the *Toolbox* in a new piece for solo percussion and multimedia, *Playing with Shadows*.

INDEX WORDS: Interactive Lighting, Lighting Design for Musical Compositions,  
DMX512, Color Organs, Max/MSP

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## CHAPTER 1

### INTRODUCING – WHAT IS THE *TOOLBOX*?

Composers have long been interested in blurring the line between a “concert” performance and a “theatrical” performance. If music is only, as Varèse put it, “organized sound,”<sup>1</sup> why must a composer stop at organizing only the sound of the piece? Should then a composer not also seek to shape the way that the stage is organized (e.g. antiphonal ensembles), or the way the instruments themselves are played (extended techniques), or if the musicians even need to be human (fixed- and interactive-media), etc. ad infinitum? This train of thought might continue – the extent to which a composer controls the material of a composition is left entirely up to the composer.<sup>2</sup> The implementation of the composer’s attempted control is left solely to the consent of the performer(s).<sup>3</sup> Without the proper tools, techniques, or funding, the performers may not be able fulfil the composer’s artistic vision.

One of the more difficult ways that composers have sought to exert their creative control is through the addition of lighting design into their work. Touring musicians, opera companies, production designers, theatre scholars, and even some composers in the past have long understood that lighting design is an integral component to the theatrical performance of a work. Performance venues hire highly trained professionals to create and execute exquisitely designed

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<sup>1</sup> Edgard Varèse, “The Liberation of Sound,” in *Perspective of New Music*, 5, no. 1 (1966): 18.

<sup>2</sup> Within reason that is; however, some composers and performance artists have already taken this idea to its extreme – look no further than the Fluxus-/performance art-aligned *danger music*, which often instructs performers to harm themselves, physically or otherwise.

<sup>3</sup> Alex Temple, “Composers, Performers, and Consent,” *NewMusicUSA*, November 24<sup>th</sup>, 2015, <https://newmusicusa.org/nmbx/composers-performers-and-consent/> (accessed November 20<sup>th</sup>, 2023).

lighting sequences. These lighting designers are so essential to the larger theatrical performance world that the profession is included in the International Alliance of Theatrical Stage Employees (IATSE) Union.

Yet, in the world of Classical Music (well-funded, traditional orchestral music), there is not a significant interest in exercising this essential theatrical element even though some composers call for this type of lighting. Many concert halls use a simple warm wash for a tuning note, a spotlight for the conductor or soloist, and dim the lights to start the performance. This simple lighting design informs the way that we as audience members and performers involve ourselves in the ritual of performance. Active orchestral concertgoers will recognize, for example, that the dimming of the lights before a performance is a signal to both the audience and performers that the typical pre-performance ritual is about to begin. Similarly, during the intermission, the flickering of lights tells everyone to find their seats once again. These simple lighting gestures are an essential part of the ceremony of experiencing live (classical) music.

If these lighting gestures shape the way we participate in the ritual of live music – if they can move us to be quiet, to find our seats, to applaud – is it then possible that they can shape the way the sounds are heard? Consider how the introduction of lighting might change how the performers are perceived on stage, and therefore, how the music itself may be heard. I am not arguing for the creation of a unified theory on how color, light, and sound interact in live performance, but rather that the presence of color and light in some way alters the perception of performance. Instead of trying to quantify how the presence of light changes the perception of a piece of music, I am merely suggesting that it has the capability to adjust one's perception.

Now consider a composer who may want to take that idea further and manipulate lighting design *during* a performance. What if said composer wanted to introduce an array of colors to

the performance space to provide visual depth to the composition? These lighting possibilities could then become a new type of musical material that the composer could control.<sup>4</sup> And if it is indeed a musical material, something that can interact with other musical materials, then it is possible that the sequencing and subtleties of the lighting design may be able to generate meaning inside of the piece – just like any other musical material.

My early experiments into incorporating lighting design with my compositions were in 2019, with my first piece: *There Is A Light*, for piano, percussion, and ensemble with interactive lighting device. The piece was developed in collaboration with percussionist and fabricator Dominic Ryder, who also played the percussion part in its premiere. Shortly after its completion came another piece, *Suffusion*, for quartet and four lighting apparatuses. For *Suffusion*, the lighting devices were four jars with LED lights affixed to a post inside the jar. Pre-programmed LED sequences, again designed in collaboration with Dominic Ryder, were executed by a Raspberry Pi at the push of a button.

These first two pieces were functional, but hardly robust, and certainly not as interactive as I had been envisioning. *There Is A Light* used interactive lighting, but only to visualize what pitch it heard – in this way it was no more complicated than a tuner one might have on their music stand. The lighting in *Suffusion* did not interact with the performers in any way. These two pieces were proof-of-concept works that demonstrated this type of integration was possible – and could be used to create more artistically interesting works.

In the spring of 2020, as I was finishing my master's program in composition, I learned how to use the popular object-based programming environment, Max/MSP (or Max, as it is commonly known). During a two-week period in March of 2020, I started to learn the basics of

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<sup>4</sup> Musical material in this paper refers to anything a composer can control within the confines of a composition.

how to use Max through online tutorials and asynchronous classes. My early experiments in Max were mostly in the audio/visual realm, trying to create patches that could be used to perform and rehearse my preexisting compositions for instrument and multimedia.<sup>5</sup>

These experiments continued into the start of my doctoral studies in the Fall of 2020 at the University of Georgia, where I started experimenting with synthesizing both sounds and video inside of Max. As I investigated what Max was capable of, I began to wonder if it could be used to interact with lighting devices. Since then, I have been developing a set of tools (known from here on out as simply the *Toolbox*) for creating interactive lighting design in Max/MSP by using the ENTTEC DMX to USB Pro hardware as an interface. The aim of this document is to introduce the general concepts and frameworks at play in the *Toolbox* and provide a technical overview of the tools that make up the *Toolbox*. To do so, I discuss how my own compositions have utilized the *Toolbox* to demonstrate how other composers may start to use them in their own works.

In discussing the topic of lighting, and particularly how it relates to its inclusion and its use in contemporary musical composition, most of my attention will be focused on the term “lighting” (or “lighting design”). This creates many ambiguities in defining what exactly “lighting” is, due to the many ways we can create and modify lighting in a concert hall or performance space. Some methods include the more traditional devices: projection, mobile phones, emergency lighting, etc. And these methods extend all the way to the more extreme approaches: fire, UV light, strobe, lasers, complete darkness, etc.

Rather than trying to unify all types of possible lighting under an umbrella term, the clarifying concept is the phrase “DMX-enabled.” This limits the type of lighting fixtures to those

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<sup>5</sup> A patch is the “sandbox” where the programming occurs in Max.

that can be controlled from a lighting console or interface such as the *Toolbox*. DMX512 is the industry standard digital control protocol for stage lighting that is used almost anywhere that stage lighting is used. These types of lights include items that are common at live performance venues such as: traditional stage lighting like spotlights, pars, cans, LED bars, house lights, strobe lights, fog machines, etc. The *Toolbox* functions as an interface between interactive software (Max/MSP) and installed hardware (DMX fixtures).

This document will also not discuss explicitly theatrical or operatic compositions where the compositional process required additional professionals to conceive of the lighting, costume, stage, or production designs. Instead, this paper is primarily concerned with concert works that integrate lighting design into the core of the composition and are originated solely by a single composer.<sup>6</sup> The focus is to look at works that are created in the singular vision of the composer – where the lighting design is written into the score rather than created by a collaborative team.<sup>7</sup>

In the discussion of historical precedent for this type of composition, I will include composers that have called for specific lighting design in their compositions; however, I will not include any speculation of artistic “meaning” of the lighting. Audiences perceive and interact with lighting design in many personal ways, and my goal is to provide the tools for composers and performers to create their own lighting designs - rather than comment on what it might mean. The discussion of precedent here is necessary to show that there is a history of this kind of work, emphasizing the utility of the *Toolbox*.

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<sup>6</sup> While I personally consider any differentiation between a “concert work” and a “theatrical work” to be unnecessary, the distinction is important for excluding works that outsource the lighting design to a professional lighting designer instead of the composer themselves.

<sup>7</sup> This also includes any other material created by the composer (such as front matter, program notes, or other writings) that may be necessary to perform the piece.

## CHAPTER 2

### CONTEXTUALIZING – THE HISTORY OF *THE TOOLBOX*

#### A BRIEF HISTORY OF (INTERACTIVE) LIGHTING IN COMPOSITIONS

Marrying light and sound as part of a musical composition is not a new idea, but one that has a substantial historical record. Musicians, inventors, and scientists throughout history have long been interested in the integration of light, color, and sound; and it is unfortunate that most of these original works, such as composers' manuscripts, designers' original inventions, etc., have been lost to time. Not only is the *Toolbox* useful for the creation of new works, but it is also capable of recreating older and modern compositions that call for specific lighting design. While an exhaustive history of experiments in lighting and composition would be an interesting conversation, it is far outside the scope of this dissertation. Rather, I will provide a brief venture into the history of the concepts that I utilize in the *Toolbox* to show that there is precedent for musical compositions to incorporate lighting design.

Within the repertoire of works that use lighting design, there are several pieces by composer George Friedrich Hass that call for the performance to be held in complete darkness. Perhaps the most famous of these works are his *String Quartet no. 3 "in iij: Noct"*, his ninth String Quartet, *in vain*, and *Solstices*. The works are either in complete darkness for the entire duration or for a portion thereof. This requires the performers to memorize and coordinate long passages without the traditional visual cues associated with chamber or conducted music.

Atlanta-based composer Jordan Benator asks not for complete darkness, but just simply a dark room, in her piece *Music for a Dark Room*. The piece is performed by moving a lighter in

front of two infrared sensors to map the flame's location in three-dimensional space. The lighter's location in space is then designated a pitch and synthesized by a Max patch. The inclusion of fire in Benator's piece draws parallels with at least two other pieces: Paula Matthusen's *nacht nach nacht nach nacht nach nacht* (2008) for three music boxes and four matchstick performers and Emmanuel Séjourné's percussion quartet consisting entirely of lighters, *Vouz avez du feu?*<sup>8</sup> (Do you have fire?).<sup>9</sup>

Matthusen's work should be performed "entirely in darkness, allowing for striking patterns to emerge from varying ostinati of sound, light, and shadow," as should Séjourné's;<sup>10</sup> he calls for the piece to be "do[ne] by heart, in the dark" (translation via Google translate).<sup>11</sup> Benator says about her dark room, that "I believe that this piece could be perfectly effective in a concert hall, and I would certainly not discourage you from performing it in one, but I would encourage you to perform it in a smaller, dark room whenever possible."<sup>12</sup>

These pieces are interesting in that the lighters and matchsticks used to illuminate the room are always accompanied by a sound, creating the music of the piece. These pieces are visual works of art as well, but it is interesting to note that the sound of the piece can only be created by the visual aspect. The striking of a mechanical light-making mechanism becomes a percussive instrument.

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<sup>8</sup> Emmanuel Séjourné, "Vouz avez du feu?" (Clermont-Ferrand: Alfonse Production)

<sup>9</sup> Clearly the more conversationally accurate translation is "Do you have a light?" much like one would ask when smoking a cigarette. Literally, these words translate to "Do you have fire?" which is more topical to the point of this paragraph.

<sup>10</sup> Paula Matthusen, "nacht nach nacht nach nacht nach nacht," Accessed December 14, 2023, <https://www.paulamatthusen.com/projects/nacht-nach-nacht-nach-nacht-nacht-nacht/>

<sup>11</sup> Original French: *A faire par cœur, dans le noir. Les brisquets tenus à hauteur du ventre, à égale distance les uns des autres.*

<sup>12</sup> Jordan Benator, *Music for a Dark Room*, Self-published, 4

The way these composers specify the lighting and size of the performance space points to a unique and singular vision for the performance of the work. Pauline Oliveros, in her book/composition *Sonic Meditations*, calls for the performance space to be “illuminate[d] with dim blue light” in *Teach Yourself to Fly*, the first composition in the collection.<sup>13</sup> Anna Clyne’s piece, *A Wonderful Day* for sextet and fixed media indicates that the piece “is best performed in complete darkness with stand lights for musicians.”<sup>14</sup> These composers are conceptualizing their work based on certain performance conditions. However, they exercise more compositional control by designating the type of room – and the way it should or should not be lit – as an integral part in the performance of the piece.

Yet, composers are not limited by static or ambient lighting, which for the most part are indicated at the beginning of the score. Some composers have included lighting indications into the score of the work, notating the timing of such events in line with the music. For example, Sofia Gubaidulina notated when, how, and what color light washes should be projected in her *String Quartet no. 4* (1993). She uses three staves in the score to correspond to each of the three string quartets that are playing in the performance – in this instance, one live string quartet and two pre-recorded and digitally manipulated quartets.

Each of the quartets has their own series of lighting indications notated on a staff corresponding to each quartet. The lighting staves show the interplay between light and sound with the musical events becoming a type of counterpoint. In the Sikorski edition of the score, the color of the lighting is notated on a traditional 5-line staff, with each color being represented

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<sup>13</sup> Pauline Oliveros, "Teach Yourself to Fly" In *Sonic Meditations*, Smith Publications, 4.

<sup>14</sup> Anna Clyne. 2012, “A Wonderful Day,” (New York: Boosey & Hawkes), 1.

with its own pitch (Figure 1).<sup>15</sup> Haas, also notates his extreme light and darkness into the score *in vain* (2000) by placing them at the top of the score, in a staff labeled *licht*.<sup>16</sup>

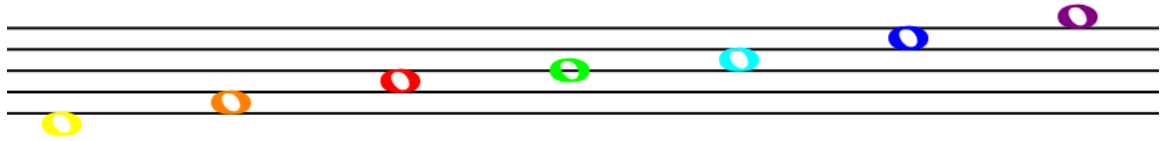


Figure 1 – Notation of lighting in Gubaidulina's String Quartet no. 4.<sup>17</sup>

Anna Thorvaldsdottir also includes lighting events in the score for her piece *In The Light Of Air* (2013/2014) for ensemble and electronics;<sup>18</sup> however, she takes the idea further by requiring a specific lighting installation (and custom-built percussion instruments) to accompany the performance. She says:

[We have] Been working on lighting fixtures, which will be a part of installation, which will go with the piece. We are controlling the lights with breaths, so that the perf-, each performer is not only performing on the instrument, but also through his or her own being by breathing. – Anna Thorvaldsdottir<sup>19</sup>

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<sup>15</sup> It is interesting to note that the lighting is notated differently in different editions by the same publisher. In the 1993 version, the color of the light is notated on one staff with pitches showing what color is to be projected. The 2003 edition notates the lighting on two staves, one for color and another for brightness.

<sup>16</sup> George Friedrich Haas, *In Vain*, (Vienna, London, New York: Universal Edition, 2000), 3

<sup>17</sup> Sofia Gubaidulina, *String Quartet no. 4*, (Hamburg: Musikverlag Hans Sikorski, 1993), 1

<sup>18</sup> Anna Thorvaldsdottir, *In the Light of Air*, (London: Chester Music, 2014), Accessed January 18, 2024, <https://www.annathorvalds.com/-inthelightofair/>.

<sup>19</sup> International Contemporary Ensemble, "ICElab presents Anna Thorvaldsdottir | International Contemporary Ensemble", Accessed January 18, 2024, <https://vimeo.com/64200360>

The lighting design for the piece is audio-reactive and had to be custom built. As, live electronics engineer and collaborator Levy Lorenzo says in a making-of video about the piece:

So, the challenge was to convert that electrical data into data that would control lights using the DMX protocol, which is generally [how] light information is communicated to lighting systems. So, I had developed some software in a software platform called Pure Data that would transfer the digital signal from the microphones into data that the lighting systems would understand. – Levy Lorenzo<sup>20</sup>

These dynamic changes in lighting used by Gubaidulina, Anna Thorvaldsdottir, and Haas have one thing in common: the lighting indications are notated directly into the score. Haas uses a staff at the top of the score marked “LICHT” (German for light). Gubaidulina uses three different staves marked *Luce* (Italian for light) or *farbenlicht* (German for colored light), depending on the edition. Anna Thorvaldsdottir uses a 2-line staff with both text and notation that describe how the lights should behave. The comparable way Gubaidulina, Haas, and Anna Thorvaldsdottir notated and utilized dynamic lighting design may share a common philosophical ancestor: Alexander Scriabin’s *Prometheus*.

In 1910, Alexander Scriabin wrote *Prometheus: The Poem of Fire*, a tone poem for “grand orchestra and piano with organ, optional choir, and light keyboard”.<sup>21</sup> The piece is a large single-movement work for symphonic orchestra and choir. The piece tells the story of Prometheus stealing fire from the Gods of Mount Olympus and giving it, along with the gift of

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<sup>20</sup> International Contemporary Ensemble, *ICELab presents Anna Thorvaldsdottir | International Contemporary Ensemble*

<sup>21</sup> In the original French: “*Prométhée, Le Poème du Feu.*”

knowledge, to humanity. In the front matter for the score, he called for (the creation of an instrument known as) the *tastiéra per luce*<sup>22</sup> – abbreviated *luce* as it appears in the Breitkopf & Härtel edition of the score.<sup>23</sup> Roughly translated as *keyboard of light*, the instrument was organized like a piano with the traditionally black and white keys – however, the keys did not produce sound, but light.

When the work was performed in 1915 at Carnegie Hall in New York, the “colors appeared, simultaneously with the rendition of the music, filtering through a mesh of fine gauze within a square framework at the back of the stage, above the orchestra, and were controlled from a keyboard, not unlike that of an ordinary piano.”<sup>24</sup> The exact mechanisms, construction, and realization of this instrument were detailed by Henry Chapin Plummer in an article for *Scientific American* in 1915 (Figure 2). In the article, Plummer describes an instrument that is positioned inside the orchestra and played like a typical keyboard instrument, with lights affixed to a rotating belt, shining through multiple plates of colored glass and gelatin (or gels, as they are known today) to provide the correct color.

The colors of the organ, as shown in the bottom left of Figure 2, are mapped to specific pitches. This list of colors is representative of Scriabin’s personal synesthetic connection between pitch and color, when he heard a note, that was the color he envisioned<sup>25</sup>. But Scriabin

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<sup>22</sup> This instrument is also known as the Clavière à lumières in French or the Color Organ in English.

<sup>23</sup> Alexander Scriabin, "Prométhée: Le Poème Du Feu," (Berlin - Moscow: Breitkopf & Härtel), 1

<sup>24</sup> Harry Chapin Plummer, “Color Music – A New Art Created With the Aid of Science,” *Scientific American*, April 1915: 343

<sup>25</sup> This document will not provide any commentary on the topic of synesthesia (outside of mentioning its existence and what can be directly quoted by those who have the condition). Synesthesia, as I understand it, is a highly personalized condition, with the connections between sound and color being unique to each person with the condition. Any statement or generalization about the types of associations between color and sound will be avoided.

did not invent the idea for this instrument – in fact, color organs had existed as cultural curiosities for some time before *Prometheus*. They reached a sort of intellectual and cultural apex toward the end of the 19<sup>th</sup> century, continuing into the lead up to the first World War.<sup>26</sup> In fact, these instruments existed for many years before *Prometheus*' successful performance – which Scriabin did not live to see.

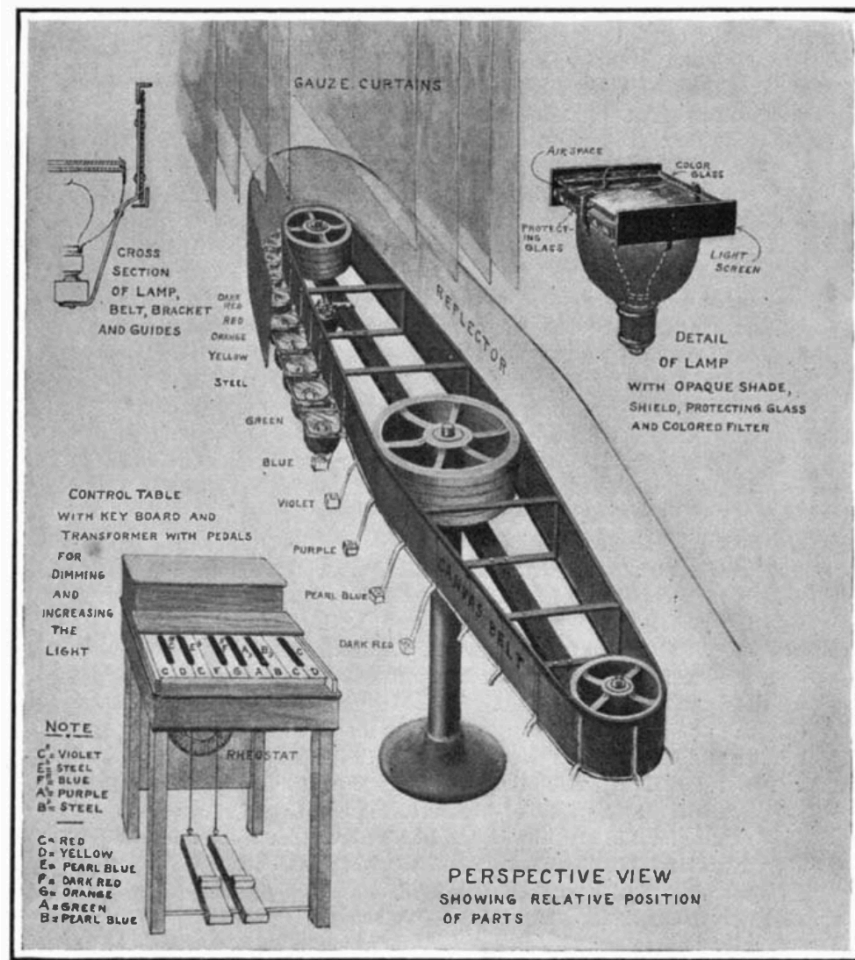


Figure 2 – A diagram of the color organ used in the New York premiere of Scriabin's *Prometheus*. Bulbs representing each color of the organ rotated on a belt to create a dynamic, moving color projection onto the curtains above.<sup>27</sup>

<sup>26</sup> During which, many instruments were scrapped for raw materials.

<sup>27</sup> Plummer, "Color Music," 343.

In 1739, the composer Georg Philipp Telemann visited the French mathematician and inventor Louis-Bertrand Castel who had invented what he called the *Clavecin pour les yeux* (keyboard for your eyes).<sup>28</sup> Castel, who was a student of Jean Philippe Rameau, had devised the keyboard to realize a hypothesis proposed by Sir Isaac Newton. When Newton determined that white light is indeed made up of a many-colored prism of light, he initially mapped this new color spectrum's seven principal colors (red, orange, yellow, green, blue, indigo, and violet) to the seven tones in the C major scale (Figure 3).



Figure 3 – Newton's color wheel, taken from his notebook which he maps his newly credited color prism to the tones of a C major scale.

Representing color with pitch, as Newton suggests, creates some interesting questions. In 1912, Alexander Wallace Rimington, a professor of Fine Art at the Queens College in London, published a book on the subject: *Colour Music: the Art of Mobile Colour*. In it, he proposes a

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<sup>28</sup> Thomas L. Hankins, "The Ocular Harpsichord of Louis-Bertrand Castel: Or, The Instrument That Wasn't," *The History of Science Society* 9, (1994): 144.

new art called Mobile Colour as an analogue to Music; where music is the abstract organization of sound in time, Mobile Colour would be the abstract organization of color in time and space. Rimington also proposes an idea for how this new art would use musical notation and instrument construction as a basis:

“The keyboard of the colour-organ has therefore been arranged precisely in the same way as that of an organ or a piano; and, as has already been stated, the spectrum-band has been divided up into similar intervals.”<sup>29</sup>



*Figure 4 – An example of a color organ. Lights are emitted through the boxes, which have different colored gels in front of a bulb to filter the color of the light. A keyboard-like mechanism is used to control the lighting.<sup>30</sup>*

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<sup>29</sup> Alexander Wallace Rimington, *Colour-Music: The Art of Mobile Colour* (London: Hutchinson & Co., 2012), 50

<sup>30</sup> Rimington, *Colour-Music*, 44

He illustrates a strong command of this subject by describing several different ways of mapping the octave to the visible color spectrum, detailing the complexities of the color organs' mechanical actions and construction (Figure 4), and comparing the qualities of music, light, and color. Rimington describes a type of "colour sense" that would be analogous to the principles of ear training and aural skills: "In music we are perfectly satisfied with compositions which do not express definite ideas, and in colour there seems to be no reason why this should not also be so if our colour sense is sufficiently developed."<sup>31</sup> He argues that Western culture has seen a "neglect of the cultivation of the colour faculty" that can be righted by an "increased special cultivation of the colour faculty; and increased knowledge as to harmonies and contrasts and other qualities of colour."<sup>32</sup>

If Rimington were to imagine a musician with a cultured color faculty, Scriabin might have been an interesting figure to look at. Scriabin's color organ was devised in such a way that it fit his synesthetic organization of the 12 tones. Much has been written about the connection between these colors and the *luce* part in *Prometheus*;<sup>33</sup> however, my interest is in its inclusion in the score at all. Scriabin notated this instrument above the orchestra (where Haas has also notated his lighting). Both indications are outside of the traditional score order, which dictates how and where instruments should be ordered on the page. Gubaidulina and Anna Thorvaldsdottir both notate their lighting schemes next to the electronic sounds that are also present in both compositions, perhaps suggesting a stronger alignment between the musical material and lighting design.

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<sup>31</sup> Rimington, *Colour-Music*, 72

<sup>32</sup> Rimington, *Colour-Music*, 9

<sup>33</sup> For example, Kenneth Peacock's 1985 article "Synesthetic Perception: Alexander Scriabin's Color Hearing" describing Scriabin's synesthesia and its connection to understanding the so-called *Prometheus* chord.

The mere presence of these lights, and the way they are to be performed, was important enough to these composers that it was to be included into the score. I argue that the inclusion of this material indicates that the lighting indications are no less optional than the musical notation – it is a necessary part of the piece. There is an implied horizontal and vertical alignment with the music and the lights that produces a counterpoint with the sound that is essential to the piece. Neglecting the lighting in performance would result in an incomplete realization akin to leaving out instruments.

Realizing that performing the piece with lighting may not always be possible, some composers have included a note that the lighting could be omitted if proven to be impractical. I believe this would be a mistake. Composers have long insisted on difficult and impossible ideas. Many of the traditional orchestral instruments became standard instruments simply because of these composers' unreasonable requests. One might imagine Beethoven's Fifth Symphony without the trombones, Mahler's Sixth without the hammer blows or almglocken, or Scriabin without the color organ – yet these omissions would severely damage the artistic integrity of the piece.

By using the tools outlined in the *Toolbox*, composers, concert producers, ensembles, or anyone else who may be interested in presenting these pieces can now fully perform these compositions. The color organ described by Scriabin is included in the *Toolbox*, as are the tools necessary to recreate the audio-sensitive lighting required in Anna Thorvaldsdottir's work. These works are more than just interesting footnotes, they are important pieces of art that deserve to be represented faithfully – which is now possible with the *Toolbox*.

## A SHORT HISTORY OF DMX512 PROTOCOL

Lighting design for staged and concert performances has a long history dating all the way back to at least the ancient Greek and Roman amphitheaters. Stage lighting historian Leonard George Applebee writes that before there were electrically controlled lights there were gas powered lights, and before that were lights that used heated elements of lime, and before that were oil lamps, and before that were candles, and even before all of those was, of course, the sun.<sup>34</sup> While Applebee traces lineage of modern stage lighting from the Greeks to the modern day (1946), his article also imagines what future lighting fixtures might look like and how they might operate.<sup>35</sup>

Since that time, there have been a significant number of changes in the way theatres and performance venues use and manipulate lighting. The most important change has been the switch from analog control voltages to digital control. The types of lights that can now be controlled have changed as well. LED lights have become a major type of lighting, almost overtaking the traditional tube and bulb lights, since LED's invention in 1962. Even more types of fixtures have become DMX-enabled, such as pyrotechnic fixtures, fog- and smoke-emitting fixtures, and fixtures that emit laser beams.

However, before the rise of digital processing, all communication between lighting consoles and fixtures was analog. The fixtures were controlled by a series of voltage attenuators that modified the amount of electrical current that ran to each fixture. Modifying values on a per fixture basis is still the basic principle behind most digital stage lighting; however, instead of

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<sup>34</sup> Leonard George Applebee, "The Evolution of Stage Lighting," *Journal of the Royal Society of the Arts* August (1946): 550

<sup>35</sup> He even makes mention of a type of color organ that can control electrical stage devices by playing a keyboard-like apparatus that was recently (to-him) installed in the London Palladium known as a *Light Console*.

limiting voltage, lighting consoles modify data values that are independent from the voltage required to power the light.

Even with these recent developments, there was not an industry standard for digital communication between lighting consoles, dimmers, and fixtures prior to 1990. The United States Institute for Theatre Technology (or USITT) ratified a standard protocol of communication, called DMX512/1990, or DMX512 for short, to solve this issue. The term DMX512, which will be used interchangeably with just DMX, stands for Digital MultipleX 512. This is a method of digital communication that can be used by multiple fixtures, and the number 512 refers to the number of values a console or fixture can communicate. Compliant lighting consoles or fixtures can digitally send and receive up to 512 values.

The collective list of 512 values is known as a universe. One universe consists of a list of 512 numbers, where each number in the list is an integer ranging between 0 and 255.<sup>36</sup> For fixtures to interpret the values inside of a universe, the fixture needs to be addressed correctly. Most fixtures can be assigned both a mode and an address; the address tells the fixture which number in the universe it should utilize, and the mode tells the fixture how many values to use.

For example, if a fixture is assigned the address of 5, it will use the fifth value in the universe, skipping the first four values entirely. In DMX, a fixture can receive the entire universe of information from either a lighting console or fixture and send the universe to the next fixture in the sequence without altering the values. Most fixtures have both a DMX input and output connector, so it is possible to daisy-chain each light in the universe to the fixtures that came before and after it in the sequence. An example of what this might look like is below in Figure 5.

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<sup>36</sup> The range 0-255 should be familiar to anyone who has ever used MIDI or played an 8-bit video game console. The number 255 is the largest value that can be represented with an 8-bit integer and given the processing power at the time of ratification, most DMX fixtures use 8-bit numbers to store values.

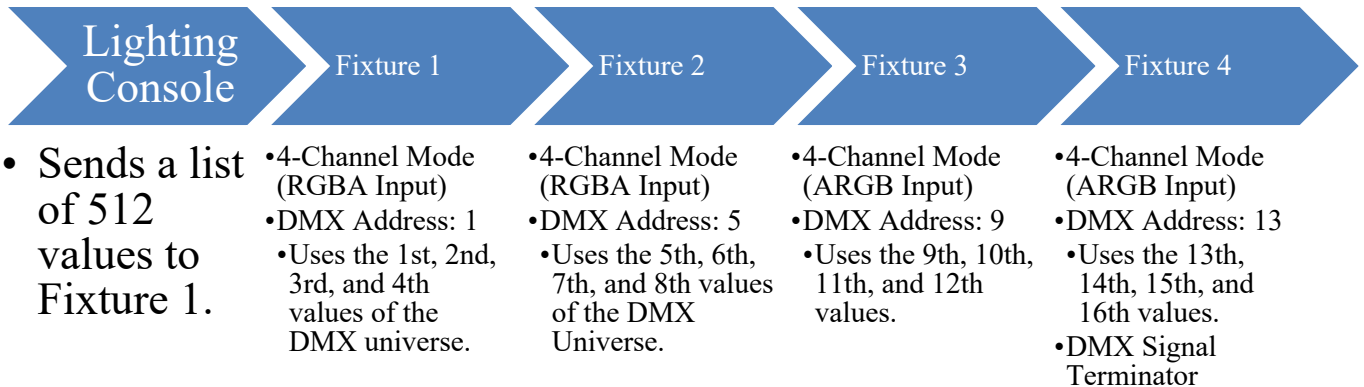


Figure 5 – A signal flow diagram outlining a basic four light setup.

It should be noted that the USITT states that a truly compliant DMX512 fixture uses a 5-pin cable designed to carry DMX data – however, some older (and even some current manufacturers) still use the more common 3-pin component that is more commonly seen in XLR audio cables. Most DMX fixtures only send or receive data on three of the five pins, leaving out the 4<sup>th</sup> and 5<sup>th</sup> pins. These “extra” pins are part of the DMX standards in case the universe uses a fixture that requires these pins to send any extra data which may be necessary for a specific fixture’s operation.

The prevalence of 3-pin connectors does not mean, however, that audio cables are designed to send DMX signal and vice-versa. While a 3-pin XLR cable may be capable of sending DMX data, it is not recommended by USITT. The primary reason for this is the ability for 3-pin audio XLR cables to carry 48v phantom power to microphones; this excess voltage is generally more voltage than what is required for a specific fixture, which may damage the device. Even when using 5-pin cables, the USITT standards require that all DMX fixtures use

only DMX cables and include a signal terminator at the end of the signal chain.<sup>37</sup> The signal terminator is a small component attached to the last fixture's output that essentially blocks any outside electrical interference. Without it, the electrical system is an open system that may be susceptible to electrical interference.

While it is the most widely used protocol, DMX is not the only communication protocol for lighting fixtures. Alternatives such as RDM (remote device management) and ArtNet are also used in the field. The reason that DMX was used for the main protocol of the *Toolbox* is due to DMX's prevalence in the field, abundance of available information, and relative cost of acquiring hardware. The tools available to learn and start manipulating DMX were much more accessible than the other protocols.

By using DMX, it is possible for the *Toolbox* to be used in many venues such as theatres, concerts halls, or anywhere that DMX fixtures are installed. It lowers the barriers for entry into this type of programming; it is possible to purchase a relatively cheap DMX fixture and the required ENTTEC interface for less than \$200. The tools within the *Toolbox* are provided on my personal website as freeware to the larger community so that composers, lighting designers, and other artists may use them more readily.

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<sup>37</sup> USITT, "DMX512 FAQ" Accessed January 5, 2024, <https://archive.ph/20130416024656/http://www.usitt.org/content.asp?contentid=373>.

## CHAPTER 3

### THEORIZING – HOW DOES *THE TOOLBOX* WORK?

#### WHY CREATE THE *TOOLBOX*?

The creation of a new tool is always the result of trying to solve a problem. In this instance, the *Toolbox* was created to solve problems I initially faced with finding appropriate tools for interactive lighting. In finding a software to control lighting, I developed (some unreasonably harsh) criteria: I wanted a software to be free and in a programming environment I was already familiar with. The first criterion was limiting enough, but it was the second condition that truly eliminated essentially every software available.

Initially, I was looking for a software that could interact with lighting fixtures in a comparable manner to a DAW (digital audio workstation). Ideally, fixtures could be manipulated both individually and in groups and both could be given different effects or presets. The ability to control the lights with a MIDI keyboard or audio input was also important, as I envisioned future compositions where that type of control would be necessary. The ability to pre-program lighting cues in sequence was also a must-have, though most software seemed to have this functionality. After spending some time searching, I could not find a software that fit my extremely limiting criteria.

My initial experiments in interactive lighting were rudimentary. I used foot-operated switches built into extension cords to control floor lamps with different colored LED bulbs installed. Rather quickly, artistic necessity deemed it essential to collaborate with other artists to

find a more compelling solution. This led to a series of collaborations with percussionist and fabricator, Dominic Ryder, on the creation of bespoke lighting fixtures.

These new fixtures we developed used pre-programmed Arduino controllers to manipulate strands of LED lights. These devices, while functional, were not flexible or robust enough to be altered on the fly.<sup>38</sup> These pieces of hardware utilized either pre-programmed lighting sequences which had to be programmed and then stored on a Raspberry Pi, or they relied on an Arduino to interface with and/or control the light via USB cable and a Max patch. It took two projects for Dominic and I to determine that a more intuitive solution must be possible.

We used Max to communicate with an Arduino for the lighting in my piece *There Is A Light*, and we figured there must be a way to cut out the middleman and connect Max directly to the lights. Using Max without having to use an Arduino, we could incorporate real-time pitch- or gain-mapping of different audio signals, flexible MIDI mapping and controlling, or interactive cue- and sequence-based programming in an environment that we were familiar with.

In the Spring of 2021, while I was taking a course on interactive electroacoustic music with Dr. Peter Van Zandt Lane at the University of Georgia, I stumbled upon a YouTube video: “Getting Started with DMX – Overview, Touchdesigner & MaxMSP” by Programming for People.<sup>39</sup> The video shows off a piece of hardware, the ENTTEC DMX to USB Pro Mk2, that

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<sup>38</sup> Or, I should say, capable of being altered by myself – as the initial programming and construction of these lights was done in collaboration with Dominic Ryder, who had the access and knowledge to design these lights. Collaborating with Dominic was a fantastic process, but it was difficult to experiment and try things with any immediacy.

<sup>39</sup> Programming for People, “Getting Started with DMX - Overview, Touchdesigner & MaxMSP,” 23:24, Accessed November 20, 2023, <https://www.youtube.com/watch?v=dAaZb8M-fpw>

can communicate with DMX lighting via USB through Max's [serial]<sup>40</sup> object. The Mk2 is a different device than the device necessary for using this version of the *Toolbox*; it is a newer version that can send and receive up to two universes of information, as opposed to the single universe that is used in the *Toolbox*. This device seemed like it could be promising – so I applied for a grant through the Willson Center for the Humanities at the University of Georgia to purchase the cheaper Mk1 interface and necessary lights, cables, and accoutrements.

Using the relatively barebones patch demonstrated in the YouTube tutorial as a starting point, I developed the earliest versions of the *Toolbox* (Figures 6 and 7). The overarching design principle for this iteration of the *Toolbox*, initially called the *DMX 8 Light Toolbox*, was to create a patch that could control the eight individual lights purchased with this grant from an iPad using the Mira external.<sup>41</sup> The relatively dull User Interface (Figure 6) was the back end of the patch, where all the routing of values and so-forth happened. Users were not expected to interact with these objects to create lighting designs, rather this is where users interfaced with the requisite hardware and setup their audio devices.

Additionally, this older version of the *Toolbox* included a basic scripting language designed to create pre-programmed cues. The scripting language was rudimentary and capable of performing basic functions, like manipulating brightness and color of individual and groups of lights, adjusting the speed of fades, and controlling a basic timer, etc. The scripting feature was abandoned in later versions due to a personal shift in my programming workflow.

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<sup>40</sup> A note about style: any Max object referenced in this document will be enclosed in square brackets to indicate that it is a Max object. This includes native Max objects and subpatches designed for the *Toolbox*.

<sup>41</sup> Mira is a suite of external objects included in the Max package manager that allow an external source (iPad or another web browser) to directly interact with a Max patch.

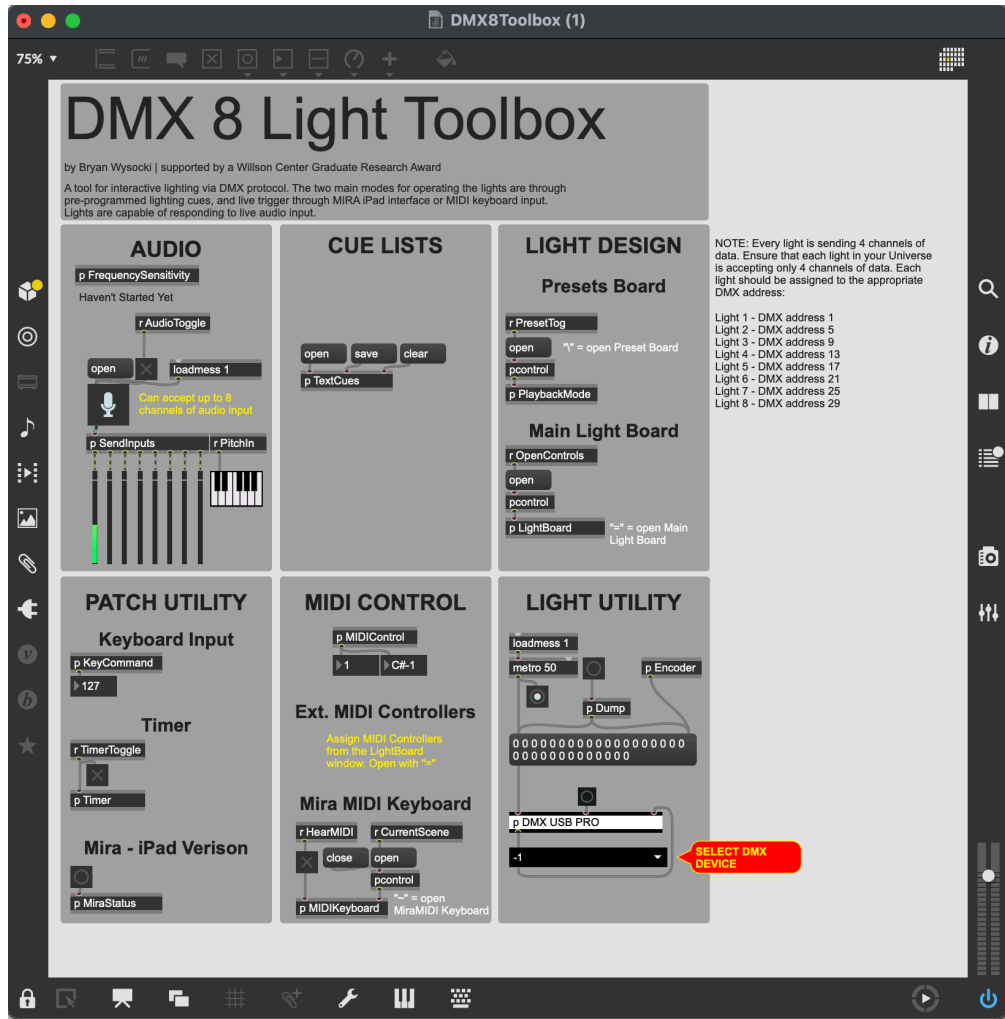


Figure 6 – The backend of the original DMX 8 Toolbox, the predecessor to the current Toolbox.

The backend structures for DMX 8 Toolbox and the most updated version of *Toolbox* remained more-or-less the same. Users would select the ENTTEC device in the background level of the patch and then be able to interface with the lights on the upper and middle levels of the patch. This screen is also where the budding lighting designer could connect and route audio signal and MIDI devices to this virtual lighting board.

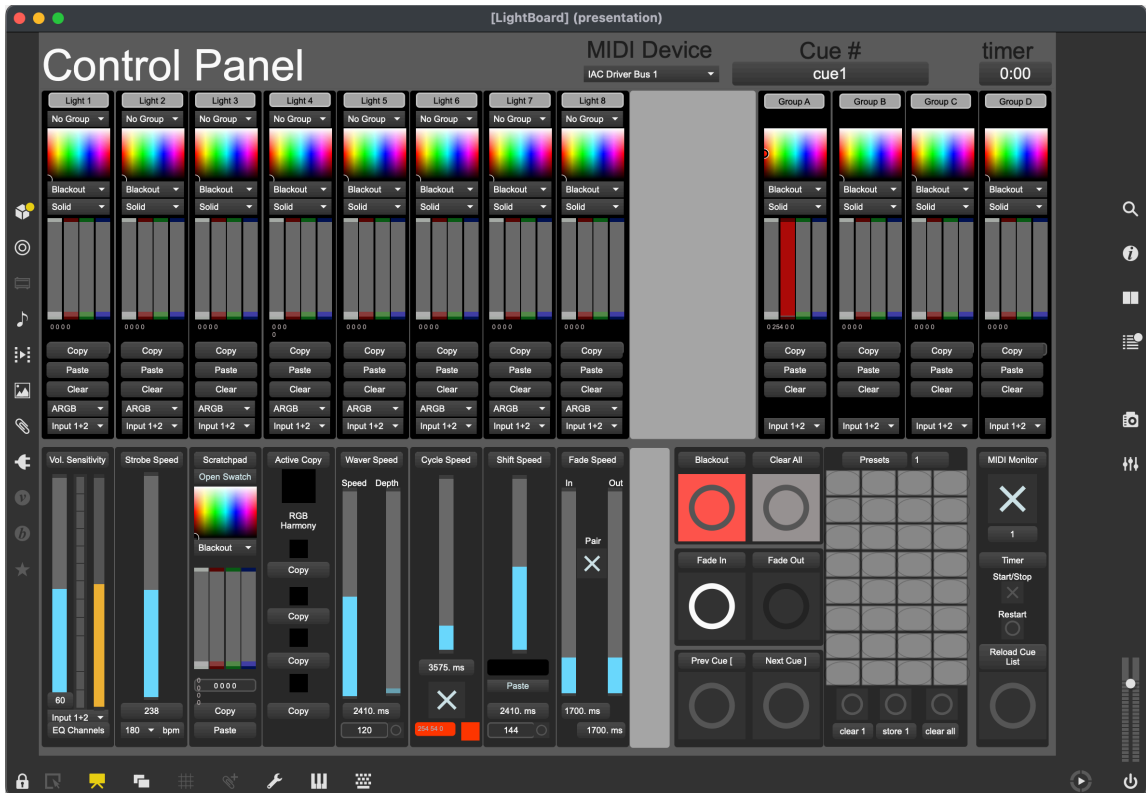


Figure 7 – The user interface (UI) of the original DMX 8 Toolbox.

Users were expected to interact with the second screen, [p LightBoard] (Figure 7), as it has the most intuitive and approachable user interface (or UI). It contained everything necessary to control lighting from an iPad: individual light and group controls, preset scene recall, blackout and fade controls, the ability to set volume sensitivity and strobing speeds, as well as the capability to run a pre-programmed set of cues with the touch of a button. Each object on the screen was also compatible with the Mira external, which allowed each object to be manipulated from a touch screen or web device, such as an iPad or cell phone.

While this initial version of the *Toolbox* met the needs of my own workflow, it became clear that it was not a flexible way of managing a full universe worth of DMX data. This became evident when I tried to create a patch to control the lights installed in the University of Georgia’s Dancz Center for New Music (Figure 8). The installed lighting in the hall was older, used many

distinct types of fixtures, and could possibly be expanded upon at any time, which the DMX 8 Toolbox could not handle.

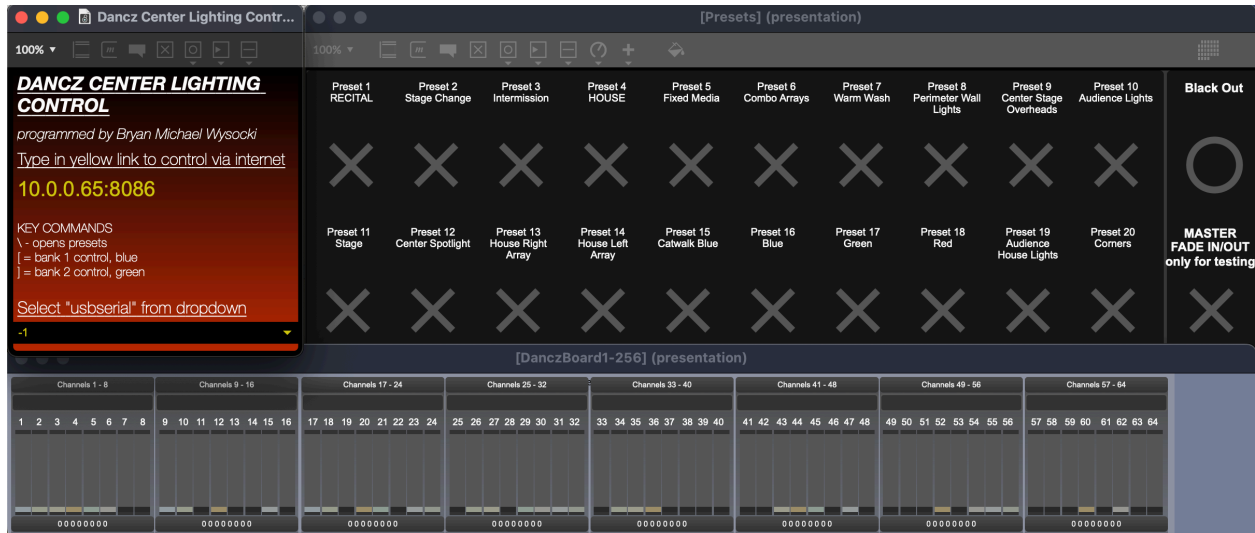


Figure 8 – The Dancz Center Lighting Control patch.<sup>42</sup>

To solve this problem, I needed to create a way to program every channel independently, rather than programming the individual fixtures like in the DMX 8 Toolbox.<sup>43</sup> This led to the creation of the audio patch bay-inspired channel bays and individual channel sends, which are still used inside of the *Toolbox*. These channel bays and sends are used like an audio patch bay to flexibly send and receive lighting values from anywhere inside of the patch. The user was expected to still interact with the fixtures directly from the iPad, but now instead of the values

<sup>42</sup> In both Figure 6 and Figure 8, you may notice that the DMX device selected is “-1”. This is an error that presented itself in older versions of the [serial] connection. To this day, I do not understand from where or how the [serial] object creates the -1 value, but it has been filtered out in modern versions.

<sup>43</sup> In the DMX 8 Toolbox, values were collected by fixture. The channel strip assigned to light 1 sent its data directly to the universe, without stopping at a middle level, like in modern versions of the *Toolbox*. The reason for this middle ground area, now known as the patch bays, is to be able to adjust individual channels without having to assign them to a fixture in the patch first.

going directly to the lights from the UI screen, the values were sent to these bays which aggregated the values into a large list. This aggregating middle ground level could be viewed and interacted with by the user for debugging and monitoring purposes.

Fixtures inside of the patch could now send their output to any channel by using a channel send, rather than by programming the fixture directly into the virtual lighting board. Adding this middle ground structure allowed the DMX universe to be manipulated by the user interface structures, giving the fixtures enough flexibility to change signal routing quickly. Rather than needing to create a new signal routing architecture to accommodate a new light in the universe, the patch represented a whole universe of 512 values by default – fixtures could instead be slotted into any address necessary.

## USING THE ENTTEC DMX TO USB PRO

The *Toolbox* exists as a singular Max patch (or .maxpat file) that sends information to the ENTTEC DMX to USB Pro (Figure 9) over a serial connection. The physical device is a small piece of hardware which connects to a computer via USB cable. The Australian company and manufacturer, ENTTEC, provides a proprietary software to connect to the device for debugging and testing purposes, but not for programming purposes. It has the capability for both sending and receiving DMX data with DMX 5-pin connectors.<sup>44</sup>

It must be noted that I am not the first person to try to connect these two tools, the ENTTEC interface and Max. Earlier versions of this effort include Olaf Matthes' [dmxusbpro]

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<sup>44</sup> The *Toolbox* is not currently capable of interpreting any DMX input. This functionality will be included in later versions of the *Toolbox*.

external.<sup>45</sup> On the many Cycling '74 forums, and in the Light & DMX New Adventures in Max/MSP/Jitter Facebook group, most users utilize Olaf's [dmxusbpro] external as a starting point. However, this external device stopped receiving maintenance sometime around 2007 and is now considered defunct.<sup>46</sup>



Figure 9 – The ENTTEC DMXUSB PRO.

These two tools, the *Toolbox* and Olaf's [dmxusbpro] function very similarly. Where our projects differ is in the scope of the project: the [dmxusbpro] external exists to simply send data to the hardware, much like the [p Universe] patch in the *Toolbox*. However, there is no framework for collecting and formatting a DMX universe of data, nor are there tools for

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<sup>45</sup> Olaf Matthes, "dmxusbpro - DMX 512 external for Max," Self-published, Accessed January 3, 2024, <http://www.nullmedium.de/dev/dmxusbpro/>

<sup>46</sup> The actual date is unclear. Olaf states on his website that the external was "originally developed for Max4.5 and has not been updated ever since." Since Max 4.6 was released in May of 2007, it must have stopped receiving updates in that time.

representing common fixtures in Max. The *Toolbox* provides users with the necessary tools to start designing lighting shows for their own setups right away with the included fixture abstractions and channel send utilities.

To start creating lighting designs with the *Toolbox* in the envisioned manner, some equipment is required:

- The *Toolbox.maxpat* file on the computer.
- The ENTTEC DMX to USB Pro interface.
- USB cable to connect the ENTTEC interface to the computer.
- The appropriate DMX cable to connect the output of the ENTTEC interface (5-pin) to the input of a DMX fixture (depending on your fixture's input, either a 3- or 5-pin converter may be necessary as well).
- A DMX fixture(s).
- A DMX signal terminator on the last light in the sequence.<sup>47</sup>

The signal flow for operating the *Toolbox* as designed is outlined in Figure 10. Once the physical components are connected using the correct cabling, open the *Toolbox 1.0.maxpat* file on the computer. This will open Max/MSP and bring the user to the home page of the *Toolbox*. More information about exactly what is contained within the home screen and how to use the *Toolbox* in general is included in the next chapter.

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<sup>47</sup> A signal terminator is not always necessary to operate a DMX universe, but it is strongly encouraged and recommended to close the electrical system.

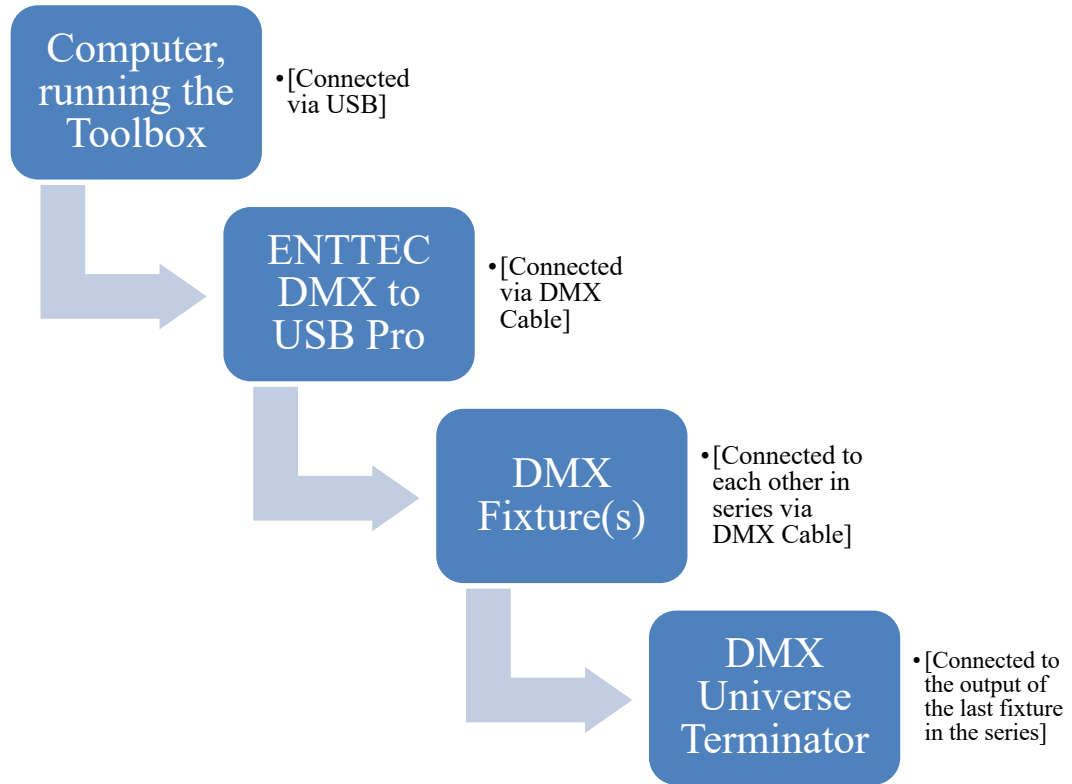


Figure 10 – A diagram of the correct signal flow for operating the Toolbox.

After the ensuring the correct routing, the next step is ensuring that the ENTTEC device is both running the latest and transmitting DMX data. This can all be achieved inside of the ENTTEC client that first opens when the device is connected to the laptop. Once properly calibrated, the ENTTEC device can now be used within Max to create interactive lighting design. Having now connected the hardware to the software, it is now possible to use the *Toolbox* – as it now meets my limiting criteria: the *Toolbox* is free of cost (considering I already owned a copy of Max) and it is also in a programming environment I was (now intimately) familiar with.

## CHAPTER 4

### DEFINING – WHAT IS IN THE *TOOLBOX*?

#### OVERVIEW OF OBJECTS

The *Toolbox* is a single Max patch file that should be used as a resource for composers interested in creating their own lighting designs. The intended function for the patch is for every object or subpatch in the *Toolbox* to be copy-and-pasted into a separate project by the user, rather than having a user directly manipulate objects inside of the original file. This sort of workflow should be familiar with anyone who has used the help or reference files included in Max.<sup>48</sup>

Organizationally, the *Toolbox* is divided into several sections, with similar functions grouped together in a subpatch. These distinct functions are identified in the separate tabs that are placed at the top of the Home Screen. The organizational structure for the *Toolbox* contains multiple tabs as seen in Table 1. The structure created by these tabs provide two significant benefits:

1. It keeps objects that perform similar tasks in the same location. This allows users to find information easily and quickly.
2. It optimizes the real estate of the patching environment to keep the user interface clean and organized.<sup>49</sup>

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<sup>48</sup> Max's included reference files for an object are fully editable; meaning that a user can edit and then save over a reference file. The practice of editing a reference file should be avoided for the default reference files as well as for the *Toolbox*.

<sup>49</sup> This feels like an apt place to inform the reader of my high school computer science teacher's favorite saying: "good code is clean code".

Tab Name	Function
1. Toolbox 1.0 (root) <sup>50</sup>	1. Contains the <i>Toolbox</i> at the parent level.
2. Critical Tools	2. Contains tools necessary for interfacing with the ENTTEC.
3. Fixtures	3. Contains abstractions of common DMX fixtures.
4. MIDI Controls	4. Contains tools for manipulating fixtures with MIDI.
5. Input Controls	5. Contains tools for manipulating fixtures with Audio Signals.
6. Color Utilities	6. Contains tools for manipulating color data.
7. Preset Definitions	7. Contains tools for manipulating global values.

*Table 1 – The organizational structure of the Toolbox.*

What follows next is an in-depth technical overview of each Tab, and the objects contained within. Given that a text format is not the ideal medium to convey this information, the reader should be advised that information contained hereafter is collected here as a general reference. It provides brief instructions on how to use these objects, but it is mainly a repository for defining the objects and functions contained in the *Toolbox*. For a more generalized resource for this information, I will refer readers to my personal website which contains tutorials for each of these objects. However, if you are reading this document to understand how the *Toolbox* works, this may be a suitable time to open the *Toolbox* and follow along on your own computer.

## HOME SCREEN

When you first open the *Toolbox*, you will be greeted by the home screen (Figure 11); this page contains all the “guts” of the *Toolbox*. All user interface for the *Toolbox* is consciously hidden inside of multiple subpatches to encourage and assist users in copying the relevant

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<sup>50</sup> Also referred to interchangeably as the *Home Screen*.

information into their own patches, rather than interfacing directly within the *Toolbox*. This home screen has four main sections:

1. The header, which relays the version of and date of last update.
2. A necessary section, labeled in red, called [p “Critical Tools”].
3. A necessary section, labeled in red, called [p Fixtures].
4. Two non-essential sections, labeled in yellow, which contain other tools.



Figure 11 – The home screen of the Toolbox.

To use the *Toolbox* to create your own lighting designs, you would copy any subpatches labeled “NECESSARY FOR USE” and paste them into your own project. The necessary subpatches are marked in red and include the subpatch [p “Critical Tools”] and [p Fixtures].<sup>51</sup> The subpatch [p “Critical Tools”] is where the serial connection between your computer and the ENTTEC DMX to USB Pro occurs. It is also where the key functions, such as the universal blackout, channel sends, and channel bays “live” in the patch. The subpatch [p Fixtures] is required to create patching representations of the physical lights you wish to send DMX data to.

The optional subpatches are useful for controlling and working with fixtures once you have already created your project and connected your DMX universe to the hardware. You may also notice that the latest version of the patch is listed in several places: the filename, the active tab on the toolbar, under the authorship, etc. It is important to use the latest version of the *Toolbox* to avoid any issues with compatibility.

## CRITICAL TOOLS

If you were to open the subpatch [p “Critical Tools”], it would bring you to the screen below (Figure 12), Critical Tools. As the name suggests, these are the most critical tools for using the *Toolbox* – without these subpatches, you would not be able to connect to the ENTTEC DMX to USB Pro. The first section, Universe Control and the subpatch [p Universe] is the “brain” of the patch. The two blackout objects contained within, [p BoutS] and [p BoutR], are not functionally necessary, but are included in the Critical Tools section because they are used by objects inside the [p Universe] subpatch, which is required. They are also incredibly useful and

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<sup>51</sup> It is also highly recommended that you copy over the subpatch [p “Preset Definitions”] if you are going to use any of the pre-built fixtures, as the [umenu] dropdown presets will be able to be converted by [p ConvertRGB].

recommended for inclusion in every patch. One may imagine the benefits of having a panic switch that (nearly) instantaneously kills all values.

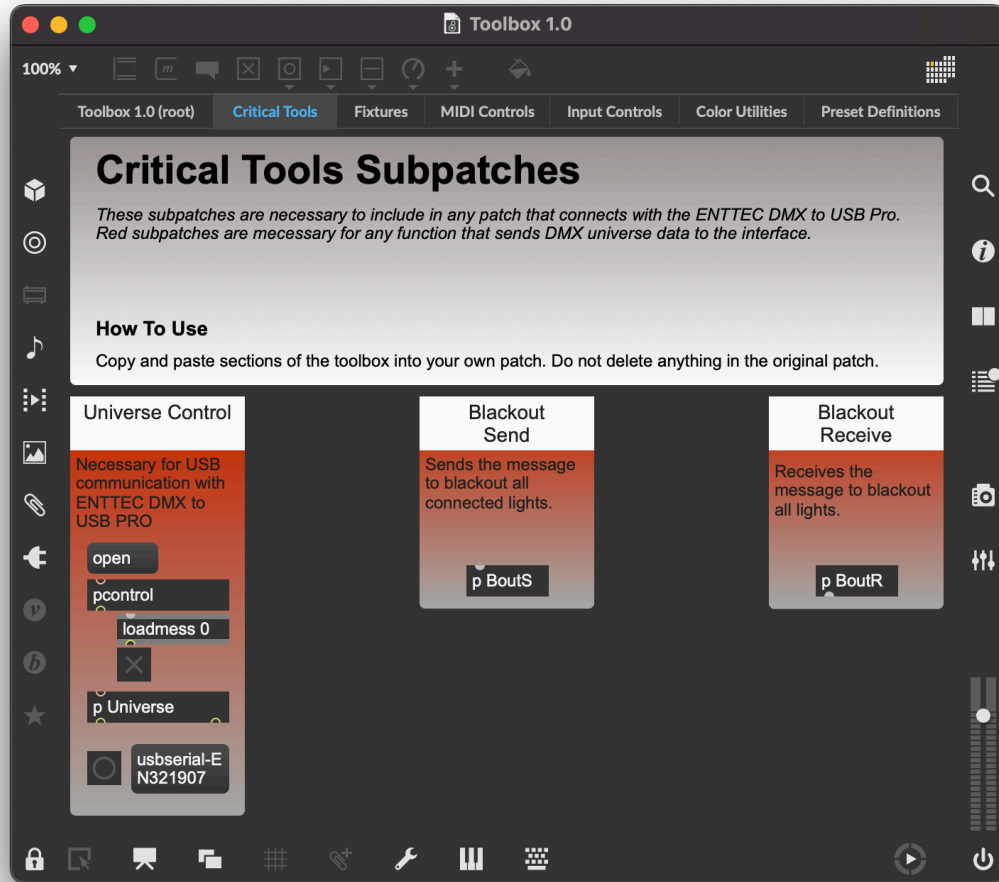


Figure 12 – Critical Tools. This section contains all the backend tools necessary for communicating with the ENTTEC DMX to USB Pro in Max/MSP.

Before we continue further, it is important to understand how [p Universe] works; so that one could send DMX data efficiently and effectively to their fixtures. The subpatch [p Universe] is a representation of one DMX Universe within the *Toolbox*. As we discussed in a previous section, a DMX universe of data is a list of 512 individual numbers which are sent to each fixture. The subpatch [p Universe] collects and sends all 512 channels of the universe to the

ENTTEC DMX to USB Pro over a serial connection. It is the last stop for the patch to alter the DMX universe before it is sent to the external device.

In the *Toolbox*, individual fixtures are represented by fixture abstractions that send values using the channel send object [s ch#]. For example, if you wanted to send values from an abstraction to a physical fixture assigned to channel 12, you would modify the [s ch#] object to read [s ch12]. These channel sends are aggregated in a middle ground level known as the Channel Bays (which are accessible in the *Toolbox* by pressing [ or ]). From these bays, the data is sent to the ENTTEC device.

The Channel Bays (as shown in Figures 13 and 14) are incredibly useful tools for debugging and programming. Each slider directly corresponds to one channel of values in the universe: slider 1 corresponds to channel 1 of the Universe, slider 2 corresponds to channel 2 of the universe, and so on. The bays are grouped into banks of 8 channels for visual clarity. The [textbox] object at the top of each bank can be used to label groups of fixtures. Additionally, the text popover for each slider can be labeled by changing its “hint” attribute in the Max inspector.

The Channel Bays are a middle ground level that are not intended to be used directly by the User – except when debugging and monitoring individual values. Another middle ground level patch, the [p EncoderUniverse1] subpatch, aggregates the values of each channel in both Channel Bays (channels 1-256 and channels 257-512 respectively)<sup>52</sup> into one large list of 512

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<sup>52</sup> This is a bit of a misleading statement. Because the header and footer data tags required by the ENTTEC (more on this later) are 6 values long, and the hardware can only receive 512 channels of information total, you can only transmit 506 channels of data. For the average user, this should still be enough channels. However, it is possible for lighting designers to require the use of more than one universe. Presently, it should be possible to do this in the *Toolbox* by using two ENTTEC DMX to USB Pros on two different serial devices – but this has not been tested. One would need to have two different [p Universe] objects and need to do a significant amount of backend repatching in both the encoder and channel send objects to make this possible.

values. This patch is not easily accessible by the user because it functions as an aggregator, and it contains no objects that a User needs to interact with.

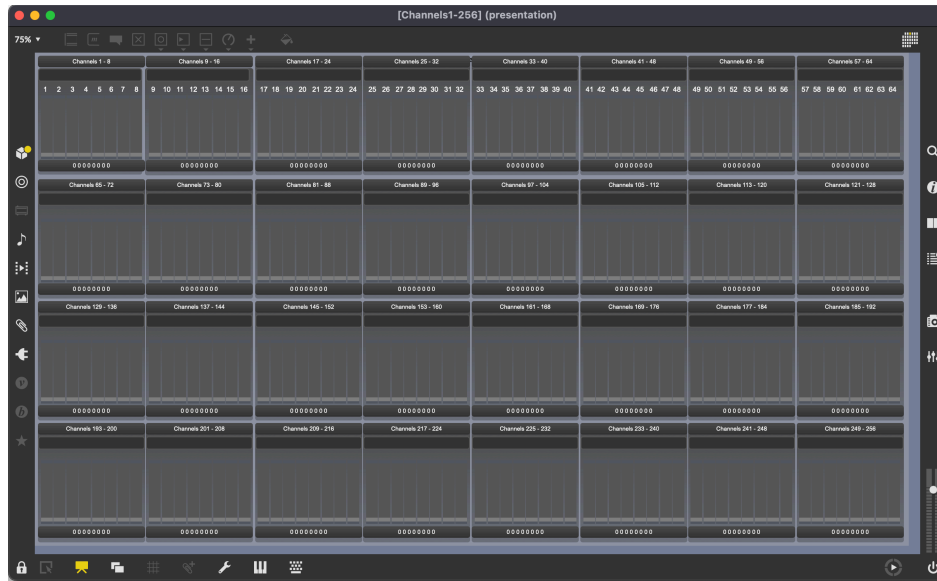


Figure 13 – Channel Bay 1 shows the current state of the Universe for channels 1-256. Users can open this screen by pressing the [ key on their keyboard while the Toolbox is open.

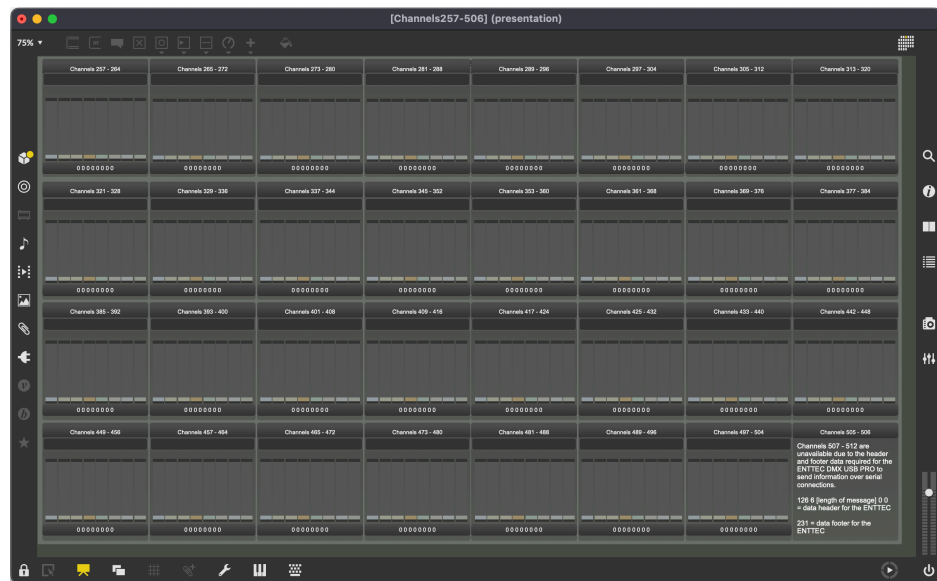


Figure 14 – Channel Bay 2 shows the current state of the Universe for Channels 257-512. Users can open this screen by pressing the ] key on their keyboard while the Toolbox is open.

The chart below (Figure 15) outlines the intended signal flow of DMX values inside of the *Toolbox* from the Upper level – where the User is manipulating individual fixtures – to the Hardware level, where the values are being physically displayed by the lights in the real world. The level designations are based on how often a User should be interacting with the objects included at a given level.

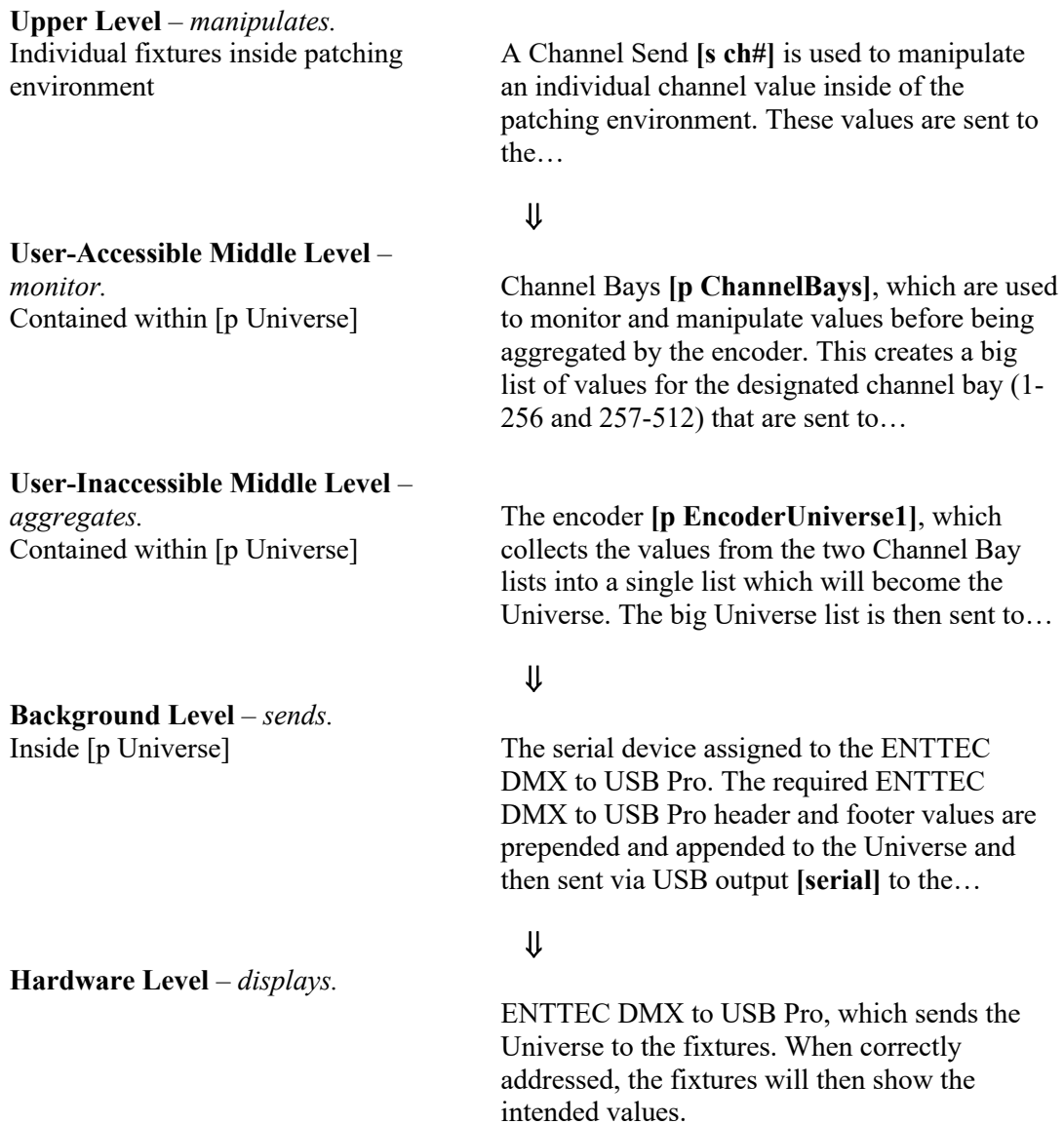


Figure 15 – A diagram of signal flow inside of the *Toolbox* from User level to Hardware level.

To understand how [p Universe] functions and communicates with the ENTTEC DMX to USB Pro, it is important to understand the signal flow inside of the subpatch.<sup>53</sup> Objects inside of the patch performing similar tasks have been color coded with similar colors to show function. The red area regulates the status and timing of the device, the orange [p ChannelBays] object collects individual channel values, and the green [p EncoderUniverse1] object creates a large list from those values. The blue area monitors and translates the universe of data to the device, which is shown in the purple area. The yellow area determines which serial devices are available and controls which serial device the universe is sent to.

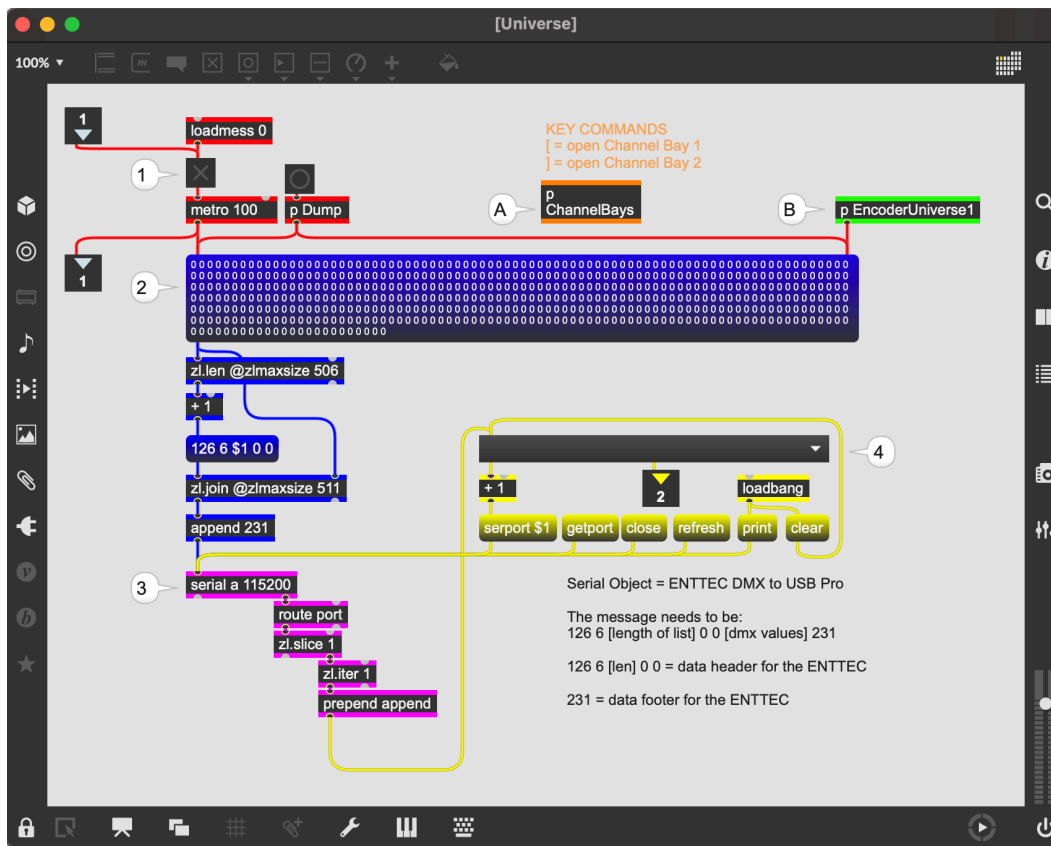


Figure 16 – A look inside of [p Universe].

<sup>53</sup> It may be helpful, both for this subpatch and every other subpatch in this document, to keep a bookmark handy, or pull up the *Toolbox* on a computer, so that you may be able to trace the “spaghetti” of patch cables.

The first inlet and [loadmess] are connected to a [toggle] that shows the status of the universe. A value of one turns the universe on and a value of zero turns the universe off. This toggle controls whether the universe is being transmitted to the hardware at a regular rate. The [metro] object sends a bang to the universe every 100ms to refresh the information. A value of 0 turns the [metro] off and stops the transmission of information to the ENTTEC interface. The outlet connected to the [metro] is connected to a bang in the Critical Tools patch for monitoring purposes.

The large blue [message] object in the middle of the patch (labeled 2) is the representation of the Universe. It contains 512 pieces of information, each representing a single DMX channel. The [p UniverseEncoder1] collects all the values for the Universe into one large list and sends that list to the Universe's right inlet (labeled B). This fills the Universe with the values from the encoder without transmitting the information to the ENTTEC interface every time it updates.

Not sending an updated list to the interface whenever the values in the Universe change would seem like an oversight; however, there is a reason for this. If the encoder were set to both left and right inlets of the Universe, then every time one of the values changes, the Universe would update. On paper this sounds like it would be the intended function; however, if the values are updating at a rate faster than the hardware can process, problems can arise in stability and functionality. The ENTTEC DMX to USB Pro is capable of a refresh rate of anywhere between 1 to 40 fps or (frames per second) (ENTTEC 2022). In this instance, a frame is an entire universe of data being transmitted. The 100ms speed is equivalent to 10fps, which gives both the user and

the hardware some flexibility. Instead, the purpose of the [metro 100] object is to create a limiter on the Universe, making sure that the device is only refreshed once every 100ms.<sup>54</sup>

After the [metro] sends a bang to the Universe, the necessary data tags for the ENTTEC DMX to USB Pro are added to the list. These values are required for the device to recognize the information as a DMX universe that the hardware should process. Because the ENTTEC device is a USB device, it is possible to open the serial connection and send it any information; but by adding these data tags, the device will correctly recognize the values as a DMX universe and treat it as such. The correct header value is “126 6 (the length of the list) 0 0” and the correct footer is “231.” Where these values come from is a bit of a mystery to detangle, as this information is not readily available on the ENTTEC website. As with a lot of internet-based DIY projects, the information had to be gathered from forums, YouTube tutorials, and Facebook groups.

Now that the Universe list is correctly formatted, it can be sent to the hardware via the [serial] object (labeled 3 in Figure 16). The correct device will need to be selected, by selecting the correct hardware in the yellow dropdown menu (labeled 4 in Figure 16). When the *Toolbox* initializes, Max scans the available USB ports and populates them into the dropdown [umenu] object. The best practice is to always select the correct DMX interface when you open any patch that uses the *Toolbox*.<sup>55</sup>

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<sup>54</sup> This rate can be changed by changing the value of the [metro] object.

<sup>55</sup> If your computer has a Bluetooth port, it is possible that the Bluetooth port will show up as a serial device. Ignore this and select the ENTTEC device, which usually has a serial name of *usbserial-ENXXXXX*.

<b>[p Universe]</b>	<i>collects, controls, and communicates the DMX universe to the physical hardware</i>	
<b>Inlet</b>		<b>Outlet</b>
8. Toggle. Optional: connect [pcontrol] to open and close the [p Universe] subpatch		8. Bang 9. Name of the active [serial] device

*Table 2 – [p Universe] is the object that interfaces with the ENTTEC hardware.*

The blackout subpatches [p BoutS] and [p BoutR] are used for the critical ability to immediately set every value in the universe to 0. These blackout objects work on the channel bay and fixture level, meaning that you do not need to connect any blackout objects to specific fixtures, as the feature is built-in to the fixture abstractions. If you copy the [p #chFixture] abstraction from the Fixtures page, you should not have to attach any other blackout functions to the fixture. To activate the blackout feature, press your keyboard’s escape key.

<b>[p BoutS]</b>	<i>Blackout Send, sends information to every connected object to set its value to 0.</i>	
<b>Inlet</b>		<b>Outlet</b>
1 – Bang or 0 to blackout all connected fixtures. Sends info to the [s Blackout] send		N/A

*Table 3 – [p BoutS] sends global blackout information across the entire universe.*

<b>[p BoutR]</b>	<i>Blackout Receive, receives a blackout message from the [r Blackout] send.</i>	
<b>Inlet</b>		<b>Outlet</b>
N/A		1 – Bang and 0 to blackout all connected fixtures.

*Table 4 – [p BoutR] receives global blackout information across the entire universe.*

## FIXTURES

At the heart of the *Toolbox* is the ability to connect Max objects to physical objects to interact with and control light. The subpatch [p Fixtures] (Figures 17 and 18) contains abstractions for some common lighting fixtures. These abstractions are meant to be virtual representations of the lights that exist in the physical space.

Say for example, that you want to use two 4-channel bar LED lights and two 4-channel par LED lights. To represent these fixtures in a new project, you would copy over four different 4-channel fixtures and place them into your project. From there, you would update the channel sends below each fixture [s ch#] with the correct channels for your fixtures, as per the fixture addressing for your universe. After ensuring the universe is on (and set to the correct device), you would be set to start communicating with the lights.

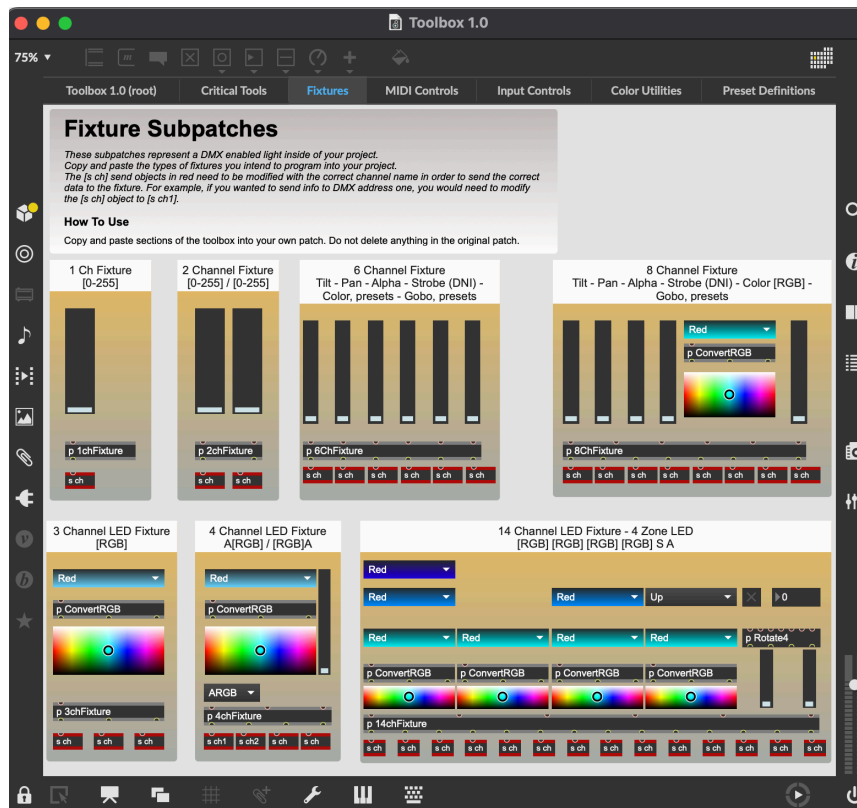


Figure 17 – The first half of the available fixtures.

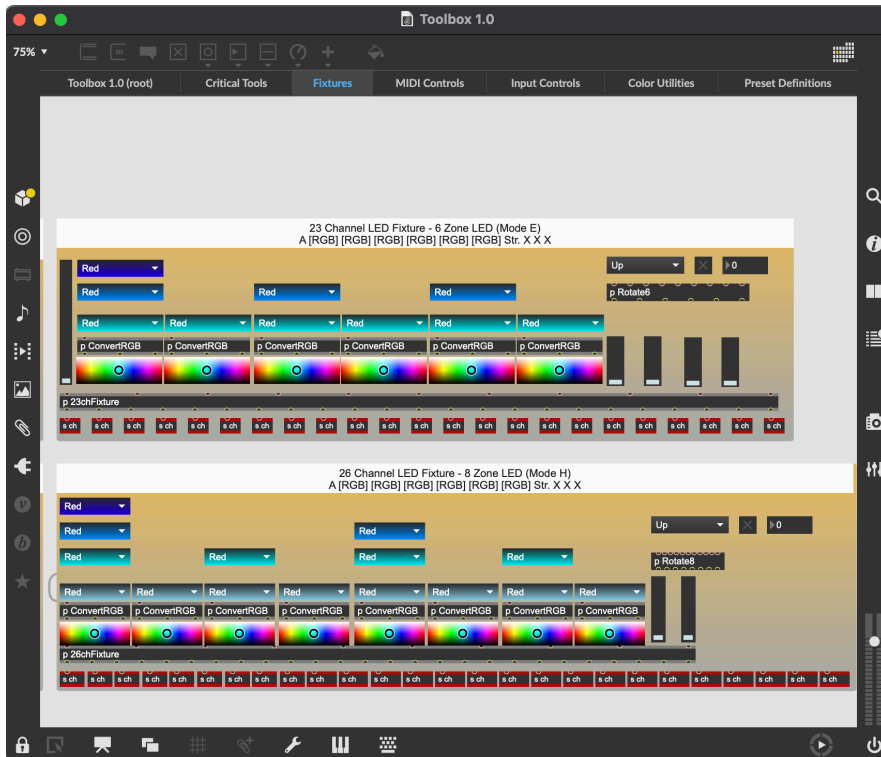


Figure 18 – The second half of the available fixtures.

Before going through each individual type of fixture, it is important to take note of some of the overarching concepts that run through these abstractions – and the physical fixtures that they are meant to model. The most important concept to keep in mind is that a single channel of DMX values is a number ranging from 0 to 255; typically, this can be shown with a value of 0 displaying no light and a value of 255 showing the light full power. All values in a DMX fixture, from its color to its pan/tilt location can be represented from 0 - 255. By using fixture abstractions with the channel sends inside of the *Toolbox*, the patch acts as a large aggregator for each channel of information.

Looking at the fixture abstractions in [p Fixtures] (Figures 17 and 18), it is apparent that most of the fixtures deal with color in some capacity, as shown by the abundance of colorful [swatch] objects. Fixtures with [swatch]es generally represent LED fixtures that can reproduce a

wide range of colors without the use of traditional gels. Additionally, most fixtures use a [slider] to represent what is called the alpha channel, or overall brightness of the fixture. There are also some additional sliders that are used to access additional functions of the light, such as strobe frequency or built-in effects and macros.<sup>56</sup>

It is also important to note that each of these fixtures use both inputs and outputs – inlets and outlets. The output values need to be sent to the appropriate address (or index value) in the universe for the fixture to receive the correct value; this can be handled by using a channel send, or [s ch#] object.

## 1- AND 2-CHANNEL FIXTURES

The most basic fixtures will require only one or two channels of data to operate. Fixtures such as a standard Fresnel light require only one channel to determine its brightness; and a strobe light might require only two values to determine its brightness and speed. These types of fixtures can easily be managed in the *Toolbox* with the [p 1chFixture] and [p 2chFixture] and connected sliders.

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<sup>56</sup> Unless I need it for a specific reason, I avoid using the built-in effects and macros due to personal stylistic preference. However, the strobing values can be incredibly useful. Most fixtures can execute a cleaner strobe than Max because their strobing functions are handled internally. If you were to replicate a strobe in Max, the timing of the strobe may not be precise enough to handle high precision needs due to the restrictions of serial communication.

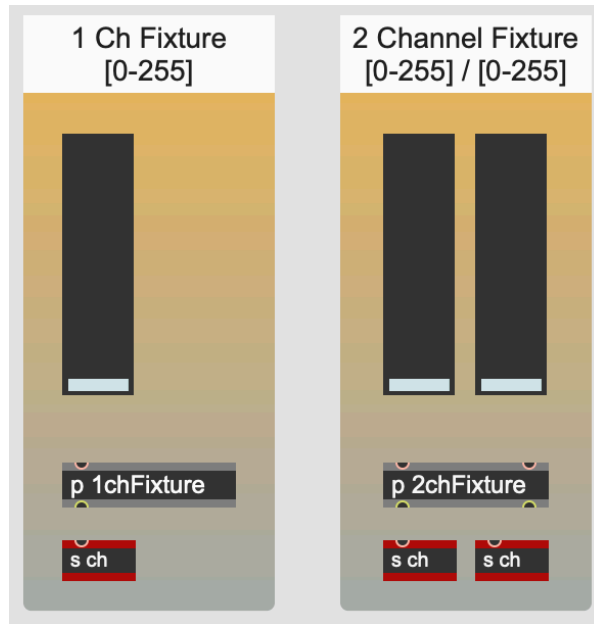


Figure 19 – A view of a [p 1chFixture] and [p 2chFixture].

<b>[p 1chFixture]</b>	<i>1-Channel Fixture controls a simple fixture</i>	
<b>Inlet</b>		<b>Outlet</b>
1. Integer value ranging from 0 - 255		1. Integer value ranging from 0 - 255, connected to a [s ch#] object

Table 5 – [p 1chFixture] is an abstraction of 1-channel fixture.

<b>[p 2chFixture]</b>	<i>2-Channel Fixture controls a simple fixture</i>	
<b>Inlet</b>		<b>Outlet</b>
1. Integer values ranging from 0 - 255 2. Integer values ranging from 0 – 255		1. Integer value ranging from 0 - 255, connected to a [s ch#] object 2. Integer values ranging from 0 - 255, connected to a [s ch#] object

Table 6 – [p 2chFixture] is an abstraction of 2-channel fixture.

The patching inside of each fixture abstraction subpatch is straightforward, as seen in Figure 20; the inlets pass values along to the corresponding outlets without any interference.<sup>57</sup> The [number] object is there to provide a monitor on the inside of the subpatch. It also acts as a convenient way to ensure that your light is automatically connected to the blackout function. As covered in the Critical Tools section, the blackout functions [p BoutS] and [p BoutR] use both the [s Blackout] and [r Blackout]. All fixture abstractions also receive the [r Blackout] send somewhere in their structure. Each time the blackout function is activated, it sets each of the monitors inside the abstraction to zero. This function is included inside of the fixture for the ease of the user; one would not have to worry about forgetting to connect their fixtures to the blackout function, as it already comes pre-connected.

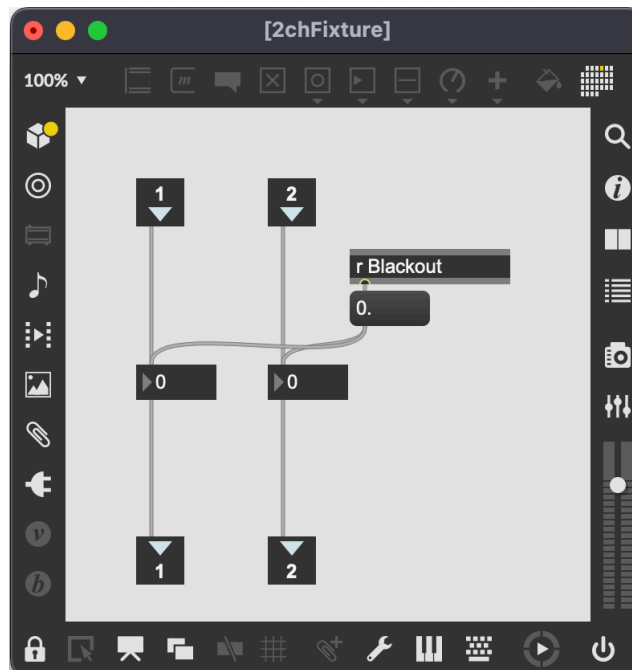


Figure 20 – The anatomy of a [p 2chFixture].

<sup>57</sup> Meaning that Input 1 is passed along to Output 1. This is not always the case for more complicated fixtures.

### 3- AND 4-CHANNEL FIXTURES

Most modern LED fixtures have the option to operate on either a 3- or 4-channel mode, wherein the fixture receives a list of values representing the red, green, and blue values of the intended color. Some models also receive a fourth value called an alpha value, which is the overall brightness of the light. This gives the 4-channel fixtures a significant advantage over the 3-channel fixtures in terms of depth and flexibility of color control.

Going forward, in discussing these types of fixtures (and the 14-, 23-, and 26-channel fixtures), I will be referring to two specific fixtures: the Stage Right 3-Color LED Light Bar (or *bar light* for short) and the Stage Right Party Wash (or *par* or *can light* for short).<sup>58</sup> These simple fixtures are both well-documented, affordable, and relatively easy to use. The default mode for each of these lights is the 4-channel mode, with the can lights using the ARGB mode and the bar lights using the RGBA mode.<sup>59</sup>

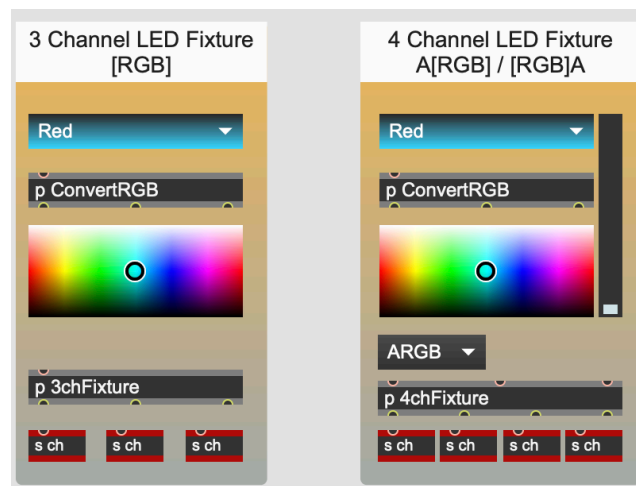


Figure 21 – A look at the default [p 3chFixture] and [p 4chFixture].

<sup>58</sup> As an aside, these lights are called “party washes” because a traditional PAR light is a specific type of light (parabolic aluminized reflector). A more accurate name would be a can light since that refers to its shape.

<sup>59</sup> It is worth referring to the user’s manual for each light. Stage Right. n.d. *Stage Right Party Wash User's Manual*. & Stage Right. n.d. *3-Color LED Light Bar User's Manual*.

<b>[p 3chFixture]</b>	<i>3-Channel Fixture: controls a simple LED fixture</i>
<b>Inlet</b>	<b>Outlet</b>
1 – RGB list	<ol style="list-style-type: none"> <li>1. Integer value corresponding to the intended red value ranging from 0 - 255, connected to a [s ch#] object.</li> <li>2. <i>sim.</i>, but the corresponding green value.</li> <li>3. <i>sim.</i>, but the corresponding blue value.</li> </ol>

Table 7 – [p 3chFixture] is an abstraction of a 3-channel fixture.

<b>[p 4chFixture]</b>	<i>4-Channel Fixture: controls a simple LED fixture with Alpha (brightness) control.</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. Toggle representing the fixture's display mode. Wherein 0 = ARGB, and 1 = RGBA.<sup>60</sup></li> <li>2. RGB list.<sup>61</sup></li> <li>3. Brightness value</li> </ol>	<ol style="list-style-type: none"> <li>1. Integer value (0 - 255) of the first value of the mode, dependent on mode (ARGB or RGBA). If ARGB mode is selected, this would output the Alpha value; conversely, if RGBA mode is selected, this would output the red value.</li> <li>2. <i>sim.</i>, but the corresponding second integer value of the mode.</li> <li>3. <i>sim.</i>, but the corresponding third integer value of the mode.</li> <li>4. <i>sim.</i>, but the corresponding fourth integer value of the mode</li> </ol>

Table 8 – [p 4chFixture] is an abstraction of a 4-channel fixture.

<sup>60</sup> Wherein RGBA = Red, Green, Blue, Alpha and ARGB = Alpha, Red, Green, Blue. Most fixtures will include this information in the DMX Modes section of their User Manual.

<sup>61</sup> The term *RGB List* will be used frequently from here on. The RGB List refers to a [message] or list containing three integers, each with a value ranging from 0 - 255. The three integers correspond to the red, green, and blue values of the intended color.

Both fixtures use a [swatch] controller, enabling the color displayed by the light to be controlled on-screen by the user. A [swatch] object by default outputs a list of four float values out of its leftmost outlet. The first three values represent the RGB values, ranging from the float numbers 0. - 1.0, as opposed to the DMX-friendly integers 0 - 255. Fortunately, Max has enabled this style of output on the [swatch] objects by including an attribute called “compatibility.”<sup>62</sup> A compatibility value of 0 sets the default [swatch] output to floats (0. - 1.0), and a value of 1 sets the output to integers (0 - 255). There are three easy remedies to ensuring that you are always using the correct values:

1. Use the default [swatch] that is connected to the fixture, as it automatically outputs a list of 0 - 255 integers.
2. Use a *Toolbox* subpatch called [p Converter], which converts floats and integers.
3. Manually edit the [swatch] attributes, either by sending it the correct compatibility value, or by changing the style in the inspector.

Both the 3- and 4-channel fixtures are also connected to dropdown [umenu] objects that are pre-populated with preset colors. These presets can be manipulated inside of the Preset Definition subpatch.<sup>63</sup> When a preset is selected from the [umenu], the text of the selection is sent to [p ConvertRGB] (Figure 22) which selects the correct color value to be displayed. The values for each color used in [p ConvertRGB] can be manipulated in the [p Preset Definitions] subpatch.

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<sup>62</sup> This is also configurable in the Max inspector by clicking an attribute labeled “Output Old Style 0 - 255 Values.”

<sup>63</sup> As mentioned before in the Critical Tools section, if you are going to use any of the prebuilt fixtures in [p Fixtures], it is a good idea to also copy the subpatch [p “Preset Definitions”] into your project as well.

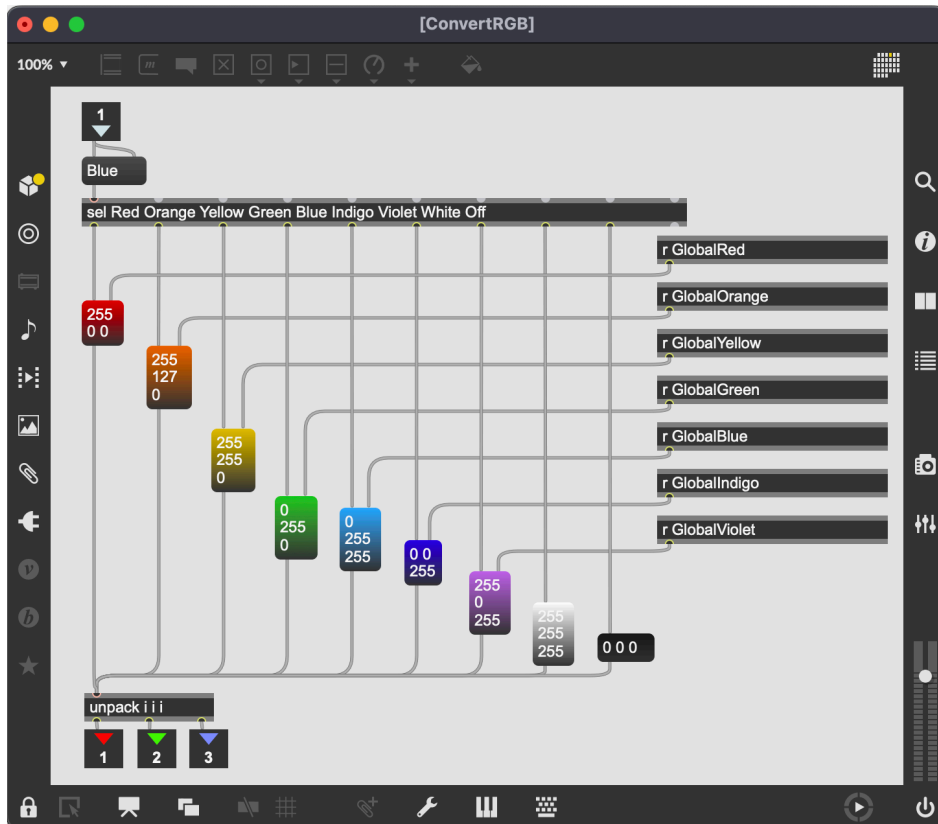


Figure 22 – The internal workings of [p ConvertRGB].

[p ConvertRGB]	<i>Converts presets into RGB values.</i>	
Inlet	Outlet	
1 – Item text evaluated as a message from the connected [umenu]. Available preset colors include red, orange, yellow, green, blue, indigo, violet, white, and off (black).	<ol style="list-style-type: none"> <li>1. Integer value (0 - 255) corresponding to the intended red value ranging from 0 - 255, connected to the corresponding color inlet on an old style (0 - 255) [swatch].</li> <li>2. <i>sim.</i>, but the corresponding green value.</li> <li>3. <i>sim.</i>, but the corresponding blue value.</li> </ol>	

Table 9 – [p ConvertRGB] converts presets from a dropdown menu into RGB values.

## 6- AND 8-CHANNEL FIXTURES

These fixture abstractions represent moving head fixtures. These types of fixtures can swivel and rotate the lens in physical space by using pan and tilt values. It should be noted that most fixture abstractions from here on out are incredibly individualized for each specific fixture. Fixtures are manufactured with any number of possible inputs, each with their own unique input requirements – so it is wise to use these pre-built fixtures as models for creating your own abstractions for the specific fixtures you may be working with, rather than assuming these abstractions will work for every type of moving head light.<sup>64</sup>

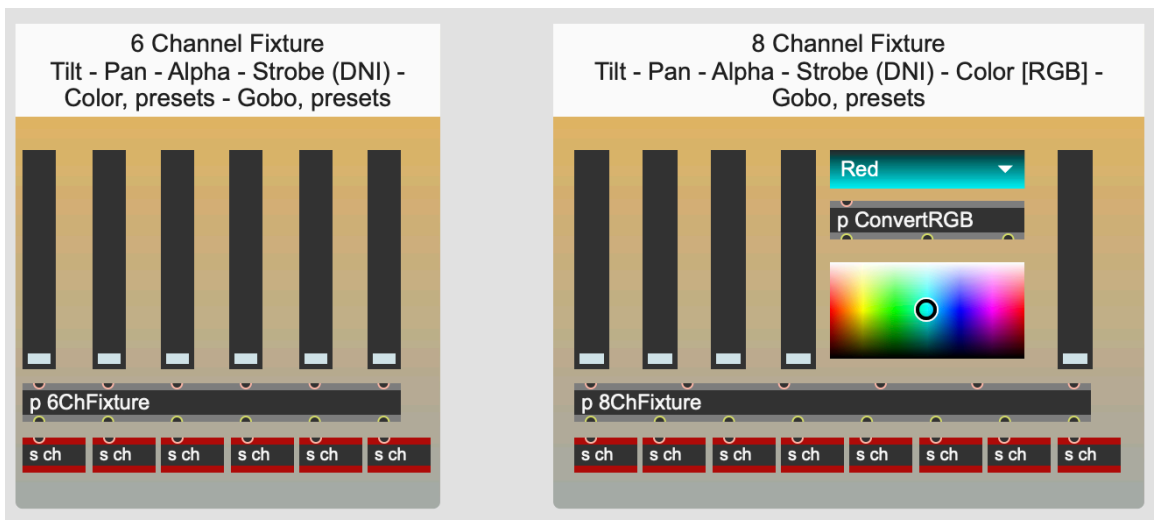


Figure 23 – 6- and 8-channel fixtures.

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<sup>64</sup> If you require a certain type of abstraction to represent a specific light, please email me through my website ([bryanwysocki.com](http://bryanwysocki.com)) with the User Manual so that I can create a new type of abstraction. Creating abstractions for every single type of fixture out there would be a significant undertaking, and well beyond the scope of this project.

<b>[p 6ChFixture]</b>	<i>Represents a simple Moving Head fixture</i>	
<b>Inlet</b>		<b>Outlet</b>
1. Tilt, 0 - 255		1. Tilt, 0 - 255
2. Pan, 0 - 255		2. Pan, 0 - 255
3. Alpha, 0 - 255		3. Alpha, 0 - 255
4. Strobe, 0 - 255		4. Strobe, 0 - 255
5. Color preset (non RGB, refer to User Manual), 0 - 255		5. Color preset (non RGB, refer to User Manual), 0 - 255
6. Gobo preset (refer to User Manual), 0 - 255 <sup>65</sup>		Gobo preset (refer to User Manual), 0 - 255

*Table 10 – [p 6chFixture] is an abstraction of a 6-channel fixture.*

<b>[p 8ChFixture]</b>	<i>Represents a simple Moving Head fixture</i>	
<b>Inlet</b>		<b>Outlet</b>
1. Tilt, 0 - 255		1. Tilt, 0 - 255
2. Pan, 0 - 255		2. Pan, 0 - 255
3. Alpha, 0 - 255		3. Alpha, 0 - 255
4. Strobe, 0 - 255		4. Strobe, 0 - 255
5. Color, RGB List		5. Red Value, 0 - 255
6. Gobo preset (refer to User Manual)		6. Green Value, 0 - 255
		7. Blue Value, 0 - 255
		8. Gobo Value, 0 - 255

*Table 11 – [p 10chFixture] is an abstraction of a 10-channel fixture.*

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<sup>65</sup> A gobo is a disk placed in front of the light source to create a pattern. These are often used to give the light some texture or variance, rather than just a full wash of color. Each light is different, and different values produce different gobos. Refer to the fixture’s User Manual and experimentation, when possible, for determining the values for each gobo.

## 14-, 23-, AND 28-CHANNEL FIXTURES

While the sheer number of DMX output values for these fixtures may seem excessive, as if they were intended for extremely complicated fixtures –these abstractions are representations of the different modes that a typical 4-channel fixture can use. For reference, each of the 4-channel Stage Right lights mentioned earlier can use multiple DMX modes. Each mode allows for individual control over various aspects of the light. Using the Stage Right lights, as an example:

- Bar Light
  - 2-Channel: Color Macros, Speed (*abstraction not yet created*)<sup>66</sup>
  - 3-Channel: RGB
  - 4-Channel: RGBA
  - 14-Channel: Zone 1 RGB, Zone 2 RGB, Zone 3 RGB, Zone 4 RGB, Strobe, Alpha
  - 7-Channel: RB, Color Macros, Speed, Strobe, Alpha (*abstraction not yet created*)
  - 26-Channel: Zone 1 RGB, Zone 2 RGB, Zone 3 RGB, Zone 4 RGB, Zone 5 RGB, Zone 6 RGB, Zone 7 RGB, Zone 8 RGB, Strobe, Alpha
- Can Light
  - 4-Channel: ARGB
  - 8-Channel: ARGB, Strobe, Alpha Macros, Effects, Speed (*abstraction not yet created*)

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<sup>66</sup> On these fixtures, the color macros represent common patterns, like quickly moving through the rainbow, etc.

- 11-Channel: Master Alpha, Pie Section 1 macro, Pie Section 2 macro, Pie Section 3 macro, Pie Section 4 macro, Pie Section 5 macro, Pie Section 6 macro, Strobe, Alpha Macros, Effects, Effect Speed (*abstraction not yet created*)
- 23-Channel: Master Alpha, Pie 1 RGB, Pie 2 RGB, Pie 3 RGB, Pie 4 RGB, Pie 5 RGB, Pie 6 RGB, Strobe, Alpha Macro, Effects, Effect Speed

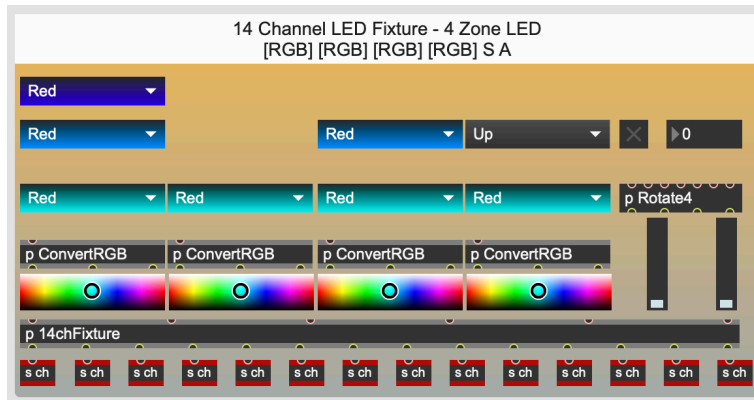


Figure 24 – A [p 14chFixture], capable of splitting a Stage Right bar light into 4 individually controllable zones.

While it is true that a 14-channel fixture is not more complicated than a 4-channel fixture in how it operates, the 14-channel fixtures are able to display more than one color at a time on a single fixture. This means it must have more information needed to control the different zones. This is managed with multiple [swatch] objects – one for each zone of the fixture. The two [slider]s at the end of the abstraction represent the strobe speed and alpha value for the entire fixture. Alpha and strobe values are at the fixture level, not the zone level – you cannot control individual brightness of zones with this alpha slider.<sup>67</sup>

<sup>67</sup> Though it is possible to control the brightness of individual zones by using a useful *Toolbox* subpatch, [p CombiAlpha].

These fixtures use cascading levels of [umenu] dropdown color presets to allow the user to select presets for each zone, for two of the four zones, or the entire light. It functions in a hierarchical manner: with the top level [umenu] (dark blue at the top) controlling the two middle-level [umenu]s (blue) and those two controlling the lowest level [umenu]s (light blue). Individual zones are controlled on the bottom level, the middle level controls half of the light, and the top level controls the entire light.

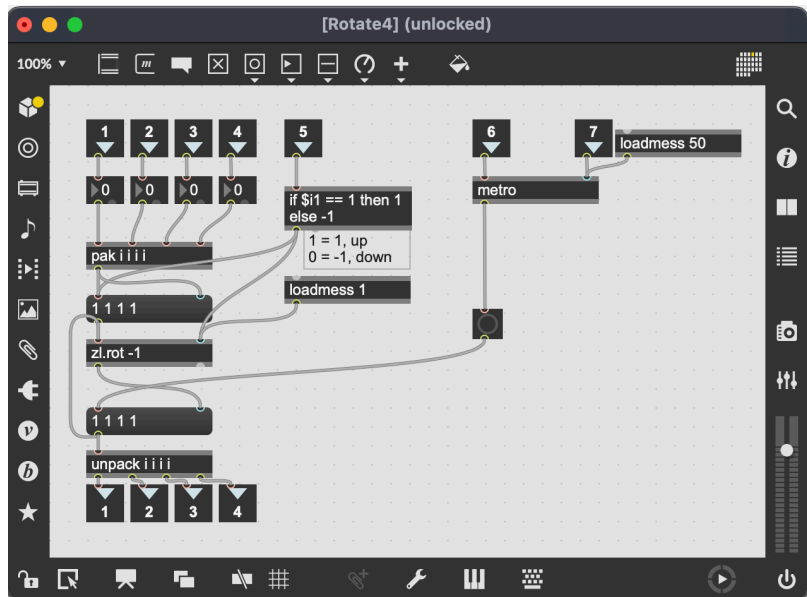


Figure 25 – The structure of [p Rotate4] shows how the values are rotated between the different outlets.

Additionally, this fixture has an additional nonessential but useful feature, [p Rotate4]. This subpatch takes the presets at each of the four zones and rotates them either up or down the lighting fixture (the preset of Zone 1 takes the spot of preset 2, the preset 2 takes the spot of preset 3, etc.) at a user specified direction (default is down) and speed (default is 50ms). The grey [umenu], [toggle], and [number] each control the specified [p Rotate4] parameter. The [p Rotate 4] subpatch is incredibly useful for creating active and dynamic variations of color, as opposed to static washes of one color.

<b>[p Rotate4]</b>	<i>Rotates the four preset values in the given direction and speed.</i>	
<b>Inlet</b>		<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. Current preset value of Zone 1</li> <li>2. Current preset value of Zone 2</li> <li>3. Current preset value of Zone 3</li> <li>4. Current preset value of Zone 4</li> <li>5. Direction of rotation from [umenu] 0/1, with 1 = up and 0 = down</li> <li>6. Rotation on/off from [toggle]</li> <li>7. Speed in milliseconds (optional, default is 50ms)</li> </ol>		<ol style="list-style-type: none"> <li>1. New preset value of Zone 1</li> <li>2. New preset value of Zone 2</li> <li>3. New preset value of Zone 3</li> <li>4. New preset value of Zone 4</li> </ol>

*Table 12 – [p Rotate4] rotates preset values.*

<b>[p 14chFixture]</b>	<i>Represents a 4-zone split on a Stage Right Bar Light</i>	
<b>Inlet</b>		<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. Zone 1 RGB List</li> <li>2. Zone 2 RGB List</li> <li>3. Zone 3 RGB List</li> <li>4. Zone 4 RGB List</li> <li>5. Strobe (0 - 255)</li> <li>6. Alpha (0 - 255)</li> </ol>		<ol style="list-style-type: none"> <li>1. Zone 1 Red Value</li> <li>2. Zone 1 Green Value</li> <li>3. Zone 1 Blue Value</li> <li>4. Zone 2 Red Value</li> <li>5. Zone 2 Green Value</li> <li>6. Zone 2 Blue Value</li> <li>7. Zone 3 Red Value</li> <li>8. Zone 3 Green Value</li> <li>9. Zone 3 Blue Value</li> <li>10. Zone 4 Red Value</li> <li>11. Zone 4 Green Value</li> <li>12. Zone 4 Blue Value</li> <li>13. Strobe (0 - 255)</li> <li>14. Alpha (0 - 255)</li> </ol>

*Table 13 – [p 14chFixture] is an abstraction of a 14-channel fixture.*

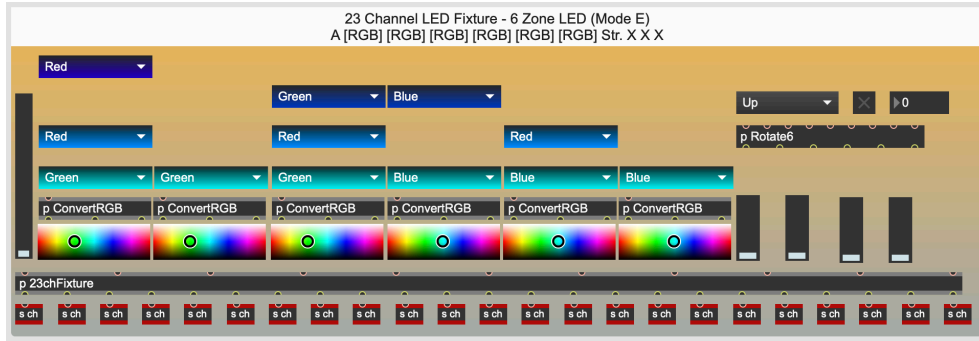


Figure 26 – A [p 23chFixture], capable of splitting a Stage Right bar light into 6 individually controllable zones.

A [p 23chFixture] functions very similarly to a [p 14chFixture], except it has two more individually controllable zones, and three extra sliders. The [p 23chFixture] is used with the Party Wash or Can Lights. It should also be noted that since these abstractions are for two different fixtures (in which the alpha value is either at the front or back of the output list), the master brightness/alpha slider is in two different locations. Bars have it at the front of their message, corresponding to their ARGB format, and Cans have it at the end of their message, corresponding to their RGBA format.

Since this fixture is capable of splitting into six zones, the [umenu] presets can control the entire fixture (darkest blue at the top), half of the fixture (dark blue), a third of the fixture (blue), and each individual zone (light blue). Additionally, the [p Rotate6] subpatch functions exactly as expected, rotating the color presets of each zone by specified direction and speed.

<b>[p 23chFixture]</b>		<i>Represents a 6-zone split on a Stage Right Can Light</i>	
<b>Inlet</b>		<b>Outlet</b>	
1. Alpha		1. Alpha	
2. Zone 1 RGB List		2. Zone 1 Red Value	
3. Zone 2 RGB List		3. Zone 1 Green Value	
4. Zone 3 RGB List		4. Zone 1 Blue Value	
5. Zone 4 RGB List		5. Zone 2 Red Value	
6. Zone 5 RGB List		6. Zone 2 Green Value	
7. Zone 6 RGB List		7. Zone 2 Blue Value	
8. Strobe (0 - 255)		8. Zone 3 Red Value	
9. Alpha Macros <sup>68</sup>		9. Zone 3 Green Value	
10. Effect		10. Zone 3 Blue Value	
11. Effect Speed		11. Zone 4 Red Value	
		12. Zone 4 Green Value	
		13. Zone 4 Blue Value	
		14. Zone 5 Red Value	
		15. Zone 5 Green Value	
		16. Zone 5 Blue Value	
		17. Zone 6 Red Value	
		18. Zone 6 Green Value	
		19. Zone 6 Blue Value	
		20. Strobe (0 - 255)	
		21. Alpha Macros	
		22. Effect	
		23. Effect Speed	

*Table 14 – [p 23chFixture] is an abstraction of a 23-channel fixture.*

<sup>68</sup> You may notice that if you hover over this outlet in the *Toolbox*, that a hint popup will tell you what the specified inlet/outlet is for. This inlet, and others like it, have a *Do Not Interact (DNI)* tag on it to note that it is not something that I personally want to use, as I infrequently use a fixture’s macros and strobe effects in my artistic practice. These inlets will still pass the information as expected; however, I tagged them (DNI) for my own clarity and user-friendliness. These can be removed in the inspector window.



Figure 27 – A [p 26chFixture], capable of splitting a Stage Right bar light into 8 individually controllable zones.

A [p 26chFixture] functions very similarly to a [p 23chFixture], except it has two more individually controllable zones, and three extra sliders. The [p 26chFixture] is used with the Bar Lights. As this fixture is capable of splitting into eight zones, the [umenu] presets can control the entire fixture (darkest blue at the top), half of the fixture (dark blue), a quarter of the fixture (blue), and each individual zone (light blue). As it was with the others, the [p Rotate8] subpatch functions exactly as expected, rotating the color presets of each zone by specified direction and speed.

<b>[p 26chFixture]</b>		<i>Represents an 8-zone split on a Stage Right Bar Light</i>
<b>Inlet</b>		<b>Outlet</b>
1. Alpha		1. Zone 1 Red Value
2. Zone 1 RGB List		2. Zone 1 Green Value
3. Zone 2 RGB List		3. Zone 1 Blue Value
4. Zone 3 RGB List		4. Zone 2 Red Value
5. Zone 4 RGB List		5. Zone 2 Green Value
6. Zone 5 RGB List		6. Zone 2 Blue Value
7. Zone 6 RGB List		7. Zone 3 Red Value
8. Zone 7 RGB List		8. Zone 3 Green Value
9. Zone 8 RGB List		9. Zone 3 Blue Value
10. Strobe (0 - 255)		10. Zone 4 Red Value
11. Alpha Macros		11. Zone 4 Green Value
		12. Zone 4 Blue Value
		13. Zone 5 Red Value
		14. Zone 5 Green Value
		15. Zone 5 Blue Value
		16. Zone 6 Red Value
		17. Zone 6 Green Value
		18. Zone 6 Blue Value
		19. Zone 7 Red Value
		20. Zone 7 Green Value
		21. Zone 7 Blue Value
		22. Zone 8 Red Value
		23. Zone 8 Green Value
		24. Zone 8 Blue Value
		25. Strobe (0 - 255)
		26. Alpha

*Table 15 – [p 26chFixture] is an abstraction of a 26-channel fixture.*

While this is the end of the pre-build fixture abstractions, this is not the end of the road for the many diverse types of abstractions that are possible. There are countless fixtures out there, each with their own specific DMX addressing needs. These abstractions may not work at all for your fixtures based on their specific addressing; however, being able to understand how these abstractions function is critical for being able to create your own abstractions. For example, DMX is frequently used to be able to control fog machines and pyrotechnic fixtures – and these types of fixtures are not covered by any of these abstractions. It is my hope that this project continues to grow to a point where there is a searchable repository of different fixtures available for one to use in their Max projects – but such a project is outside of the scope of this document.

## MIDI CONTROLLERS

One of the main reasons Max/MSP has become an incredibly popular tool for composers is the easy-to-use MIDI functionality built-in to the software. You can assign multiple parameters of input from a MIDI controller to control objects natively in the patching environment, which has given Max a significant degree of flexibility, particularly in the live electronics community. As such, the *Toolbox* can utilize both MIDI controllers and audio signals as input.

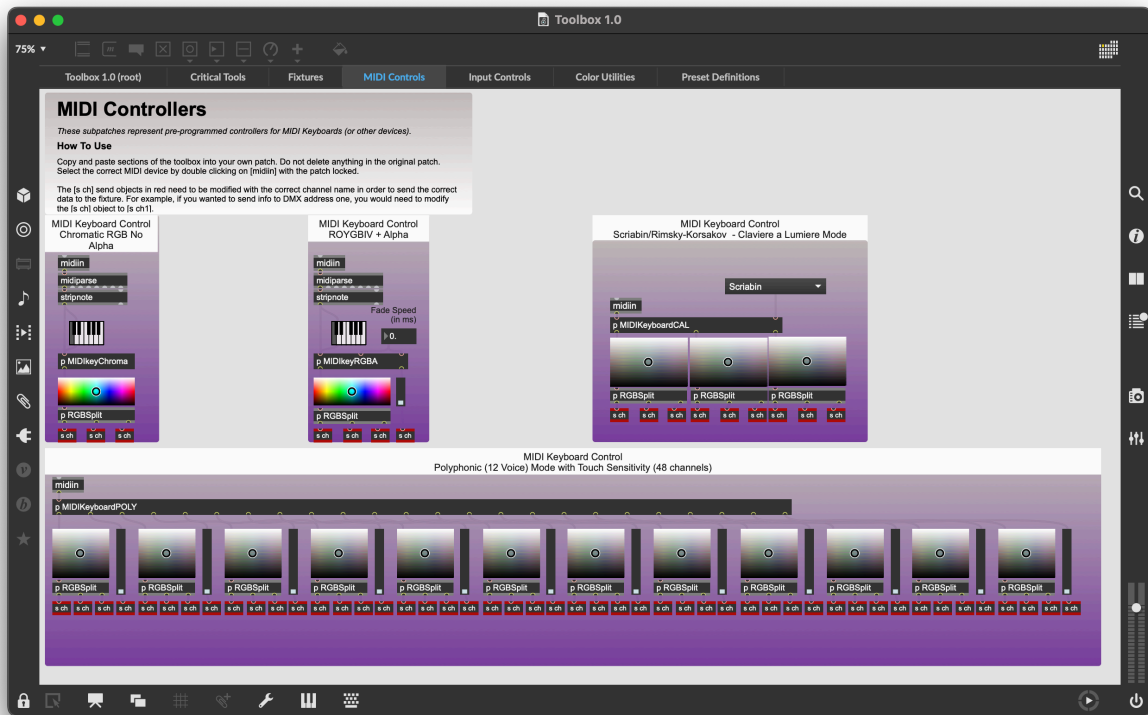


Figure 28 – An overview of all the pre-built keyboard abstractions for interfacing with MIDI.

The prebuilt MIDI controller abstractions included in the *Toolbox* are meant to be used with any MIDI keyboard. Each keyboard abstraction can be assigned to a physical piece of hardware by double clicking on the [midiin] object and selecting the correct input. These keyboards are designed with the human player in mind, as such there are two main ways to use these controllers, where:

- the MIDI keyboard acts as a controller and controls the color output and brightness separately.
- the MIDI keyboard acts like a piano and can control both the color output by pitch and brightness by velocity at the same time.

Due to how Max can handle the mapping of MIDI controllers to certain objects, it is possible to bypass these objects altogether and rely on Max to properly handle MIDI information on its own. This may be necessary in instances where a MIDI controller is not a keyboard or pitch-based instrument – like a drum or sample pad. While these devices are becoming more and more common, the guiding principle for designing MIDI controllers in the *Toolbox* was to create abstractions for the most popular MIDI devices currently available.<sup>69</sup>

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<sup>69</sup> Unfortunately, the *Toolbox* does not have native EWI (Electronic Wind Instrument) or sample pad support.

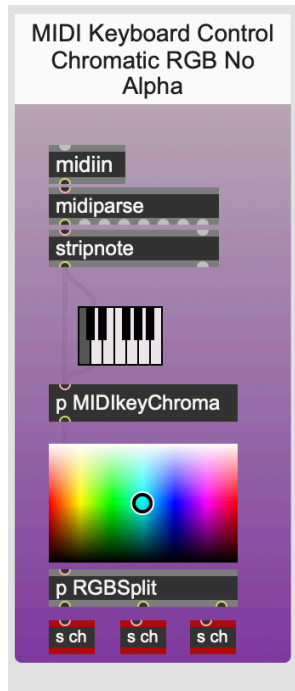


Figure 29 – [p MIDIkeyChroma] allows the performer to simply choose the color with pitch.

The [p MIDIkeyChroma] subpatch effectively allows a MIDI Controller to select colors according to the preset definitions: if you play a C (in any octave), the color assigned by C in the Preset Definitions will be returned, etc. for all 12 chromatic pitches. This is a rudimentary MIDI controller, as it is only concerned with the note on messages to select color; a note off message from the controller will be ignored by the subpatch. This would be useful if you had a small MIDI controller available to just select colors, and if you were controlling brightness values with a different method.

<b>[p MIDIkeyChroma]</b>	<i>A basic MIDI controller for determining colors</i>
<b>Inlet</b>	<b>Outlet</b>
1. Note on Data from a MIDI device.	1. RGB List of the corresponding color

Table 16 – [p MIDIkeyChroma] is a basic MIDI controller for determining colors.

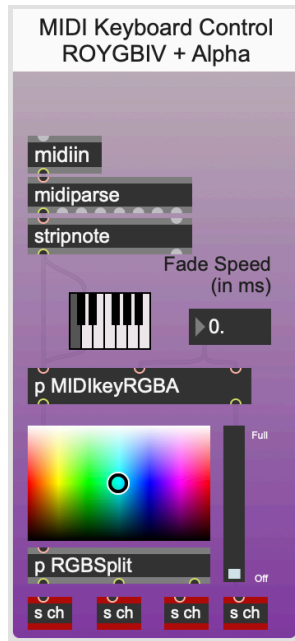


Figure 30 – [pMIDIkeyRGBA] subpatch can control both pitch and brightness from the keyboard.

The [p MIDIkeyRGBA] subpatch can control pitch and brightness at the same time however, it has a smaller pool of colors to pull from. Whereas [pMIDIkeyChroma] can pull 12 colors that correspond to all 12 pitches, [p MIDIkeyRGBA] pulls 7 colors (red, orange, yellow, green, blue, indigo, and violet) for the 7 natural notes (A, B, C, D, E, F, and G) and controls brightness via the accidentals. C# and D# fade the brightness in and out respectively, and F# and Bb immediately sets the brightness to full and 0 respectively; Ab/G# is not used in this setup.<sup>70</sup> This setup allows the performer to “play” the lights by reading traditional piano notation (and is the same type of keyboard used in my piece *Toy Boat*).

<sup>70</sup> For a visualization of how this works, please reference Figure 65.

<b>[p MIDIkeyChroma]</b>	<i>A basic MIDI controller capable of controlling color and brightness.</i>	
<b>Inlet</b>	<b>Outlet</b>	
<ol style="list-style-type: none"> <li>1. Noteon Data from a MIDI device.</li> <li>2. Fade in speed in milliseconds (default 1500ms)</li> <li>3. Fade out speed in milliseconds (default 1500ms)</li> </ol>	<ol style="list-style-type: none"> <li>1. RGB List of the corresponding color.</li> <li>2. Alpha value</li> </ol>	

Table 17 – [p MIDIkeyChroma] is basic MIDI controller capable of changing color and brightness.

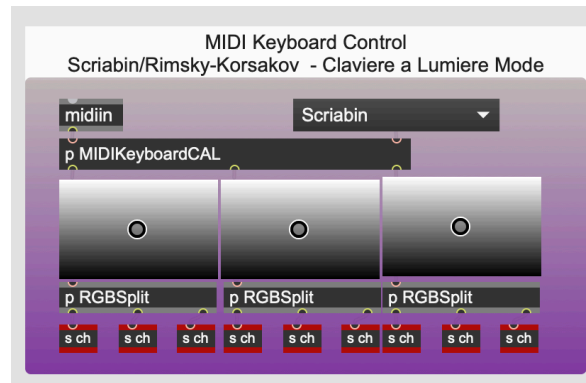


Figure 31 – Clavière à lumières Mode with [p MIDIKeyboardCAL].

The [p MIDIKeyboardCAL]<sup>71</sup> subpatch supports three voice polyphony, which is consistent with what is required to perform the *Clavière à lumières* part in Scriabin’s *Prometheus* tone poem. The dropdown [umenu] changes the preset colors of the *Clavière à lumières* to represent Scriabin or Rimsky-Korsakov’s synesthetic descriptions of the twelve chromatic notes.

<sup>71</sup> One might also notice that the polyphonic keyboards, [p MIDIKeyboardCAL] and [p MIDIKeyboardPoly] both spell out the word Keyboard. The other keyboard abstractions truncate the word to “key” as in [p MIDIkeyRGBA]. This is a subtle distinction that may only be of use to myself.

<b>[p MIDIKeyboardCAL]</b>	<i>A basic MIDI controller capable of three-voice polyphonic color control.</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. MIDI input directly from [midiin]</li> <li>2. Synesthete Mode from [umenu] (Scriabin or Rimsky-Korsakov)</li> </ol>	<ol style="list-style-type: none"> <li>1. RGB List of Voice 1</li> <li>2. RGB List of Voice 2</li> <li>3. RGB List of Voice 3</li> </ol>

Table 18 – [p MIDIKeyboardCAL] is a basic MIDI controller capable of three-voice polyphonic color control, useful for performing Scriabin’s Prometheus.

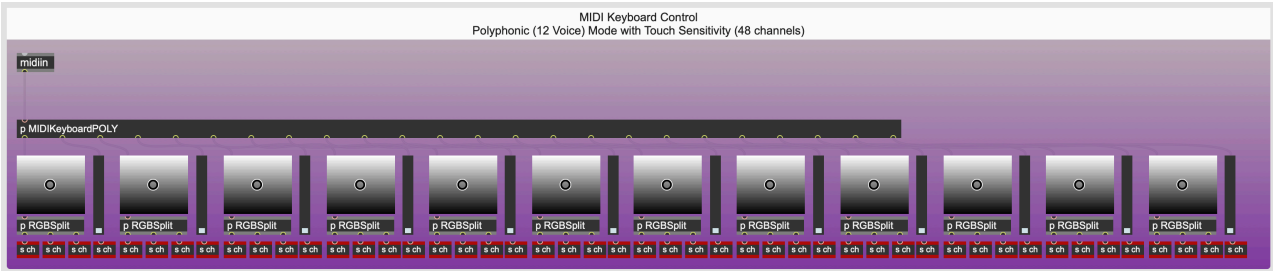


Figure 32 – [p MIDIKeyboardPoly] object capable of controlling up to 12 voices of color and brightness simultaneously.

The [p MIDIKeyboardPoly] can handle up to 12 voices of MIDI data.<sup>72</sup> This keyboard abstraction is the most like a traditional piano, in that each voice determines its own pitch and brightness completely independently.

<sup>72</sup> Someone more capable than I could create a more robust version of this patch’s polyphonic capabilities by using Max’s built-in [poly] functions. However, I enjoyed the challenge of building it from scratch.

<b>[p MIDIKeyboardPOLY]</b>	<i>A MIDI controller capable of twelve-voice polyphonic color and velocity-sensitive brightness control.</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. MIDI input directly from [midiin]</li> </ol>	<ol style="list-style-type: none"> <li>1. RGB List of Voice 1</li> <li>2. Alpha value (0 - 255), scaled from velocity value of input.</li> <li>3. <i>Sim.</i> Voice 2</li> <li>4. <i>Sim.</i> Alpha 2</li> <li>5. <i>Sim.</i> Voice 3</li> <li>6. <i>Sim.</i> Alpha 3</li> <li>7. <i>Sim.</i> Voice 4</li> <li>8. <i>Sim.</i> Alpha 4</li> <li>9. <i>Sim.</i> Voice 5</li> <li>10. <i>Sim.</i> Alpha 5</li> <li>11. <i>Sim.</i> Voice 6</li> <li>12. <i>Sim.</i> Alpha 6</li> <li>13. <i>Sim.</i> Voice 7</li> <li>14. <i>Sim.</i> Alpha 7</li> <li>15. <i>Sim.</i> Voice 8</li> <li>16. <i>Sim.</i> Alpha 8</li> <li>17. <i>Sim.</i> Voice 9</li> <li>18. <i>Sim.</i> Alpha 9</li> <li>19. <i>Sim.</i> Voice 10</li> <li>20. <i>Sim.</i> Alpha 10</li> <li>21. <i>Sim.</i> Voice 11</li> <li>22. <i>Sim.</i> Alpha 11</li> <li>23. <i>Sim.</i> Voice 12</li> <li>24. <i>Sim.</i> Alpha 12</li> </ol>

*Table 19 – [p MIDIKeyboardPOLY] is a MIDI controller capable of twelve-voice polyphonic color and velocity-sensitive brightness control.*

## INPUT CONTROLS

One of the largest motivating factors behind the creation of the *Toolbox* was the ability to incorporate Max's ability to synthesize, process, and manipulate audio signals from a microphone or line input and use them in real time lighting design. Max is known in the composing world as one of the primary methods of generating and performing pieces for live electronics, and the ability to combine lighting design elements into this workflow was highly attractive.

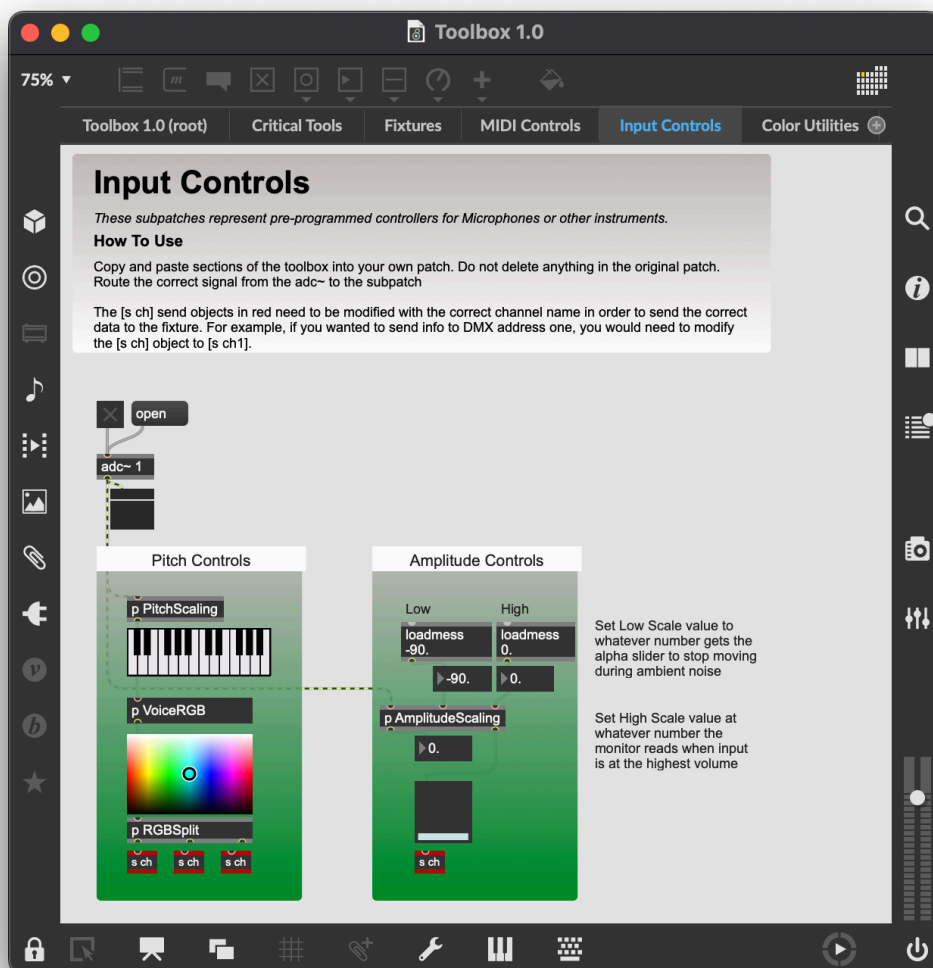


Figure 33 – An overview of the Input Controls. These tools take an incoming audio signal and use it to interact with the lights.

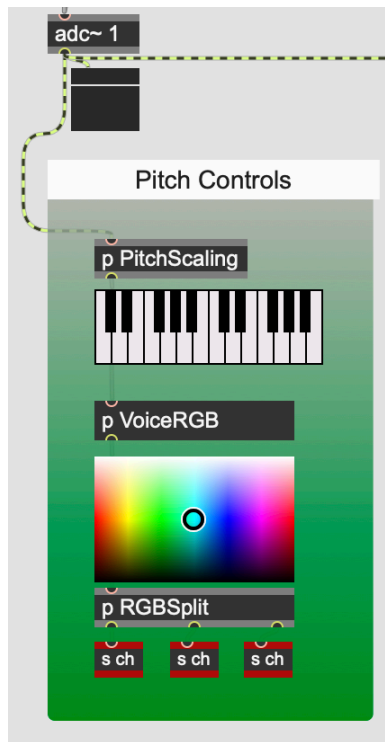


Figure 34 – Using two subpatches, [p PitchScaling] and [p VoiceRGB] to map pitch to color.

When one thinks about what information is possible to extract from an audio signal, the first two parameters that might come to mind are pitch and amplitude. In Max, it is possible to determine how loud a signal is by using a simple [meter~] and what pitch is the strongest in the signal, by any number of ways, with [fzero~] being the simplest<sup>73</sup>. From those two parameters, it is possible to create a patch that listens to an incoming signal and reacts to the pitch and volume parameters in (close to) real time.

To understand how this works, we must first look at the two tools that make up how pitch detection and color mapping are done in the *Toolbox*. The first tool is [p PitchScaling], which

<sup>73</sup> [fzero~] is a built-in object that shipped with Max starting with Max 6 that uses a zero-crossing algorithm to estimate the fundamental pitch of a given signal. Other pitch detection objects include [sigmund~] and [fiddle~], however [fzero~] was chosen for its simplicity.

takes in an audio signal and outputs the last pitch it heard. This discussion can become slightly complicated as there are multiple ways to determine the main pitch of a signal. This is made even more complicated by the complex way we as humans perceive pitch versus the way Max hears pitch.<sup>74</sup> In the *Toolbox*, and in the subpatch [p PitchScaling], the Max object [mc.fzero~]<sup>75</sup> is used to estimate the fundamental pitch being “heard” in an audio signal.<sup>76</sup>

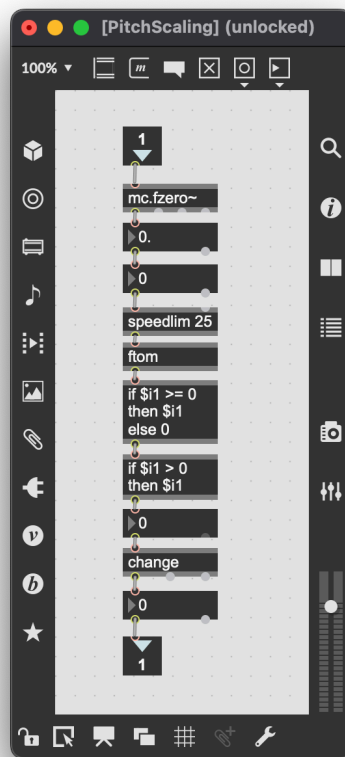


Figure 35 – A look inside of [p PitchScaling].

<sup>74</sup> This is a can of worms (re: timbre, acoustics, overtone series) that has already been opened by other scholars.

<sup>75</sup> The prefix mc. means that the [fzero~] tool is the multichannel version of the object. This is because it is possible to send this subpatch a multichannel signal and specify which signal it should “listen” to. For simplicity’s sake, I will refer to the normal [fzero~] and [mc.fzero~] objects interchangeably, as there is no difference in their function.

<sup>76</sup> Again, another can of worms. There are endless internet rabbit holes to track down vis-à-vis how [fzero~] works and the reliability of other pitch tracking methods inside of Max. For the *Toolbox*’s purposes, [fzero~] is a good starting point for estimating pitch.

The [fzero~] object outputs an estimated frequency that is sent to an [ftom] object to determine the frequency’s approximate MIDI pitch value.<sup>77</sup> The rest of the patch is there to filter out unnecessary information, such as repeated note values and moments of silence; for example, if there is no pitch being detected, the intended action is for the patch to only output the most recent pitch it heard.

Once a pitch has been heard, [p PitchScaling] then returns the corresponding color as determined by the preset.<sup>78</sup> For example, if I were to sing an F# into the connected [adc~] input, [p PitchScaling] would detect that I am singing an F#. It would then tell [p VoiceRGB] that it heard an F# - then [p VoiceRGB] would return the RGB values of the preset color that corresponds to F#.

<b>[p PitchScaling]</b>	<i>Determines the estimated pitch of a given audio signal.</i>
<b>Inlet</b>	<b>Outlet</b>
1. Audio signal	1. MIDI note value of the estimated pitch

*Table 20 – [p PitchScaling] estimates the pitch of a given audio signal.*

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<sup>77</sup> The important word here is “estimated”. As mentioned earlier in a previous footnote, the way [fzero~] “hears” pitch is not an exact replica of how we hear pitch. If you are using these objects, it is best to build in some time to discover how these tools respond to your specific audio setup.

<sup>78</sup> More on what these presets are and how they can be configured in a later section.

Once a MIDI note value has been determined by [p PitchScaling], that value is sent to a [kslider] object that acts as a visual monitor of pitch before the correct color is determined by [p VoiceRGB]. This subpatch functions identically to the [p MIDIkeyChroma] subpatch (so much so that the color returned by both subpatches are governed by the same preset). The reason for two objects that perform duplicate tasks is for convenience's sake. It may be confusing to take an object meant for MIDI control and use it with live audio processing, and vice-versa. This duplicate object was created to keep similar functions organized together.

<b>[p VoiceRGB]</b>	A basic controller for converting pitch information to color
<b>Inlet</b>	<b>Outlet</b>
1. Integer, as Pitch Data from [p PitchScaling].	1. RGB List of the corresponding color

*Table 21 – [p VoiceRGB] is a basic controller for converting pitch information to color.*

By using these two objects, [p PitchScaling] and [p VoiceRGB], it is capable to control the color of a fixture using only the audio input from an [adc~] object. This may be enough for some applications; however, wouldn't it be interesting to also have the volume of the input control the brightness of the connected fixture? This would make the fixture even more reactive by showing both the relative volume and pitch of the signal.

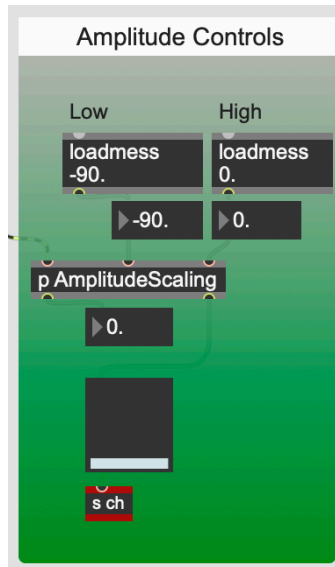


Figure 36 – [p AmplitudeScaling] with default settings.

As with most things in Max, there are always several different ways to complete a task. The method employed in the *Toolbox* in [p AmplitudeScaling] is to use the values created by a [live.meter~] object to determine the amplitude.<sup>79</sup> The [p AmplitudeScaling] subpatch receives an audio signal, monitors it with a [live.meter~], and then scales the output from the monitor to a DMX-friendly 0 - 255 integer. The output of this object can be directly connected to an alpha or brightness channel of a fixture. This subpatch is incredibly useful for creating volume sensitive lights.

The other two inputs, float numbers labeled “Low” and “High” on the patch, are there to function as fine tuners for the scaling. They set the range for the amplitude to brightness conversion. If you set a very narrow range, then the volume sensitivity is very low – and if you set a wide range, then the volume sensitivity may be too high. In either case, the light may not

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<sup>79</sup> Any object that includes the prefix “live.” was brought into Max from the popular digital audio workstation (DAW) Ableton, by the parent company, Cycling ’74. Max has its own [meter~] object, however I find the utility of the [live.meter~] object to be more satisfying.

respond in the manner you intend, so it is best to experiment with these values until you find values that create the expected outcome.

The expected function for [p AmplitudeScaling] is for the decibel (dB) value of the loudest sound to be set to the “High” value, and the dB value of the softest sound to be set to the “Low” value. This would give the lights a wide range for volume sensitivity; the loudest sound would create very bright sounds and vice-versa. The current dB value can be monitored by the first outlet of [p AmplitudeScaling]. Ideally, the “High” and “Low” values are set so that when the input is incredibly soft the scaled brightness is very low (and vice-versa). It will take some manipulating to determine which numbers are necessary for your audio setup to return the desired brightness scaling.

<b>[p AmplitudeScaling]</b>	<i>Takes the amplitude of an audio signal and converts it to a DMX-friendly integer (0 - 255)</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. Audio Signal</li> <li>2. Float, “Low” value (default -90.)</li> <li>3. Float, “High” value (default 0.)</li> </ol>	<ol style="list-style-type: none"> <li>1. Float, current amplitude (in dB)</li> <li>2. Integer, scaled output (0 - 255)</li> </ol>

*Table 22 – [p Amplitude Scaling] takes the amplitude of an audio signal and converts it to a DMX-friendly integer.*

## COLOR UTILITIES

Color Utilities are just that, tools for interacting with color. This collection of subpatches is not strictly necessary for communicating with the hardware. Rather, these tools are convenient for managing common tasks and functions, such as math, transitions, and experimentation or visualization of color. These subpatches are useful for interfacing with the fixtures in the design or live performance stage.

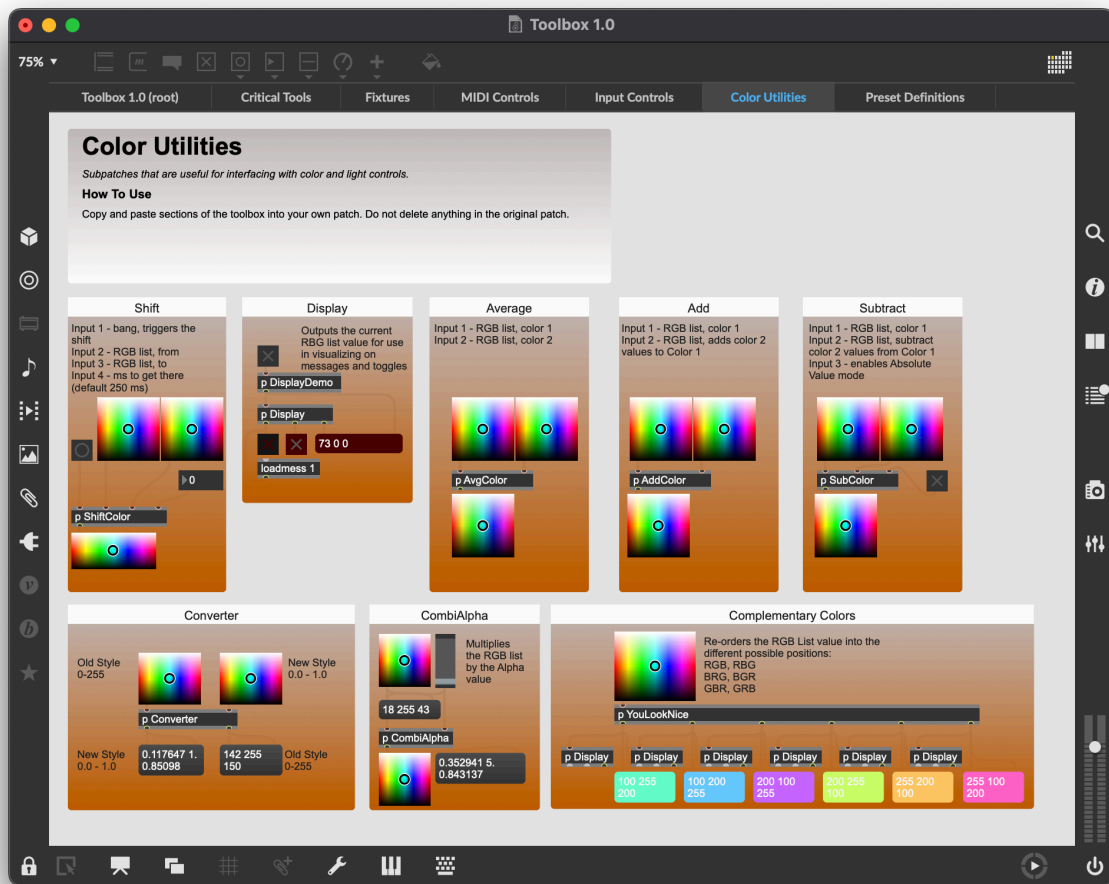


Figure 37 – Color Utilities are extremely helpful for interacting with fixtures.

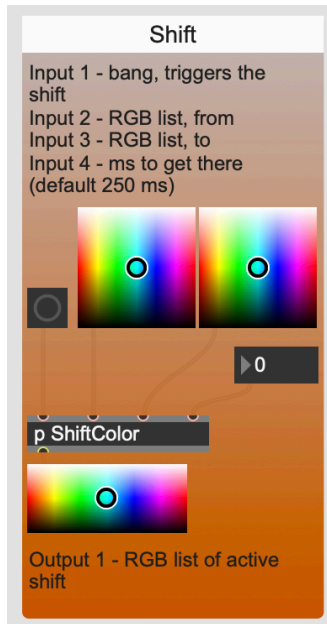


Figure 38 – The default [p ShiftColor].

The utility [p ShiftColor] operates by splitting the current and desired RGB lists into their main values and using three distinct [line] objects to create a ramp for each value (r, g, and b) between the two endpoints of the line. For example, if you were to start at a pure blue (0, 0, 255) and end at a basic yellow (255, 255, 0), the [line] objects for the red and green values would continuously output values between 0 and 255, while the blue value would output values between 255 and 0. The line object chooses the most direct path between the two values, as opposed to other methods of moving around color space.<sup>80</sup>

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<sup>80</sup> For example, values could wrap around from 255 back to 0 instead of taking the most direct path. This is not what happens, instead, the [p ShiftColor] subpatch takes the route defined by its input.

<b>[p ShiftColor]</b>	<i>Shifts between two colors over a given period</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. Bang, required, triggers the shift to occur.</li> <li>2. RGB List of starting color, required.</li> <li>3. RGB List of destination color, required.</li> <li>4. Integer, optional, speed of shift (in milliseconds, default is 250ms).</li> </ol>	<ol style="list-style-type: none"> <li>1. A shifting RGB list</li> </ol>

Table 23 – [p ShiftColor] shifts between two colors over a given period.

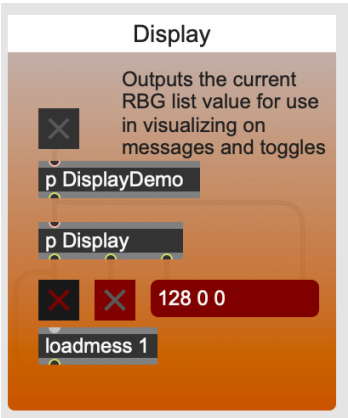


Figure 39 – Showing a random color on [p Display].

The [p Display] object is used to monitor active colors without having to use a [swatch] object. For example, if you want to see what color your lights are at a given moment in a show but do not yet have access to the lights, you could use the [p Display] object to set the color of a [message] to display the active color of a particular light. It is most useful in visualizing individual colors.

<b>[p Display]</b>	<i>Manipulates the color of common Max objects</i>
<b>Inlet</b>	<b>Outlet</b>
1. RGB List	<ol style="list-style-type: none"> <li>1. [Toggle] attribute checkedcolor, displays when the [toggle] has a value of 1.</li> <li>2. [Toggle] attribute bgcolor, always displays on the [toggle].</li> <li>3. [Message] attribute bgfillcolor, changes the message bubble color.</li> </ol>

*Table 24 – [p Display] manipulates the color of common Max objects.*

The next three utilities represent basic color comparison functions, where one would want to compare two colors and evaluate the differences between them. These are not advanced color mixing formulas, instead they are rudimentary functions that operate on the value level. There are three functions of basic math: addition, subtraction, and averaging.<sup>81</sup>

It should also be noted that each of the comparison functions have two hot inlets, meaning that updating the input in either the left or the right inlet will trigger a new output. Additionally, the output of these color functions is always going to be an integer. As such, it is best to not use the new style of RGB values (0.0 – 1.0) with any of these functions, as they will not return the expected result.<sup>82</sup>

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<sup>81</sup> More complicated mathematical functions are of course possible, but I have not found a use-case for find the square root of a color.

<sup>82</sup> To convert the values from new to old style values, refer to [p Converter] and Figure 43.



Figure 40 – [p AvgColor] averages two color lists.

The [p AvgColor] subpatch finds the average of values between two colors. This function, as well as the following functions, use the mathematical evaluator [expr] to calculate the results. It adds the red values for each color divides the result by two to find the average red value – this process is repeated for the green and blue values as well to find the average color.

<b>[p AvgColor]</b>	<i>Averages the values of two colors</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. RGB List of Color 1</li> <li>2. RGB List of Color 2</li> </ol>	<ol style="list-style-type: none"> <li>1. RGB List of averaged color</li> </ol>

Table 25 – [p AvgColor] averages the values of two colors.

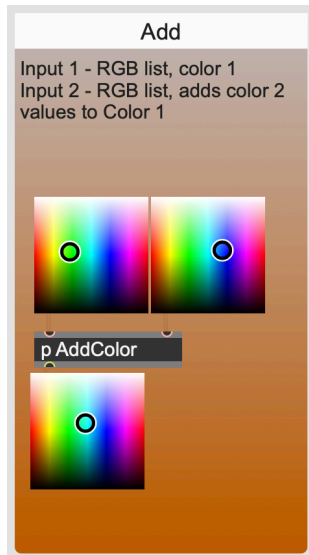


Figure 41 – [p AddColor] adds the values of two lists together.

The [p AddColor] subpatch does exactly what you might expect: it adds the values of two colors together and returns the result. This function does not compensate for values higher than 255.<sup>83</sup> This is a useful tool for fixture experimentation, wherein you could take a primary color such as red (255, 0, 0) and add a more complicated blue to it to control the exact shade of purple.

<b>[p AddColor]</b>	<i>Adds the values of two colors.</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. RGB List of Color 1</li> <li>2. RGB List of Color 2</li> </ol>	<ol style="list-style-type: none"> <li>1. RGB List of added color.</li> </ol>

Table 26 – [p AddColor] adds the values of two colors.

<sup>83</sup> If you were to send a value larger than to 255 to a fixture, the expected behavior is that most fixtures will interpret the number as 255.



Figure 42 – [p SubColor] subtracts the values of color 2 from color 1.

This function takes the values of Color 2 and subtracts them from the values of Color 1. This will very often lead to an output that includes negative numbers, which are often interpreted as zeros by a fixture. However, the [p SubColor] function has an absolute value mode. When this mode is selected, any negative values are returned as their absolute value. This often yields colors that are surprising and unpredictable.

[p SubColor]	<i>Subtracts the values of two colors.</i>
<b>Inlet</b>	<b>Outlet</b>
1. RGB List of Color 1 2. RGB List of Color 2 3. Toggle, absolute value mode	1. RGB List of subtracted color

Table 27 – [p SubColor] subtracts the values of two colors.



Figure 43 – [p Converter] converts between old (0-255) and new (0.-1.0) style color values.

As mentioned previously when the [swatch] object was first introduced, [swatch]es can use either integers (0 - 255) or floats (0. - 1.0) to represent the RGB values of a color. For most of the include *Toolbox* objects, the [swatch]es use integers ranging from 0 - 255. However, there are many instances in Max where using a float is more common – and the [p Converter] subpatch allows you to work with whichever values you like.

<b>[p Converter]</b>	<i>Converts between old and new style color values.</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. RGB List, in integers</li> <li>2. RGB List, in floats</li> </ol>	<ol style="list-style-type: none"> <li>1. RGB List, in floats</li> <li>2. RGB List, in integers</li> </ol>

Table 28 – [p Converter] converts between old (0-255) and new (0.-1.0) style color values.

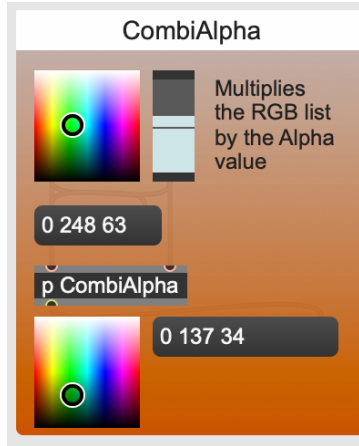


Figure 44 – [p CombiAlpha] multiplies a color by a brightness value.

The [p CombiAlpha] subpatch takes the RGB list values of a color and multiplies each value by the brightness slider on the right. By using [p CombiAlpha] you can dim or brighten an RGB list without having to use a built-in dimmer. A full slider has a value of 1.0 and an empty slider has a value of 0.0; this means that when the brightness slider is completely up, the full value of the color is shown, and when the brightness slider is completely down, a value of zero is returned.

It is a useful tool for dealing with a 3-channel fixture that only receives an RGB list and does not include a dimming function. Or for trying to control individual sections of a fixture that has multiple-section control (like the Stage Right Bar and Can lights) and an overall brightness of the fixture.

<b>[p CombiAlpha]</b>	<i>Multiplies an RGB list by a brightness value</i>
<b>Inlet</b>	<b>Outlet</b>
<ol style="list-style-type: none"> <li>1. RGB List, in integer format</li> <li>2. Brightness scaling factor, float (0. – 1.)</li> </ol>	<ol style="list-style-type: none"> <li>1. Scaled RGB List</li> </ol>

Table 29 – [p CombiAlpha] multiplies an RGB list by a brightness value.

The next few patches are useful for mining different possible colors out of a given color. These will not necessarily create a gorgeous color palette, but they might provide one with the information necessary to create an interesting set of hues.

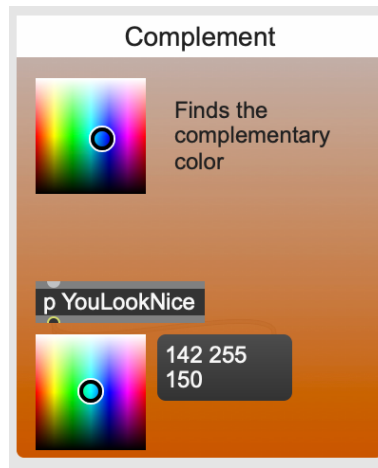


Figure 45 – [p YouLookNice] finds the complementary color for the given input.

Two colors are complementary when they are opposite each other on the color wheel; or when their values cancel each other out by producing either white (255, 255, 255) or black (0, 0, 0). The subpatch [p YouLookNice] takes the values from an RGB list and subtracts them from 255 (white) and returns the absolute value, which results in a complementary color.<sup>84</sup>

<b>[p YouLookNice]</b>	<i>Provides the complementary color for a given input</i>
<b>Inlet</b>	<b>Outlet</b>
1. RGB List	1. RGB List of complementary color

Table 30 – [p YouLookNice] provides the complementary color for a given input.

<sup>84</sup> The name of this patch is a little bit of comic relief. I always use the wrong homonym (compliment instead of complement) when writing about complimentary colors; this was my way of mitigating that error.

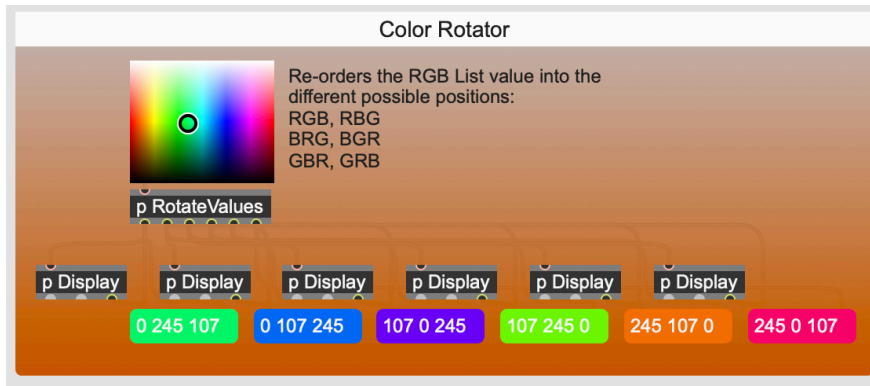


Figure 46 – [p RotateValues] rotates values of the RGB list into different figurations.

Say you have a color with the values (0, 245, 107), and you want to swap the placement of the values in the RGB list but leave the integers intact. The subpatch [p RotateValues] outputs RGB lists for each of the possible permutations of the 3 integers. The connected [p Display] objects show the values of each permutation. This function is useful for creating highly textured colors on a single light; if you were to connect each one of these RGB values to a section on a single fixture, for example, the resulting output is generally a nuanced white color.<sup>85</sup>

<b>[p RotateValues]</b>	<i>Swaps the placement of values of a given RGB list</i>
<b>Inlet</b>	<b>Outlet</b>
1. RGB List	1. RGB List 2. BGR List 3. GBR List 4. RBG List 5. BGR List 6. GRB List

Table 31 – [p RotateValues] swaps the placement of values of a given RGB list.

<sup>85</sup> For personal reference, pastel color palettes work best for creating these nuanced colors, due to having three (typically) unique RGB values that are not usually complementary.

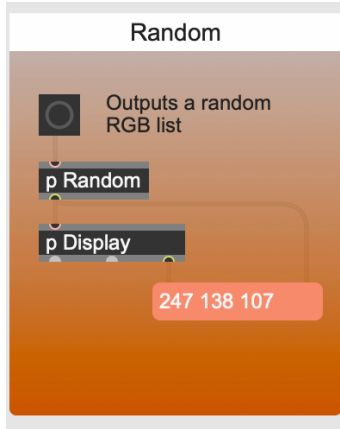


Figure 47 – [p Random] generates a random RGB list.

When using the *Toolbox*, the general assumption is that one would be working with colors that have been carefully curated. However, the need might arise for a bit of randomness in a project. The [p Random] subpatch does just that. It creates a random RGB list by pulling a random number between 0 – 255 for each value in the list.<sup>86</sup>

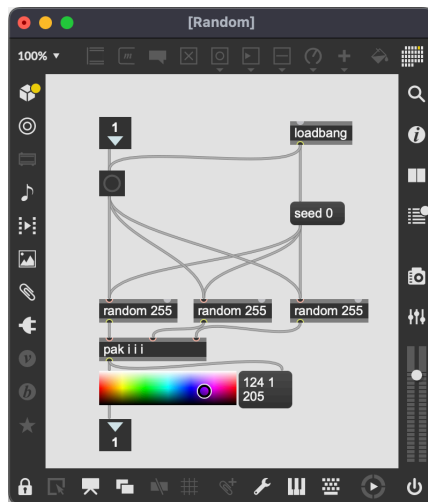


Figure 48 – The anatomy of [p Random].

<sup>86</sup> As anyone who has ever dipped their toes into computer programming knows, randomness in computing is a bit of a misleading phrase – randomness is not random. Again, this is a can of worms that is well outside the scope of music composition dissertation. Suffice to say, the [p Random] subpatch is random enough for most basic needs.

Where these random numbers are generated from is a question that would require yet another dissertation. Put simply, providing each of the [random] messages a seed of 0 gives each [random] a unique seed value due to how Max handles a seed value of 0. This gives each [random] more than enough randomness for this application inside of the *Toolbox*.

<b>[p Random]</b>	<i>Generates a random RGB list</i>
<b>Inlet</b>	<b>Outlet</b>
1. Bang	1. RGB List

*Table 32 – [p Random] generates a color with three random RGB values.*

## PRESET DEFINITIONS

Preset Definitions are useful for using any of the prebuilt fixtures that use the [umenu] dropdown to select preset colors or any of the [p MIDI Controls]. These presets function slightly differently than the rest of the *Toolbox*, as these are not subpatches that need to be copied into your patch to function. However, if you plan on using any of the prebuilt MIDI controls, Input Controls, or fixtures that utilize a dropdown color select menu, it is mandatory that you copy this patch into your project. If you were to copy the entire [p “Preset Definitions”] into your patch, you would only need to return to this screen to edit any of presets attached to the previously mentioned objects. As such, these are not subpatches with inlets and outlets. One way to think of this collection of objects is to think of this as a place to adjust your color preferences.

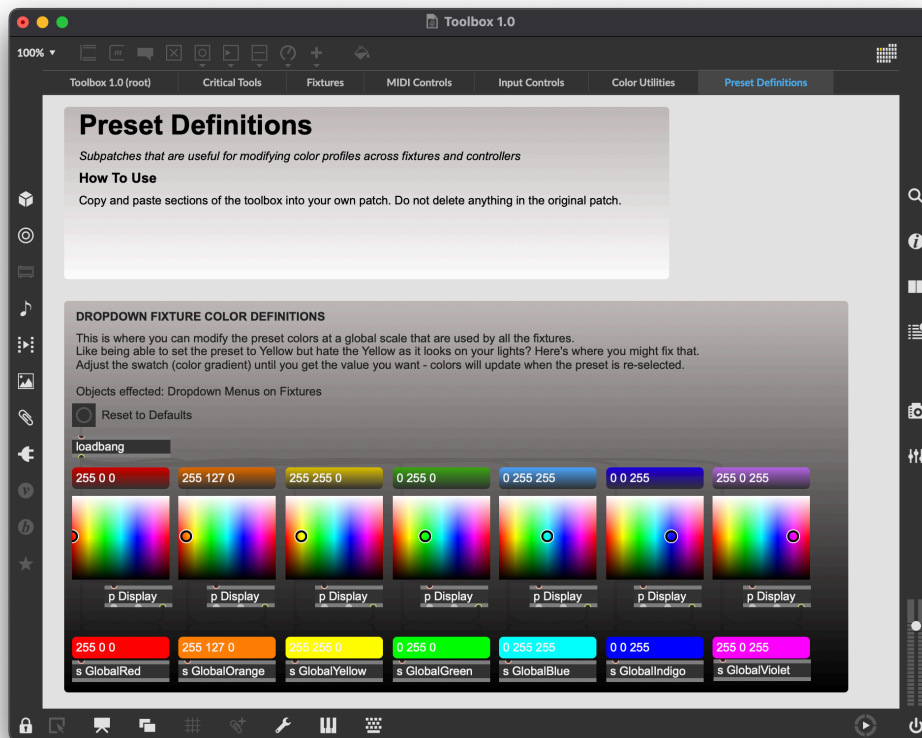


Figure 49 – Preset Definitions are used to adjust the preset colors across the Toolbox (dropdowns and MIDI keyboards).

For example, this first bank of colors in Figure 49 effect both the dropdown [umenu] presets used by many of the fixtures and the [p MIDIkeyRGBA] subpatch. When these colors are adjusted, the global color sends for their corresponding color ([s GlobalRed], [s GlobalOrange], etc.) are updated. The updated colors are only applied once the preset is selected again by the fixture. For example, if a fixture was already set to the yellow preset and then the [s GlobalYellow] value was changed, the new value would not take effect until a new preset was selected again.<sup>87</sup>



Figure 50 – Input Color Presets are used to match signal frequencies to designated colors.

<sup>87</sup> The reason for this is simple, it encourages local color manipulation at the fixture level and discourages manipulating color on the global scale.

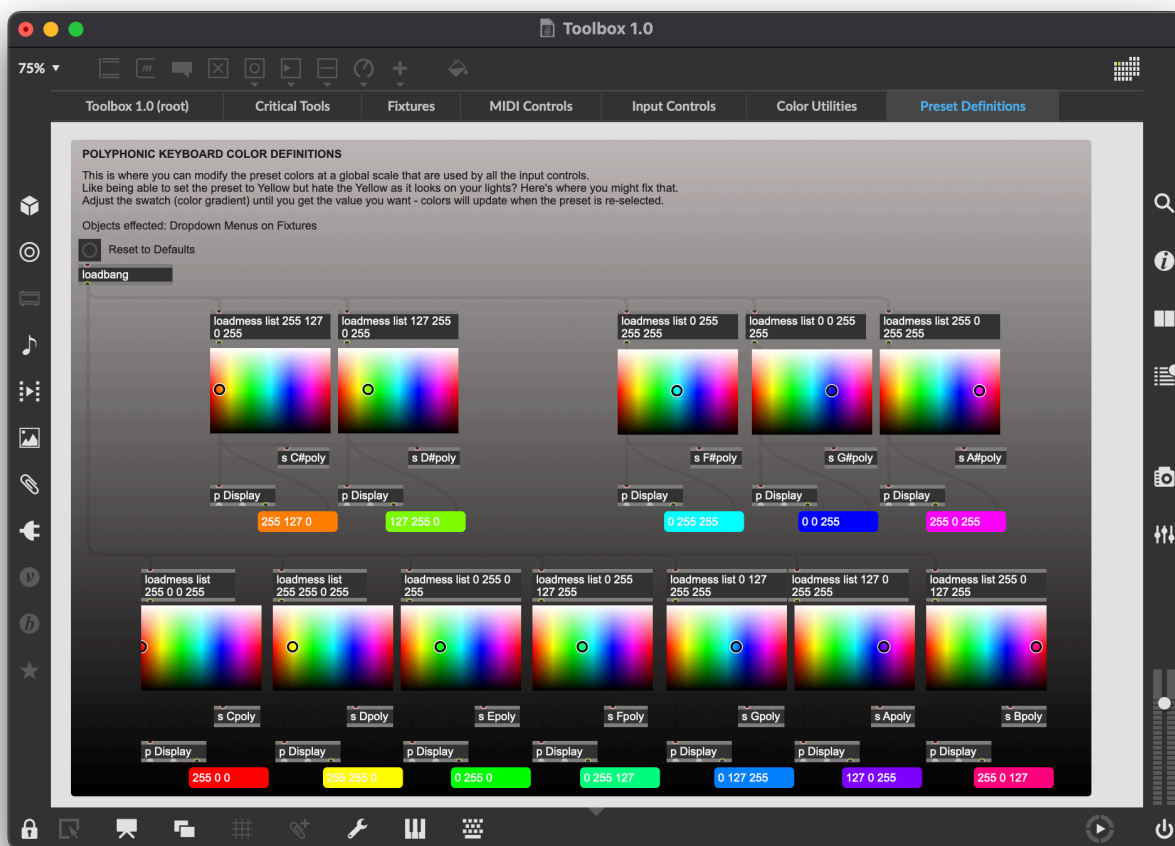


Figure 51 – Polyphonic Keyboard Presets can also be adjusted independently of the typical keyboard controls since they function in a different manner.

The input color definitions in Figure 50 are used by the [p PitchScaling] and [p MIDIkeyChroma] subpatches, both of which map the 12-EDO<sup>88</sup> octave to 12 gradations of color.<sup>89</sup> The polyphonic presets in Figure 51 are only used by the [p MIDIKeyboardPOLY]

<sup>88</sup> More than 12 equal divisions of the octave (EDO) are possible but might require preprogramming a new subpatch for each division of the octave. Though it would be an interesting challenge!

<sup>89</sup> Repeating octave that is; meaning that these patches are not pre-programmed to differentiate between different octaves. One might build a patch that can use the different octave to differentiate multiple parameters by using [p PitchScaling] and/or [p CombiAlpha].

subpatch. Having multiple distinct types of presets allows users the flexibility to use multiple types of devices with multiple presets available. It also allows for a differentiation of how these presets are used: the [p MIDIKeyboardPOLY] subpatch can use the MIDI velocity value to change the color's brightness value, whereas the [p MIDIkeyRGBA] uses the accidental keys to control the overall brightness value.

Having now gone through each of the pre-built subpatches in the *Toolbox*, it should be clear that these tools are a starting point, not an end point, for the possibilities of interacting with light and color inside of Max. It is my hope that by providing these tools and explanations that other creators will be able to create more imaginative and interesting abstractions, subpatches, and pieces of art than what is contained within this document.

## CHAPTER 5

### REALIZING – USING *THE TOOLBOX*: SELECTED ORIGINAL COMPOSITIONS

#### PRE-*TOOLBOX* COMPOSITIONS

Before the creation of the *Toolbox*, I composed a few pieces using bespoke lighting apparatuses that were designed and programmed in collaboration with Dominic Ryder. The two main pieces from this period are *There Is A Light* for piano, percussion, and ensemble and *Suffusion* for two treble instruments and two bass instruments. At the time, it seems I was interested in exploring my relationship with religion and the iconography of religious institutions through both sound and light, as both pieces, *There Is A Light* and *Suffusion* deal with quasi-religious materials. Perhaps on a subconscious level, incorporating lighting was a way to introduce some sort of non-musical representation of what I was trying to explore.<sup>90</sup> *There Is A Light* includes many biblical references, with the title alluding to the biblical creation story (“let there be light”), and the four main thematic colors used in *Suffusion* are taken directly from several stained-glass panels I saw in a church in France.

In *There Is A Light*, I placed a significant amount of freedom in the hands of the performers, in essence, giving them freedom over the sound of the piece. I had laid out basic parameters for performance, including form, pitch, and very loose playing instructions; but specific materials were left up to the players, such as exact instrumentation, orchestration, and

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<sup>90</sup> A musicologist (or maybe a keen psychologist) might be able to trace and explain the religious through lines in my work dealing with lighting, however these two pieces are the only two in my catalogue to deal with religion explicitly. Coincidentally, both pieces contain the phrase “Let the light” somewhere in the score. *Suffusion* uses the phrase in the final moment of the prose, and *There Is A Light* uses it in the original manuscript.

the length of the performance. By requiring the performers to invest their time into figuring out how the piece should be structured, it also gave them a significant amount of autonomy, which for me, was an exercise in letting go of control.<sup>91</sup> This act of letting go is not always intuitive for composers, (see: my opening salvo about composers and wanting to exercise *more* control), but it was a good step exploring the balance between freedom and control for the performers.

*There Is A Light* was written for the Terminus Ensemble's performance on the 2019 SoundNOW contemporary music festival. Early sketches of the piece, as shown in Figure 52, show a composition with a considerable amount of openness in its realization. The first manuscript consisted of only a single page, split into four sections, with minimal instructions for each group of players. The only instruments specifically listed in the score are piano and percussion, with an implied collection of instruments (listed as Other in the score) filling out the ensemble.<sup>92</sup> Each instrument has only three actions listed in their part, each of which correspond to the three main sections of the piece. The duration of the piece is also left open, with a simple ratio of 3:4:3 being the only indication as to the form of the piece.<sup>93</sup>

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<sup>91</sup> The thought process was that the more control I abdicated as a composer, the more control the performers would have to exert over the piece themselves; and when the performers had control over the piece, this would allow the performers to take ownership of the piece and elevate it past just the notes on the page.

<sup>92</sup> The reason for not assigning instruments was practical as well as artistic. The Terminus Ensemble had not been able to confirm which players of its roster would be available for this performance, so I opened the instrumentation to allow for any of their performers to join in on the day-of with little (if any) rehearsal time required.

<sup>93</sup> This would have been realized most simply by performing section 1 for a duration of 3 minutes, section 2 for 4 minutes, and section 3 for 3 minutes. In later versions of the piece, these durations were altered.

**THERE IS A LIGHT**  
 FOR TERMINUS ENSEMBLE  
 & AUDIO SENSITIVE LIGHTS  
 SOUNDNow 2019

FORM,  
 BEGINNING  $\frac{2^{st} - 2^{nd} - 3^{rd}}{3 : 4 : 3}$  END

PIANO,  
 PLAY THESE CHORDS IN A QUICK OSTINATO

1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup>

BEGINNING 3 : 4 : 3 END  
 mf →

OTHER,

- THERE IS A LIGHT
- YOU WILL BE ASSIGNED A COLOR
- THE LIGHT WILL TELL YOU WHEN
- DECIDE HOW TO SOUND
- LET THE LIGHT

1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup>

BEGINNING *p* < *f* > *p* END  
 mf →

PERCUSSION,  
 PLAY THESE INSTRUMENTS IN A FAST OSTINATO

1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup>

BEGINNING 3 : 4 : 3 END  
 mf →

Figure 52 – A scan of the first manuscript for There Is A Light.

The first version of score also indicates the inclusion of “audio sensitive lights”, which for this piece, consisted of a lamp created in collaboration with Dominic. We took an inexpensive floor-length lamp and removed the power cord and fixture that holds a light bulb, and then replaced these items with a USB cable, an Arduino controller, and simple LED light. The lamp was connected to a Max patch (created and programmed by Dominic) via USB cable. The Max patch listened to two channels of audio input (one microphone at the piano, and another for the percussion) and tried to decipher a singular pitch between the two signals. Using this pitch, the Max patch determined what color should be displayed by referencing a pitch-color table, then the Arduino displayed that color on the LED light.

The color displayed on the lamp corresponded to a player in the mixed ensemble. Before the performance, each player in the mixed ensemble was given a color, that when displayed, indicated when they should play. For example, if red was displayed, the person assigned to red would choose a note out of the collection and perform the note in the manner designated by the marking; the percussionist and pianist were to ignore the light and continue playing their indicated ostinati. The way these colors were assigned to players was also open: any instrument, providing they could play the given pitches (in any octave), could be assigned a color.<sup>94</sup>

***There Is A Light***  
for Terminus Ensemble

Bryan Michael Wysocki

The score is divided into four measures, each with a circled number in the top left corner:

- Measure 1:** Mixed Ensemble (3) *On/Off*, *Sustain*, *n*. Percussion: *"Come from nothing"*, *Instrument 1*, *n*. Piano: *Fast Ostinato*, *n*.
- Measure 2:** Mixed Ensemble (4) *Ebb/Flow*, *Blossom*, *m*. Percussion: *"Fill the space"*, *Instrument 2*, *m*. Piano: *Medium Ostinato*, *m*.
- Measure 3:** Mixed Ensemble (3) *Repeat*, *Bright*, *f*. Percussion: *"Fast bursts"*, *Instrument 3*, *f*. Piano: *Slow Ostinato*, *f*.
- Measure 4:** Mixed Ensemble (4) *Up/Down*, *Reaching*, *m* to *n*. Percussion: *"Steady, controlled"*, *Instrument 4*, *m* to *n*. Piano: *Medium Ostinato'*, *m* to *n*.

Figure 53 – The final version of the score for *There Is A Light*. The full score is available in Appendix B.

<sup>94</sup> Groups of instruments, not just single players, could also be assigned to a single color, allowing this piece to be performed as a piano and percussion “concerto” with orchestra, with sections of the orchestra each assigned a color.

In the final version of the score, (available in full as Appendix B, and with relevant passage in Figure 54 below), the “Mixed Ensemble,” pianist, and percussionist were all given clearer instructions. These newer instructions corresponded to different actions; for example, in the first section, the mixed ensemble has the indications “on/off” and “sustain.” The intended realization of these instructions is for a player to sustain one of the given notes from the time they first see their color until their color re-appears on the light.<sup>95</sup> These instructions were written out in the part for the mixed ensemble to explain how they should interact with the light.

### Mixed Ensemble

My Color is: Red – Purple – White – Green – Yellow – Blue

Section 1 – On/Off, Sustain ( : : - : : )

When you see your color, sustain one pitch in the collection until you see your color disappear and come back again; at that point, once it has come back, stop playing that pitch. Begin again once you see your color repeated. Stay on one pitch at a time, only changing when your color reappears.

Section 2 – Ebb/Flow, Blossom ( : : - : : )

When you see your color, sustain one pitch in the collection for the duration of the color, adding a slight crescendo/decrescendo to the pitch. Begin again once you see your color again. Stay on one pitch at a time, only changing when your color reappears.

Section 3 – Repeat, Bright ( : : - : : )

When you see your color, play fast repeated notes on one pitch in the collection for the duration of the color. Begin again once you see your color again. Stay on one pitch at a time, only changing when your color reappears.

Section 4 – Up/Down, Reaching ( : : - : : )

When you see your color, casually, but purposefully play multiple notes in the collection for the duration of the color. Stop when the color changes and begin again once you see your color again.

*There Is A Light*  
for Terminus Ensemble  
Bryan Michael Wysocki

Mixed Ensemble

*All pitches are in written in concert pitch.*

Figure 54 – The part for the mixed ensemble of *There Is A Light*.

<sup>95</sup> The assumption was that the color of the light would be changing fairly frequently. This was not the case in the original performance. Because the pianist and percussionist were both playing constant ostinati, the microphones did not pick up as much variance in the primary pitch detection as expected.

The interactive lighting device in this piece was connected to a Max patch designed and programmed by Dominic, (Figure 55), which allowed the light to “listen” to the percussionist and pianist. In this version of the patch, the input from the microphones for the percussion and piano are routed into the patch and filtered according to the six different frequency banks on the left of the patch using an [fffb~] object.<sup>96</sup> The input is sent through six different filters, and if the resultant audio signal crosses a volume threshold, then the patch understands the audio signal to contain a substantial amount of that frequency (either by fundamental or overtone), which means that it must be “hearing” that pitch. The color corresponding to that frequency is then shown on the light to represent that it “heard” that pitch.

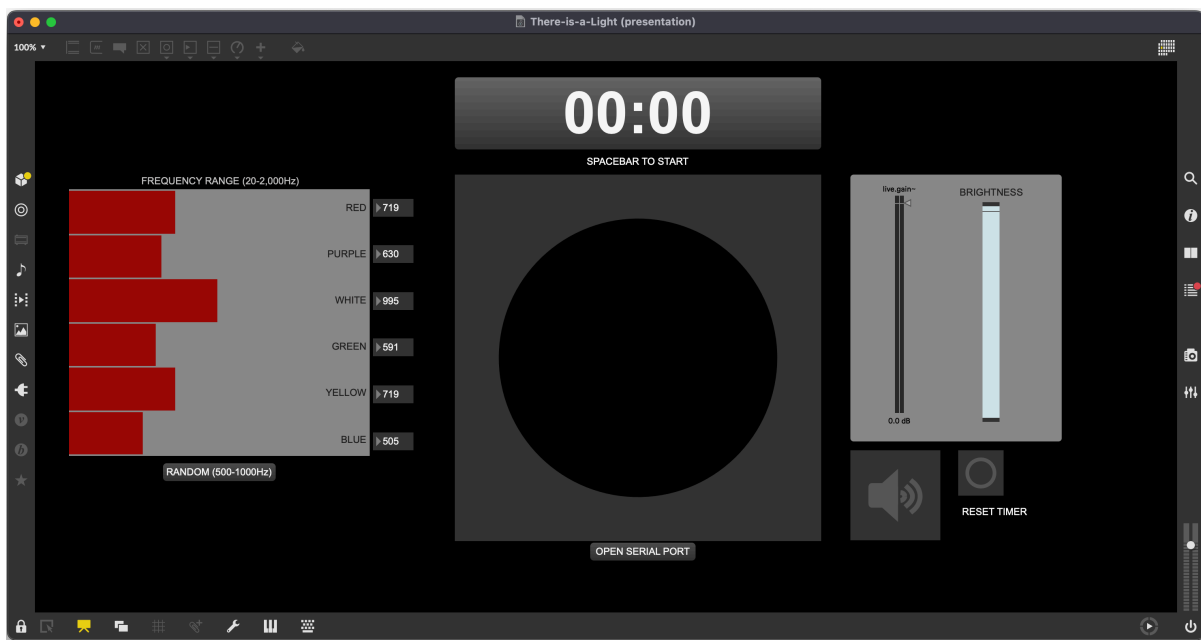


Figure 55 – The original patch for There Is A Light, programmed by Dominic Ryder.<sup>97</sup>

<sup>96</sup> A signal is sent to an [fffb~] object that is set to one of the main frequencies in the bank. This applies a resonant bandpass filter, which amplifies the frequencies immediately adjacent to that signal.

<sup>97</sup> Patch provided courtesy of Dominic Ryder.

The premiere of *There Is A Light* was generally successful, which indicated to me that this style of composition, using lighting to interact with and enhance the sound of the performers, should continue to be explored.<sup>98</sup> The idea for a new piece did not take long to develop. If *There Is A Light* was about using the performers to create the lighting in an interactive way, I wanted to try the opposite, using the lighting to inform how the performers should interact. For me, this meant creating a pre-programmed lighting sequence, and assigning different musical motives to the colors.

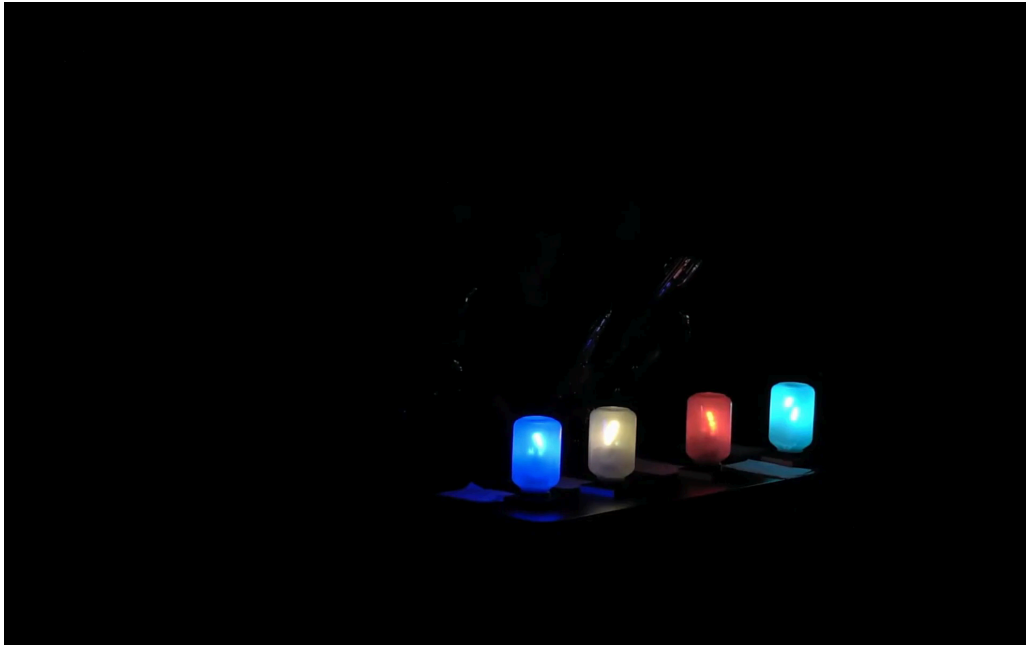
In the summer of 2019, I spent two weeks in the Jura region of France. While I was there, my host brought me to the village of Château-Chalon, and we visited a church that had been built centuries ago. I was struck by the beauty of the stained glass, which was incredibly vivid and unlike any of the stained glass I had seen in the States. I wanted to bring these colors into the concert hall and use them as thematic material for a new piece, which became *Suffusion*.

The piece was originally written for two Bb clarinets and two bass clarinets, but then later modified to be for two treble instruments and two bass instruments.<sup>99</sup> Dominic and I again collaborated on the creation of four new lighting apparatuses for this piece. In trying to bottle-up the lights I saw in Château-Chalon, I had the (very literal) idea to put the lights into jars, like fireflies, bring them into the hall. The light jars, as they came to be known, are exceptionally large mason jars affixed to a 3d-printed base, which houses the Arduino controller, battery, and light switch.

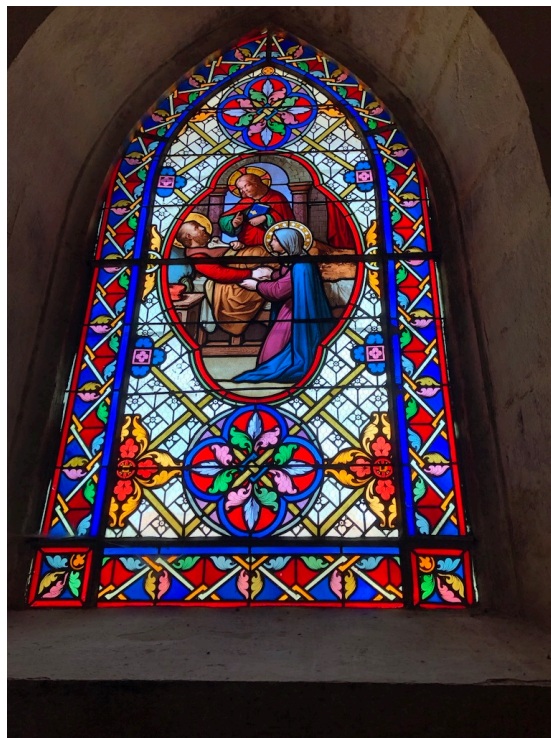
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<sup>98</sup> How a composer measures a successful performance is entirely personal. For me, it means the piece more-or-less matched the score, people enjoyed it or at least talked about it, and the result was a sonic experience indicative of what I had intended to create.

<sup>99</sup> The original performance of this was scheduled and then cancelled due to COVID-19. The full score for *Suffusion* is available as Appendix C

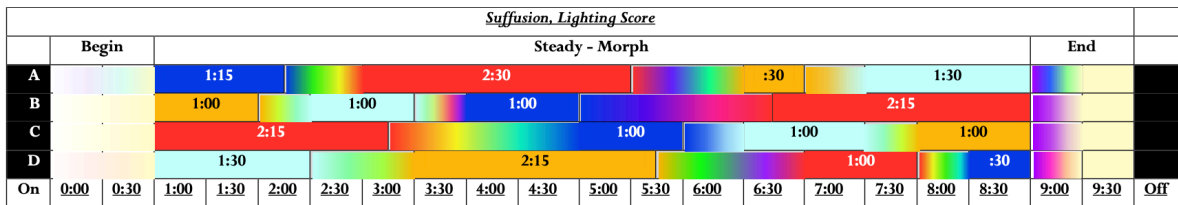


*Figure 56 – The Suffusion light jars in action towards the beginning of the piece.*



*Figure 57 – The actual stained-glass panel that the jars were meant to emulate.*

The four light jars display a pre-programmed lighting sequence which used the four main colors on the stained glass as thematic material. The lighting score in Figure 58 indicates exactly what colors should be used, and how the lights should transition between the different colors. Each of the the four main colors, blue, light blue, orange, and red, are used in the score to represent four different melodic themes. When a performer’s jar showed a specific color, they were to improvise using that melodic material, and when it morphed between colors, they were to morph the current melodic material into the next color’s melodic material. The exact manner in how to do this are then left up to the performer, creating a lot of room for improvisation on the performer’s end.



**Color Index**

White:

- RGB: 255, 255, 255
- Hex: #FFFFFF

**Yellow-ish White:**

- RGB: 255, 255, 200
- Hex: #ffffc8

**Blue:**

- RGB: 4 – 58 – 229
- Hex: #0439e5

**Light Blue:**

- RGB: 193 – 255 – 254
- Hex: #c1fffe

**Orange:**

- RGB: 255 – 181 – 6
- Hex: #ffb506

**Red:**

- RGB: 254 – 51 – 45
- Hex: #fe332d

**Purple:**

- RGB: 167, 0, 255
- Hex: a600ff

Figure 58 – The lighting score for Suffusion. RGB and Hexadecimal values are provided in case the lighting was to be replicated outside of the four light jars.

The way the colors were displayed was a new artistic direction after the six main colors of *There Is A Light*. These colors were very specific hues which gradually shifted from one color to the next over a pre-determined period of time. These were essentially, four composed lighting sequences that the performers improvised alongside. The sound of the performance had no real influence on the lighting design. The piece could have fully existed as an art installation consisting of four jars of light in a dark room.

The melodic material for each color varies depending on which part you read; the two treble players read from the same part, and the two bass players read from the same part (Figure 59). The shorthand scores were a useful way to see the entire piece at a glance, without having to read the poetry/prose parts (Figure 60).

### Treble Instrument Score

A shorthand guide.

#### Begin

Follow the light in F Major. Crescendo as the light gets brighter.

#### Pathways

Be sure to play what your color is telling you; the {constant:change} and the brightness.

**Blue**

Moderate Speed  
① ② ③ ④  
*in any order, repeat ad. lib.*

**Light Blue**

Very Fast  
① ② ③ ④ ⑤ ⑥  
*in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series*

**Orange**

Briskly, with exuberance  
① ② ③ ④ ⑤ ⑥ ⑦ ⑧  
*in any order, in rapid succession, ad. lib.*

**Red**

Moderately, Evenly  
① ② ③ ④ ⑤ ⑥ ⑦ ⑧  
*in any order, ad. lib. | even rhythm, with occasional rubato; quasi-baroque*

#### End

Follow the light in C Major. As the color changes, glissando from {C Major – F Major}

Highs and Lows must sustain their notes.

Fade out.

### Bass Instrument Score

A shorthand guide.

#### Begin

Follow the light in F Major. Crescendo as the light gets brighter.

#### Pathways

Be sure to play what your color is telling you; the {constant:change} and the brightness.

#### Blue

Moderate Speed

① ② ③ ④  
*in any order, repeat ad. lib.*

#### Light Blue

Very Fast

① ② ③ ④ ⑤ ⑥  
*in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series*

#### Orange

Stately,

① ② ③ ④ ⑤ ⑥ ⑦  
*in any order, repeat ad. lib. | paranthetical noteheads denote optional octave choices*

#### Red

Moderately, Evenly

① ② ③ ④ ⑤ ⑥ ⑦ ⑧  
*in any order, ad. lib. | even rhythm, with occasional rubato; quasi-baroque*

#### End

Follow the light in C Major. As the color changes, glissando from {C Major – F Major}

Highs and Lows must sustain their notes.

Fade out.

Figure 59 – The shorthand score for both the treble and bass instruments in Suffusion.

The shorthand scores also helped the performers memorize the piece, as they were required to do if the piece were to be performed in complete darkness. It solves a very real problem that we encountered in rehearsals: how would the performers read the poetry in the dark? Should they memorize the text? Was it necessary for them to read the prose during the performance? The solution was the creation of these shorthand scores, which were much easier to memorize and enabled them to see a summation of the entire piece on one page.

**Begin** (0:00 – 1:00)

Your individual light will start to glow.

And as it grows, I want you to create a note that sounds how the light looks.

It'll get brighter during this section;  
and I imagine you might want to crescendo.  
(or create some other sort of gradual change).

Let it be a long note,  
or at least one that takes a while to get to where it's going.  
But it should live within the world of F major.

It can be a note in the  
{tonic:dominant:subdominant:whatever} triad,  
but it should always be diatonic.

And after each long note,  
you should play another note in that world.  
(But it should always stay in F major.)

Follow the growth of your light.  
As it gets brighter, you should too.

Do you decide to do that with a brighter tone?  
A louder dynamic?  
A more extreme tessitura?  
By creating {harmony:dissonance} with your pair?  
By complementing one of the other instruments?

Find a way to create beauty in this moment within  
{yourself :  
your partner :  
your other pair}  
and use that beauty to build until the light changes.

(You must know all things change?)

As the light is growing and glowing  
you must radiate together;  
You must build this tension and beauty  
and hold onto it for as long as you can.

Until suddenly.

You embark on your own path.

By yourself.

With your own light.

Relish in this shared moment of unity.

*Figure 60 – A view of the poetry/prose section from the treble part of Suffusion.*

The first performance of the piece was with an SATB saxophone quartet made up of graduate students at Georgia State University (Joe Lyons, Benjamin Bradburn, Emma Mooradian, Curtis Allen Gay).<sup>100</sup> While every component part of the piece worked well, the performers played it well, the lights looked gorgeous in the space (and on video), and the experience of the piece was exactly what I intended – the piece left a bit to be desired. The connection between the lighting and sound was not as apparent as I hoped it would be. The audience did not leave the performance with the idea that the four main melodic themes corresponded to the four main thematic colors. The experiment in this case was successful in proving the concepts and creating new works; however, the created work left a bit to be desired.

After these first two pieces were performed, I was confident in the idea of combining my compositions with lighting design. The pieces were interesting musical experiences which were engaging visually and sonically. However, it became clear that designing, fabricating, and programming these lights was going to be a significant undertaking that required collaborating with outside partners.<sup>101</sup> It also became clear that I had more ideas for how to interact with the lights, and that trying to connect these ideas required outside tools.

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<sup>100</sup> The thought process behind the SATB sax quartet was that the homogenous texture would mirror the clarinet quartet that the piece was originally written for. The soprano and alto saxophones read the Treble part, and the tenor and baritone saxophones read the bass part (even though they are technically treble-reading instruments, they generally sound in the bass clef).

<sup>101</sup> It should be noted that collaborating with other creatives is almost always a good thing! The main drawback is that it usually takes longer than creating something on your schedule.

## WORK CREATED IN TANDEM WITH THE DEVELOPMENT OF *THE TOOLBOX*

With the successful premiere of these first two pieces, *There Is A Light* and *Suffusion*, I became interested in how to connect other aspects of music to lighting. Both pieces required living performers to improvise with the lights, but what if I wanted to exert a little more control (over the lights or the performers)? At around the same time, I was awarded a grant from the Willson Center for the Humanities at UGA to start developing the *Toolbox*.

After developing the necessary tools, I composed several pieces that utilized the *Toolbox* in the compositional process.<sup>102</sup> These early *Toolbox* pieces were used as trials to create different functionalities for the *Toolbox*. Two compositions that contributed the most to the development of the *Toolbox* were *Daylight Suite* for quadraphonic audio and *Toy Boat* for clarinet quartet.

The *Daylight Suite* is a purely electronic piece for quadraphonic audio and four 4-channel lights that exists entirely as a Max patch (Figure 61). It consisted of several movements, each attempting to capture the colors and sounds present at different times of the day. The piece exists in two versions: an installation mode capable of running 24 hours a day, changing color and sound in real time to match the current time of day, and a concert mode that performs 3-minute versions of each notable time of day.<sup>103</sup>

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<sup>102</sup> Meaning that, the subpatches and concepts used in these pieces were initially developed to solve problems presented by the piece itself. The subpatches eventually became part of the *Toolbox* later.

<sup>103</sup> Which are: Sunrise, Daytime, Sunset, Dusk, Midnight, and Dawn.

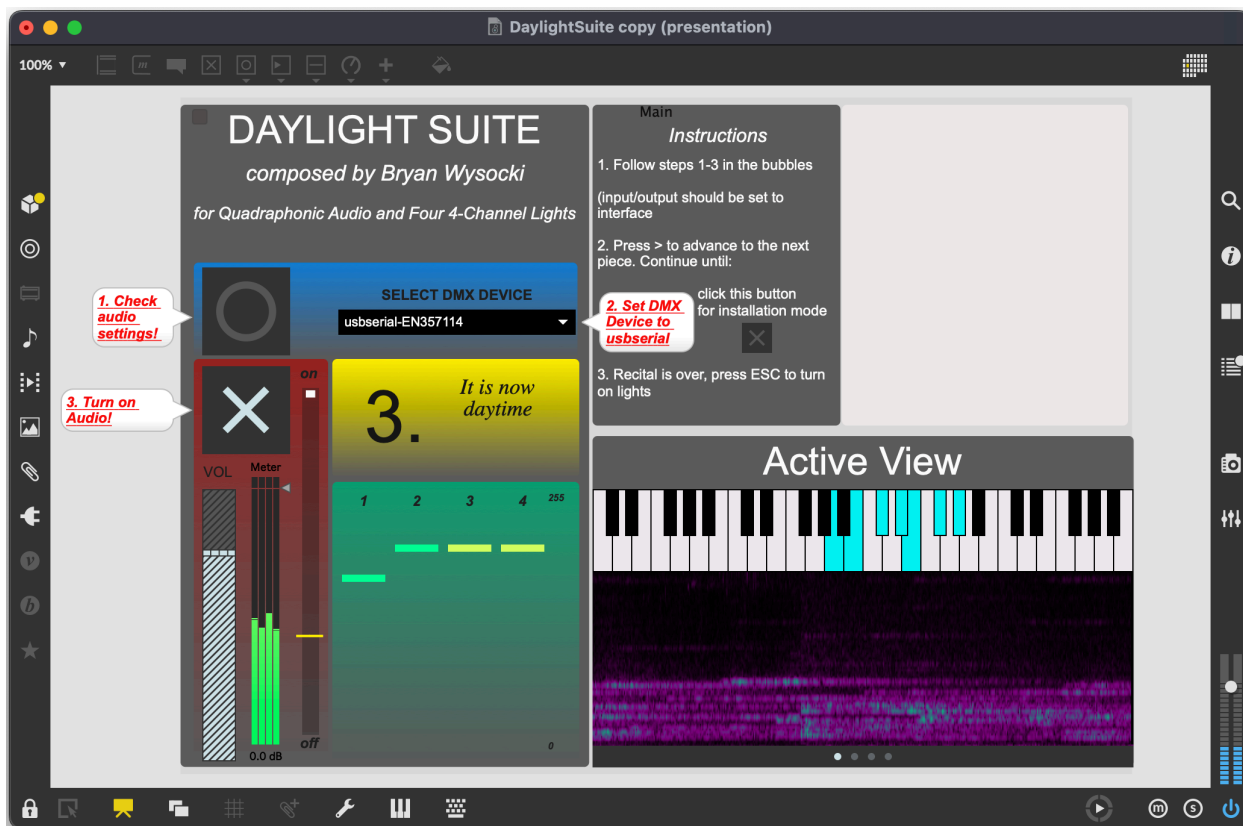


Figure 61 – The performance patch for Daylight Suite.

The sound of the *Daylight Suite* is generally ambient, with the brighter parts of the day sounding higher in pitch than the later parts of the day. Audio samples of crickets, birds, wind, rustling trees, and other atmospheric sounds are present throughout the day, with more nocturnal environmental sounds developing later in the day.

The electronic sounds, or the so-called “bleeps and bleeps”, are synthesized inside of Max, using four separate but continually running random number generators to determine when and what pitch will be played. The random number generator is an [urn] object that is polled at a regular interval and refreshed when it reaches the conclusion of its process. The [urn] object is attached to [sel] objects that look for specific numbers corresponding to a pitch. When that number is randomly generated, a pitch is synthesized. The types of scales available for the patch

to use change throughout the day, with the earlier parts of the day corresponding to the generally “brighter” scales and modes (and vice-versa with the darker parts of the day and “darker” scales).<sup>104</sup>

When one of the random number generators is pinged, the synthesizer creates a tone. That audio signal is sent out to the channel corresponding to its number; for example, if the second of four random number generators creates a bleep, then it comes out of the second channel of audio. The brightness of each fixture directly corresponds to each channel of audio; meaning that if the first random number generator creates a “bleep” in channel 1, then the first fixture will become brighter as the bleep is heard.

This is the earliest version of the subpatch that would later become [p AmplitudeScaling] and the first instance of electronic sounds being represented visually with the *Toolbox*. Being able to physically see where the sound is coming from inside of a quadraphonic array provides the audience with a more immersive experience.

A short time after completing the *Daylight Suite*, the opportunity arose to work with an ensemble that was visiting the UGA Composition department. The ensemble, in general, specialized in multimedia and works that used other aspects of music technology. The resulting piece was *Toy Boat*, for clarinet, violin, cello, piano, and multimedia – full score available in Appendix D. It uses several of the multimedia techniques I was exploring at the time such as projection, video manipulation, and interactive lighting. The *Toy Boat* controller patch managed all these aspects internally in one patch (Figure 62).

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<sup>104</sup> The section labeled “Active View” shows which pitches are active, with a [spectroscope~] object showing the sounds of the entire installation.

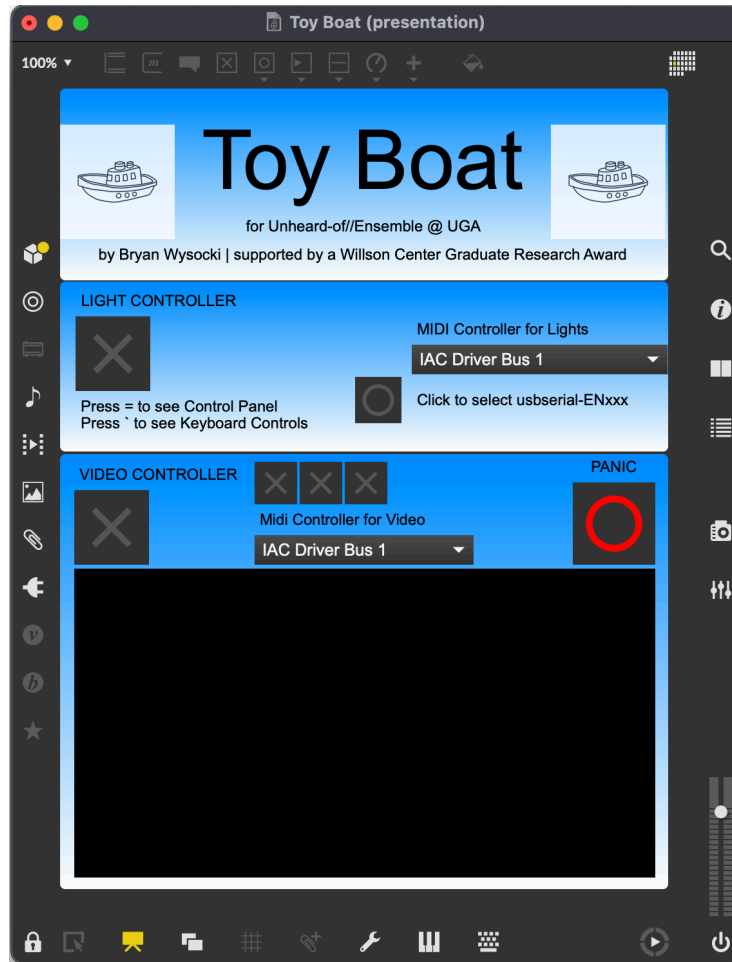


Figure 62 – The home screen of the performance patch for Toy Boat.

The piece was an experiment in using MIDI input from a keyboard to control lighting in real time. A MIDI keyboard was placed on the shelf of the piano, so that the pianist could play both keyboards easily. This allowed the pianist to control the lighting by playing the notes written into the score.<sup>105</sup> The clarinetist operated a MIDI foot pedal which operated the projections. Both players used the same patch, open on different laptops, to create the piece's multimedia and lighting – rather than running it all through one laptop.

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<sup>105</sup> At least, that's how it was designed to function. In the reading/recording session, I personally performed the MIDI keyboard part.

For *Toy Boat*, four lights were used, with a light placed in front of each player, illuminating them from below. The lighting was notated rhythmically into the score, on a separate staff that was to be read and played by the pianist. The noteheads were color coded, to represent the color of the light would become when that key was pressed. The seven natural notes (C, D, E, F, G, A, and B) corresponded to the seven colors of the rainbow (red, orange, yellow, green, blue, indigo, and violet) directly.

While the noteheads controlled the specific color, the octave controlled which of the lights in the setup was to be changed. The first and lowest octave of the MIDI controller corresponded to the first of the four lights in the setup – the second octave the second light, and so on until the fifth and last octave. The notes pressed in this last octave controlled all four lights at the same time, rather than just one single light.

Toy Boat - TRANSPOSED SCORE

The image displays a musical score for measures 191-198 of the piece 'Toy Boat'. The score is titled 'Toy Boat - TRANSPOSED SCORE'. It consists of several staves: Cl. in bb (Clarinet in B-flat), Ped. (Pedal), Vln. (Violin), Vc. (Viola), MIDI, and Pno. (Piano). The MIDI staff is the key feature, showing color-coded notes (red, orange, yellow, green, blue, indigo, violet) that correspond to the seven natural notes of the rainbow. The notes are placed on a staff with a dashed line labeled '8va' above it, indicating the octave. The piano part (Pno.) shows chords and single notes corresponding to the MIDI notes. The other instruments (Cl. in bb, Vln., Vc.) have their own musical notation. The score is marked with a box 'I' at measure 191 and a 'f' (forte) dynamic marking.

Figure 63 – Measures 191-198 of *Toy Boat*, showing the color-coded notation of the MIDI keyboard. The colored notes translated to the color of the light. Each of the five used octaves corresponded to a single light.

In the passage above (Figure 63) the melody present in the MIDI keyboard part is played in the highest octave of the MIDI controller. The notes played in this octave control the color of all four lights at the same time, in rhythm. While the passage below (Figure 64) shows the color changing of individual lights, with each octave of notes (from B to C) corresponding to the second and first lights in the setup.

Figure 64 – Measures 115-121 of Toy Boat. The MIDI keyboard part shows a descending scale, changing the color of individual lights in separate octaves.

Figure 64 also shows one of the functions of the accidental notes (Db, Eb, Gb, Ab, Bb). The accidentals in this setup generally control the brightness values of the lights.<sup>106</sup> The general control scheme is represented below in Figure 65:

	C#: Fade In		D#: Fade Out			F#: All On		G#: Not Used		A#: All Off		
	C: Red	D: Orange	E: Yellow	F: Green	G: Blue	A: Indigo	B: Violet					

Figure 65 – The control scheme of one octave of MIDI keyboard for both Toy Boat and the [p MIDIkeyRGBA] subpatch.

<sup>106</sup> In this patch, the accidentals function just as in the [p MIDIkeyRGBA] subpatch. This is because the functionality created for *Toy Boat* was refined to become the [p MIDIkeyRGBA] subpatch.

The speed of the fading in and out of the lights can be controlled in the [p MIDIkeyRGBA] subpatch, but not in the *Toy Boat* patch. This is because the *Toy Boat* patch uses consistent fade times to match the tempo of the piece. The immediate on and off notes (F# and Bb, respectively) were instantaneous.

In *Toy Boat*, a single octave of colored noteheads corresponded to a single light's color, and so too did the brightness controls. The brightness controls in the first octave only controlled the brightness of the first light – the second octave controlled the brightness of the second light, and so on until the fifth octave. Again, this last octave controlled all four lights simultaneously. This functionality is not present in the [p MIDIkeyRGBA] patch, because that subpatch was designed to be more adaptable. Where the *Toy Boat* patch was written for a specific setup, [p MIDIkeyRGBA] was written to be malleable and used as needed for any given lighting setup.<sup>107</sup>

From these two pieces, *Toy Boat* and the *Daylight Suite*, it became possible to control lighting both by manipulating MIDI data and by using audio input. This allowed for the lighting to be controlled in a way that was more “musical” than just simply programmed sequences. Now, the light could be operated by a musician, without prior training in the *Toolbox* – as in the case of *Toy Boat*. This was a huge step in the development of the *Toolbox*, as it allowed the concepts to move beyond what I alone could do with them. Other musicians could and should use the *Toolbox* in new and creative ways that may have otherwise been unintuitive to me.

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<sup>107</sup> This functionality could be recreated in any number of ways. For example, using [/ 12] and [route] to sort incoming MIDI pitch values according to its octave.

## NEW COMPOSITION: *PLAYING WITH SHADOWS*

*Playing with Shadows*, the titular piece for both this document and my final recital, is a work that merges the lighting tools of the *Toolbox* with the compositional techniques I have developed in my artistic practice. It is an evening length solo work for percussion and multimedia that uses projection, autobiographical narration, improvisation, and interactive lighting to tell the stories of my many memories and (alternate) realities.

The inspiration for the piece, as intangible as that is, comes from wanting to take advantage of what may be my last opportunity to write this type of immersive multimedia piece. It is a work that I have always wanted to write. It is self-reflective, autobiographical, and sincere, with moments of beautiful interplay between the instruments and the synthesizer; and yet it is also deceptive, groovy, and ostentatious. It holds both ideas at the same time, with the kitsch redefining the beauty, and the gorgeousness recontextualizing the tackiness as the piece unfolds.

The work is about the many (false) binaries we experience in life and how reality and memory are often constructed from the gray areas in between. The piece primarily focuses on several contrasting ideas: lightness and dark which are reflected in the physical shadows and monochromatic projections used throughout the piece, the duality of existence and memory as utilized in the narration, the distance between composition and improvisation, etc.

There is also duality in the narration; it is very distinctly my own voice talking to the audience, but none of the words are coming from myself, the person visible on stage whose body the voice belongs to. Recording my voice, as opposed to performing the narration live serves two main purposes: it memorializes these stories by recording them and it allows me some mental bandwidth to adapt the performance to match the text with some regularity. By not improvising

the material and recitation of the text, it allows me the space to improvise and perform the musical aspects of the performance.

The work is structured in nine movements, each using a percussion instrument and a spoken word narration. The narration accompanying each movement oscillates somewhere between truth, falsehood, and a kind of bent reality. It is not quite true, not quite false, but somewhere in between, living in the shadows of both. The odd-numbered movements such as the Prelude, Interludes, and Postlude all feature the vibraphone as the main percussion instrument, along with narrations reflecting on my real life. The even-numbered movements all feature drums and other non-pitched percussion instruments as the main instrument for the movement. The narration is made up of stories that are either flat out false or may have happened to me in another reality.<sup>108</sup> The first few words of each line in the narration are present in the score, to help the performer line up musical events.

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<sup>108</sup> Transcripts for each of the narrations is included in the score as part of Appendix A.

Instruments in this Movement:  
Vibraphone

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 1. Prelude

**Calmly** ♩ = 132

Bowed Vibraphone

Synthesizer

Video Projection

**Calmly** ♩ = 132

*p*

Night Time Car

1 2 3 4 5 6 7 8 9 10 11

///

B. Vib.

S. Bells

Synth.

Film

(mV)

*p* pedal ad lib.

12 13 14 15 16 17 18 19 20 21 22 23 24

///

B. Vib.

Synth.

Film

*When I was a kid*

25 26 27 28 29 30 31 32

Figure 66 – A score sample from the opening Prelude, showing the synthesizer, video projection, and vibraphone part.

The sound of the piece heavily features synthesizers created in Max/MSP. The odd-numbered movements have more-or-less identical structures, each repeating with a new variation in texture, key, tempo, etc. to give them a sense of unfamiliar familiarity. These interludes all use the same synthesizer, which sounds reverberant and spacious. The sound is of long sustaining tones, reminiscent of a digital bell tower. Ideally, when listening to these movements, the synthesizers transport you into dream-like state, suspended in a familiar place, out of time.

14

*Playing With Shadows - Movement 2: Control*

The image displays a musical score for the second movement, 'Control'. It is divided into two systems of music. The first system covers measures 83 to 86, and the second system covers measures 87 to 90. Each system includes three staves: Dr. (Drum), Synth. (Synthesizer), and Film (Film). The Dr. part features a driving, rhythmic pattern of eighth notes with accents, marked with a forte (*f*) dynamic. The Synth. part consists of a melodic line in the treble clef and a bass line in the bass clef, marked with a fortissimo (*fff*) dynamic. The Film part provides a harmonic foundation with sustained notes and rests. The score is marked with a common time signature (C) and includes dynamic markings such as *f* and *fff*. The second system shows a change in the drum pattern and the film part, with measures 89 and 90 featuring a 3/4 time signature.

Figure 67 – A score sample from the second movement, Control, showing the driving percussion and electronic parts.

Even-numbered movements use drier, more articulate sounds, which each of these movements using a different synthesizer. This creates variety and texture in the ear as the evening develops; the ear recognizes that we have returned to an interlude and when it departs, the sound is not the same as it was previously. These movements are more rhythmic than the interludes, and when coupled with a more pronounced synthesizer, create intrigue in the listener's ear.

The large-scale harmonic structure of the piece generally moves between major scales, with *Control* and *Accident* veering away from a standard key center. This is deliberate, as the major keys create a sense of familiarity within the ear immediately – but the way they are arranged and moved between is unusual. The general harmonic form could be thought of as follows:

	<i>Prelude</i>	<i>Control</i>	<i>Peach</i>	<i>Sky</i>	<i>LEGO</i>	<i>Accident</i>	<i>Mountain</i>	<i>Collage</i>	<i>Aether</i>
Key:	C <sup>Δ</sup>	G <sup>Δ</sup> / D Mixolydian	G <sup>bΔ</sup>	D <sup>Δ</sup>	F <sup>Δ</sup>	Bb <sup>Δ</sup> / D Phrygian	A <sup>Δ</sup>	E <sup>Δ</sup>	D <sup>bΔ</sup>

*Table 33 – Large scale harmonic form of Playing with Shadows.*

The lighting also operates in a similar manner to the audio, projection, and form. They establish clear visual patterns that shift as the piece develops, constantly keeping the eyes as interested as the ear. The interludes use every light to generate deep washes of color that respond to my voice. The color of each light is controlled by the pitch of the synthesizer, as controlled by the *Toolbox*'s preset definitions. When the synthesizer in Max creates a note, the pitch information of that note, regardless of octave, is converted to one of the colors below (Figure 68)

and is then used by the light. This is true for the video projector as well; when a note is produced in Dorico, a video in Max is played for the duration of the note.

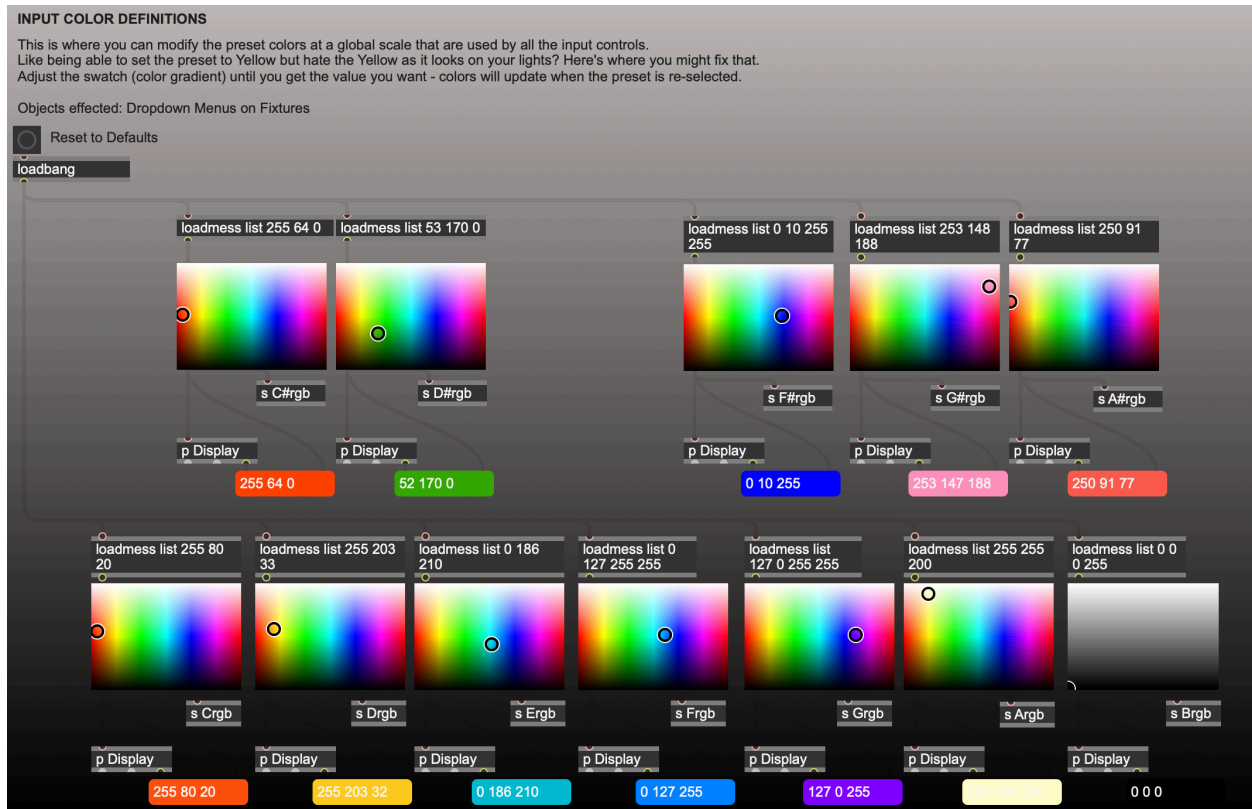


Figure 68 – Color preset definitions for Playing with Shadows.

In the interludes, the lights are all generally the same color, with the brightness of half of them responding to the amplitude of the voice recordings; the other half fills in the space, relying on the inverse of the brightness values.<sup>109</sup> During the even-numbered movements, the lights are split by color. Half are assigned the color determined by the synthesizers pitch, and the other half are assigned a color any number of half steps away from the original color. This creates a sort of

<sup>109</sup> If lights 1 and 2 are bright when I am talking, then lights 3 and 4 are dark. When I am not talking, 1 and 2 are dark, and 3 and 4 are bright. This is an instance where seeing this phenomenon is essential.

visual harmony. If the off-numbered interludes are unison colors but opposing actions – the even-numbered movements are opposing colors but unison actions.

The composition was written in a sort of top-down approach, with the large-scale aspects written first: structure, narration, and form were the primary focus. Once the canvas was established, creating the smaller moments became more interesting. The odd-numbered movements share several key components: the vibraphone is the featured instrument, they all use the same synthesizer, and they all generally follow the same structure. Yet, they all use different keys, textures, and registers. The even movements were written to be more intense: drier synths, dynamic videos, stronger rhythms. The influences on each of these are more overt: synthpop and dance influences in *Control* and *Accident*, and different shades of minimalism in *Big Sky Country* and *Collage*.

The instrumentation used in every movement is also different, with every movement using unique instruments. Even in the interludes, which all use vibraphone, most use saucer bells, but *Peach* does not. Each of the interludes all have slightly different textures as well, with the bowed vibraphone note existing in the multiple registers of the vibraphone along with a varied interplay between the struck vibraphone and saucer bells.<sup>110</sup>

	<i>Prelude</i>	<i>Control</i>	<i>Peach</i>	<i>Sky</i>	<i>LEGO</i>	<i>Accident</i>	<i>Mountain</i>	<i>Collage</i>	<i>Aether</i>
Key:	Vibraphone, Saucer Bells	Snare Drum, Cowbell, Guiro, Kick Drum	Vibes	Bass Drum, Kalimba	Vibes, Saucer Bells	3 Rototoms	Vibes, Saucer Bells	5 Assorted Wind Chimes, Triangle, Coil, Trine	Vibes, Saucer Bells

Table 34 – A list of instruments used in each movement.

<sup>110</sup> Saucer bells are an unusual instrument; like crotales in sound, saucer bells are two octaves of a chromatic bell tree that have been re-purposed to be played as a keyboard instrument.

The synthesizer sounds created in Max are also used to manipulate the look of the piece. Pitch information is used to control some of the lighting, while the immediate amplitude values are used to distort the video projections. The projections are video files taken from digital transfers of early 20<sup>th</sup> century Hollywood B-roll film canisters.<sup>111</sup> All in vivid monochromatic black and white, the films are both mundane and gorgeous. The footage is mostly of establishing shots: wide static landscapes, exteriors of buildings, scenes from everyday life, the view from a moving window, etc. Where exactly these rolls of film came from, what they were used for, and why they were seemingly discarded is a bit of a mystery to me – but I have been captivated by their look since I found them.

The clips used in each movement differ wildly, and no clip is repeated twice throughout the piece. The videos, just like the sounds, lighting, and narration, are constantly changing. Thematically, there are a few throughlines that run the piece. Interludes are generally blurry, to represent the haziness of a dream or memory. Even-numbered movements are generally clear or digitally altered to smudge the line between truth and fiction. The table below shows the primary visual motifs for each movement:

<i>Prelude</i>	<i>Control</i>	<i>Peach</i>	<i>Sky</i>	<i>LEGO</i>	<i>Accident</i>	<i>Mountain</i>	<i>Collage</i>	<i>Aether</i>
Blurry Car, Night	Mountain, Night Beach	Blurry Car, Day	Clouds	Train Depot Passengers	City Street, NYC Skyline, Train Depot	Blurry Bridge, as seen from a Boat	Line Art: Lighthouse, Mountain, Carousel, Department Store	Street

*Table 35 – Film footage corresponding to each movement.*

<sup>111</sup> The source footage is available on the Internet Archive at: <https://archive.org/details/35mmstockfootage>

Playing with Shadows - stage setup

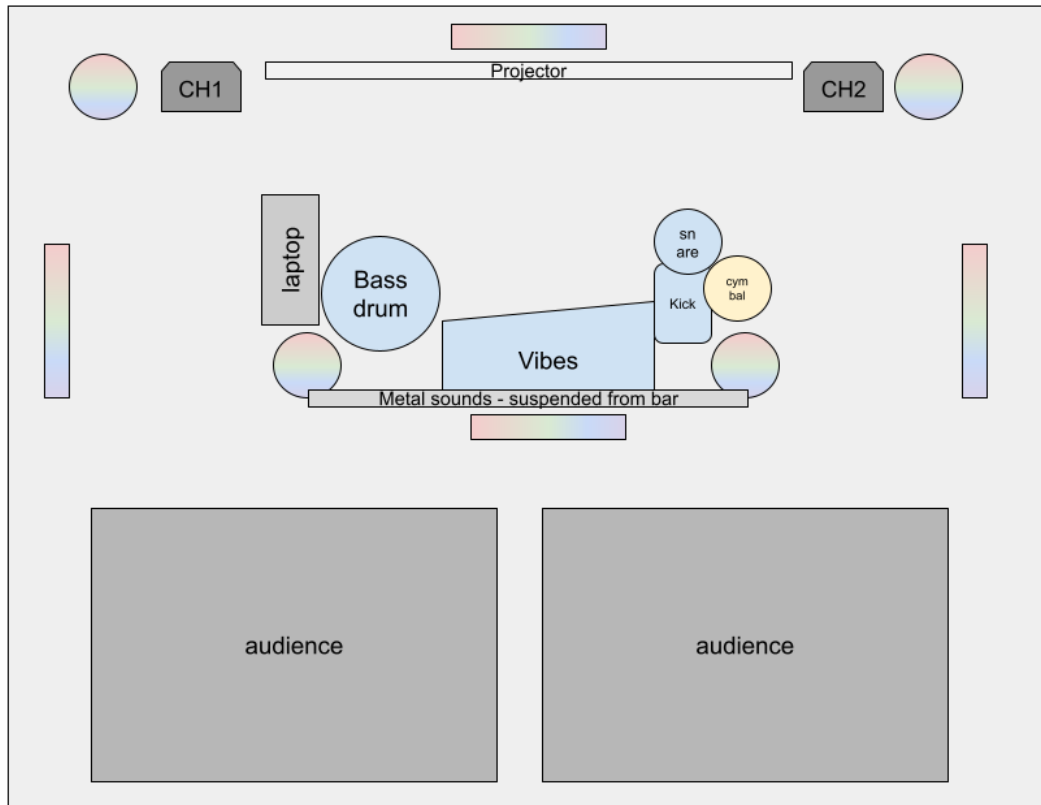


Figure 69 – An early stage diagram for the premiere of *Playing with Shadows*, as performed in the Dancz Center for New Music at the University of Georgia.

Each movement of the piece features these video recordings, with my body physically casting shadows onto them as the work unfolds, as you can imagine from the stage diagram (Figure 69). The black and white footage is also altered by the tinted lighting which projects color into the space my body negates. The result is a colorized shadow of myself inserted into the vintage films presented simultaneously with an overlay of the video onto my physical body. I am, in a sense, transporting myself out of both time and place. In the performance, I am in the room in the moment, but my figure is both represented by and distorting footage of the past.

The piece is performed by running MIDI information from the notation software Dorico into Max/MSP via Max's virtual MIDI devices. When one presses play on Dorico, the necessary

MIDI information that is used to automate the piece is sent to Max and the piece is played without interruption. Moving in between movements happens manually, by pressing the arrows keys on the keyboard, but the Dorico file of the work is constructed in such a way to give the performer (myself) enough time to make the necessary changes.

The MIDI information from the instruments labeled *Synthesizer* and *Video Projector* are sent to Dorico to control their specific materials. This allows both the synthesizer and projector, and by some extent the lighting design, to be controlled in *Toolbox* via musical notation. Given that all the lighting design is done by utilizing MIDI data or audio signals created in Max, one could think about the lighting design as being created “live”.

The performance patch that controls the piece is straightforward (Figure 70). Each component of the work that is synthesized inside of Max (video, audio, and lighting) is controlled inside of this subpatch. Each aspect of the piece is controlled in its own sandbox. Separating functions like this keeps the patching environments tidy and organized by grouping like functions together.

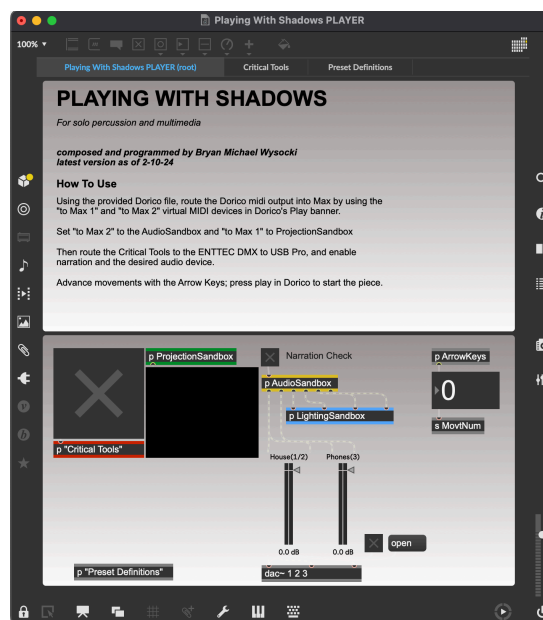


Figure 70 – The home screen for the Playing with Shadows performance patch.

When the patch is loaded, only a few pieces of information need to be set by the user: one needs to balance the correct audio device and inputs, select and initialize the ENTTEC lighting interface, route the two [midiin] devices inside of the audio and projection sandboxes from Dorico, and ensure the projection is moved to the correct screen.

Once the performance patch, physical hardware, and Dorico file are all correctly configured, the piece plays itself.<sup>112</sup> Choosing to run the piece through Dorico was practical, as it ensured the different components (sound, video, and light) were in sync. Initial experiments tried to use Max to synchronize playback of MIDI files that corresponded to the virtual instruments inside of Dorico – but this proved to be more complicated than necessary. By just sending the information from Dorico directly to Max, it enabled the playback of all components to be synchronized – and more importantly, rehearsed.<sup>113</sup>

Technological requirements aside, *Playing with Shadows* is a deeply personal piece that is richly suffused with the materials I find interesting: concert percussion instruments, interactive light, bold colors, old 35mm film reels, pop bass lines, found sounds and created instruments, bubbly synthesizers, personal stories, untrustworthy narrators, autobiographical composition, immersive experiences, video projection, narrative as form, long form works, etc. The work is an assemblage of all the experiences that have shaped me and all the things I love. I want the audience to feel enveloped in a bizarre, yet nostalgic and relaxing hug.

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<sup>112</sup> This footnote exists only for my own future reference. Since Dorico utilizes Max's virtual MIDI devices, Max needs to be opened first, before Dorico can be opened. Failing to open the programs in this order causes Dorico to send MIDI data to a virtual device which does not exist.

<sup>113</sup> This was perhaps Dorico's biggest advantage over the simple playback of MIDI files. Rehearsing the piece became selecting a bar to start at, rather than coordinating each of the MIDI files to playback at the same location.

## CHAPTER 6

### CONCLUDING – THE FUTURE OF THE *TOOLBOX*

The goal in creating the *Toolbox* was to provide composers with a new way to create exciting and captivating compositions. Ideally, the concepts covered within this document are thorough and descriptive enough to convey just how to use the *Toolbox*. In reality, I am sure this document is limited in how much information is conveyed, given how imperative it is to visualize how these lighting concepts are realized. Lighting is, of course, a notoriously difficult phenomenon to describe in text.

It is for this reason, that I suspect several video tutorials may be necessary to aid the reader in understanding just what these tools are capable of.<sup>114</sup> Being able to see the results of the *Toolbox* will better serve the reader's creativity, even if the descriptions in this document explain precisely *how* it should function. It is seeing these tools in action, being able to manipulate the light oneself, that illuminates *why* these tools exist, and for what creative purposes they can be used.

However, it is important to note that the current state of the *Toolbox* is just a starting point, both for my own personal Max journey, and for interactive lighting design tools in Max, in general. By releasing these tools to the public for free, I hope that in time, these concepts and patches have a life outside of the one I have already given them.

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<sup>114</sup> The creation of these tutorials is an ongoing project; and one that is currently in the pre-production phase. The expected completion date is set for the end of the 2024 calendar year. Video tutorials will be available at my personal website: [www.bryanwyssocki.com](http://www.bryanwyssocki.com).

Given that this is just a start, where do I see this project going? It is possible to connect the *Toolbox* to the popular Cycling '74-owned DAW, Ableton.<sup>115</sup> From there, it becomes possible for many other musicians and artists to incorporate the *Toolbox* without needing to use Max/MSP as the home software. It is even plausible that the *Toolbox* could be ported onto external hardware, such as a Raspberry Pi or Arduino. It could even be uploaded to a website and hosted on an external server for remote control, through the new RNBO package for Max.<sup>116</sup> Even inside of Max, the worlds of [gen] and JavaScript offer several ways to interact with lighting that are presently, unexplored.

By using internal MIDI devices like the iOS IAC Driver Bus and the built-in Max MIDI devices, it is possible to connect your notation software to the *Toolbox*. Doing so allows me to compose using the *Toolbox* in real time, which has been a breakthrough for my personal composing workflow, as it allowed me to compose and perform *Playing with Shadows*. Using these virtual MIDI devices greatly increases the potential for integrating and utilizing the *Toolbox*. And the number of physical MIDI devices is vast, any of which will give creators and artists new ways to play with visualizing light and sound.

If I were to speculate as to possible use-cases for the *Toolbox* outside of the ones I have envisaged for it, one of the most significant uses is the performance of older works that incorporate lighting. Scriabin's color organ for *Prometheus*, Gubaidulina's colored lights for her fourth string quartet, and Anna Thorvaldsdottir's interactive lighting for her work can now be easily programmed and performed by anyone with the requisite time and materials. The original

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<sup>115</sup> This is a larger project than the current scope of this document – but one that will inevitably be taken up at some point in the future.

<sup>116</sup> This is again, a larger project, outside of the current scope of this document.

color organs, which were mostly lost to time and various wartime material repurposing drives, can now be recreated without having to design, source, and fabricate a bespoke instrument.

By using the *Toolbox*, it is also possible for living composers who have synesthesia to create more dynamic works that reflect their condition. Both by programming lighting sequences and/or by live performing with the MIDI controls – synesthetic composers who are interested in exploring these connections can now easily do so. Going beyond just the composer, performers who themselves have synesthesia and associate colors with other works may now communicate their experiences of color through light. Concert programmers and producers can now create much more engaging performances with relative ease.

The life of the *Toolbox* is only just beginning. While many of the possibilities are currently unrealized, this is not an indictment of this project or my compositional output – rather it is a consequence of the seemingly infinite ways Max can be utilized. Every person who uses Max has an idiosyncratic way of working within it, and as such, there may be multiple ways to utilize the tools within the *Toolbox* that are currently unknown to me. I am still discovering new ways to use lighting in my music, and I look forward to developing this project further as I continue to develop my own artistic practice and compositional voice to incorporate the *Toolbox*.

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Bryan Michael Wysocki

# Playing with Shadows

For Solo Percussion and Multimedia

*For Myself; written for my Doctoral Dissertation, University of Georgia*

© Bryan Wysocki  
2-14-24  
Atlanta, GA

## Program Notes

*Playing with Shadows* is a deeply personal piece that is richly suffused with the materials I find interesting: concert percussion instruments, interactive light and bold colors, old 35mm film reels, synthpop bass lines, found sounds and created instruments, bubbly synthesizers, personal stories, untrustworthy narrators, autobiographical composition, immersive experiences, video projection, narrative as form, etc. The work is an assemblage of all the experiences that have shaped me and all the things I love. The intended result is for the audience is to become enveloped in a bizarre, yet very nostalgic hug.

The work is about the many (false) binaries we experience in life and how reality and memory are often constructed from the gray areas in between. The piece primarily focuses on several contrasting ideas: lightness and dark which are reflected in the physical shadows and monochromatic projections used throughout the piece, the duality of existence and memory as utilized in the narration, and the distance between composition and improvisation, etc.

The work is structured in 9 movements:

1. *Prelude*
2. *Control*
3. *Peach*
4. *Big Sky Country*
5. *LEGO*
6. *Accident*
7. *Mountain/Ocean*
8. *Collage*
9. *Aether*

The narration accompanying each movement oscillates somewhere in between truth, falsehood, and a kind of bent reality. It is not quite true, not quite false, but somewhere in the middle, living in the shadows of both. The odd-numbered movements all feature the vibraphone as the main percussion instrument with the narrations reflecting on my real life. The even-numbered movements all use drums and other non-pitched percussion instruments as the main instrument for the movement, and the narration reflects stories that are flat out false or may have happened to me in another reality.

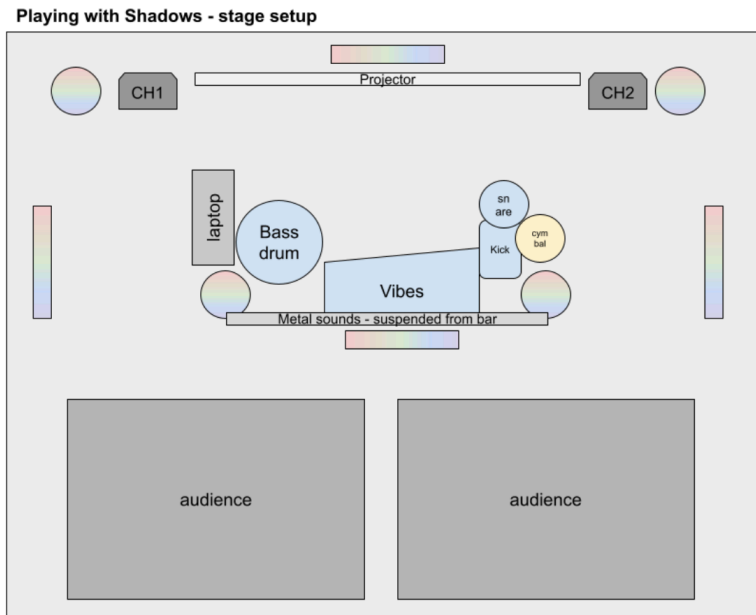
There is also duality in the narration; it is very distinctly my own voice talking to the audience, but none of the words are coming from my body, the person visible on stage whose body the voice belongs to. Recording my voice, as opposed to performing the narration live serves two main purposes: it memorializes these stories by recording them.

## Performance Notes

### Instrument List:

- Vibraphone
- 2 Octaves of Chromatic Saucer Bells (or Crotales or Glockenspiel)
- Snare Drum
- Kick Drum
- Cowbell (laid on Snare Drum)
- Guiro (laid on Snare Drum)
- Concert Bass Drum (laid on its side)
  - Glass or Plastic beads to pour on Bass Drum drumhead
- Kalimba – tuned to D Major
- 3 Rototoms
- 5 Assorted Wind Chimes
- Triangle
- Spring or Coil
- Trine

### General Setup:



## Narration Transcripts

## 1 – Prelude

When I was a kid, I spent a lot of time looking out the window of the family car.  
We traveled a lot, since there wasn't a lot to do in our hometown.  
So I sat in the backseat, watching the world.

Being young, almost everything prompted a question:  
"Where are we going? How do we get there?"  
"Where are the other cars going?  
Are there families in those cars too?"

There was one day that, even with as young as I was,  
and how far away in time that is from now,  
I vividly remember asking my parents if the people in the other cars were real.

I asked them if they were real.

I asked if I was real.

They told me that, of course we were real.  
Everything was real.

When you're a child, most of your fears are simple,  
because you don't know what you do not need to fear.

But I feared that my parents weren't real,  
and that maybe by extension, I wasn't real.

And what if I wasn't real? Did that pose any major problems to me?

Because I knew there are versions of me out there that weren't real.

I saw him when I looked out of the window at just the right angle.  
I saw him on the sidewalk when I played hopscotch outside in the sun.  
I saw him in photographs.

And if those weren't the real me, the me I could touch, the me in this room.  
Then maybe I wasn't real after all?

Maybe I was only the shadows, reflections, and projections of myself.

Does that pose any major problems to me?

## 2 – Control

The first time I went to Italy,  
I was there for a contemporary music festival.  
There was a midnight rave on the beach.  
I was only 20 years old.  
And it was the first night I was there.  
It was sometime in July, I can't remember exactly when,  
But it was a few days before my birthday and  
I remember that there was still snow on the Alps.

I was there by myself.  
Speaking next to no Italian, with only the euros I had with me in my wallet,  
Drinking awful beer at a lake rave on a lake in the Italian alps.

Then it hit me.  
I remember waking up when I hit the water.  
Being that it was a lake, the beach was made of rocks – not sand.  
Time hadn't yet eaten away at it.

It was freezing because the lake was sourced by the melting of the alps.  
So unlike any of the beaches I knew back home.  
I collected myself and went to the Airbnb to change clothes.  
I knew needed food, but the only thing open was a Greek spot near the beach.

Walking back now, I feel my phone go off.  
Twice.  
Three times now.

I knew that it was probably my girlfriend.  
Wanting to see how I was doing,  
if I made it through the airport alright.

Things weren't going well, and this trip didn't help.  
She hated me, and I probably deserved it.

At some point during the rave, they released paper lanterns over the lake.  
The sky was so empty and unpolluted by light that I could see the constellations as clear as day.  
The tea lights in the lanterns joined the stars as they floated up the mountain.  
I remember looking up at the stars, laying on my back, and seeing Ursa Major for the first time.

The moon was so bright that I could see myself in the reflection on the water.  
But I didn't look like myself.

### 3 - Peach

Do you remember the first time you realized you were alive?  
That you were really in control of your body.

I was a kid, maybe no more than 3 or 4 years old.

I remember that I was at my parent's house, sitting at the counter, and I remember eating a peach.  
And I remember that it must have been summertime because the screen doors were open.

I grew up on the shores of Chesapeake Bay, maybe 100 yards from the water.  
You could smell the bay from our windows.  
The air was different then, I think. Maybe it actually was.

I remember taking a bite of the peach.  
It was ripe and juice spilled down my chin.  
And I realized that I could move my eyes.

I could look around.  
I had control over what I was doing.

If I try to think about it now and I can still see our kitchen.  
Every time I picture it, it's different.  
I see the tiles and the counter as pale and cloudy, but they're there.

Maybe the sweetness of the peach mixed with the slightly salty air must've rewired my brain.  
It tricked me into realizing I could see – that I was conscious.

But I could look around.  
So, I took another a bite of the peach.

I could see my mom.

I took another bite and looked outside.  
I remember looking at the peach pit.  
I could see the trees, gently rustling in the breeze.

The tree trunks and the peach pit were both brown.  
I looked back at my mom.

I asked her why I couldn't see the wind?

## 4 – Big Sky Country

When me and my sister were young, our family took a road trip out west.  
We rented a van somewhere outside of DC and took off.

I think I was in middle school, maybe?  
I remember listening to music on my iPod nano.  
The special red edition.

There was nothing but road for long stretches of time.  
I was excited to see the country, but at the same time incredibly bored.

I don't remember much from the early parts of the trip,  
And if I try to imagine them, the hazy memories get further away and become hazier.

Through the haze, I see lights outside Chicago,  
A single lane road going straight up a mountain in Colorado maybe?  
The badlands of the Dakotas seemed almost alien.  
I remember jumping from rock to rock.

I remember the sketchy hotel outside Yellowstone where they shot off fireworks for the fourth of July maybe?

I remember going up the elevator of the arch in St. Louis  
I remember having a cooler of snacks in the way back of the van, where I sat.  
I remember my legs falling asleep in the car.  
I remember driving straight through the night and pretending to be asleep.  
I remember a pizza hut.

But these are all slightly hazy stories.  
What I do remember clearly is the sky.

I remember feeling small in comparison.  
Many people feel this way in front of the ocean, or the Grand Canyon, or something massive.  
But there's a reason it's called Big Sky Country.

The sky was oppressive almost. I became aware of its presence at all times.  
Most of all when we got out of the car.  
When you drive at night, the moon follows you and its comforting.

In the day, the sky is always there. Surrounding and suffocating you.  
You can never escape it.  
Grasping for clouds is impossible.  
They shift, like memories, the second you try to grab one.

## 5 – Lego

My mom tells this great story about me from when I was a kid.  
It starts, like most stories from that time in my life, with telling people that I loved playing with Legos.

I mean who doesn't?  
And as an adult, it makes sense why you'd give your kids Legos.  
One toy becomes infinite toys. It's perfect - there's always something new to make.

No matter what happened, I could always find a way to make what I wanted.  
There was always a new way to put the pieces of my life together.  
She says that I would make these elaborate games, creating environments, characters, and even game pieces out of Lego.  
The issue was, well, I was a young kid, and my games didn't make a ton of sense.

My mom, being the saint that she is, played along to the best of her ability.  
Trying to decipher what the rules were, and how to make sense of it.  
Often, as she tells it, I would get frustrated when she started beating me at my own game.  
What's weird is I remember these games, I think.  
Obviously not the actual game, but I do remember playing with my mom.

I can see the house as it was when I was young.  
I can see these old stories about me happening to me, as if I was viewing them from afar.  
And I have memories of the these that happened that, realistically, I could not actually remember.

But still I see it. I'm sure if you were to close your eyes, you could also see your stories too.

There's another story from this time that involves me missing the bus on my first day of kindergarten.  
The gist of that story is that the school blamed it on me, because I should have known which bus to ride.  
I came home, upset of course because I thought my parents abandoned me to live at school forever – and buried myself in my work.

So I'd sit there, making up my own games with the materials I had,  
Crafting every moment, every interaction of it until it only made sense to me.

## 6 – Accident

Right after I undergrad was temporarily homeless.  
I went to and finished school on Long Island, in New York.  
I had to move out of the house I was renting,  
Attend these summer music programs, teach at an orchestra camp,  
and then immediately start grad school.  
I knew the summer programs were coming up,  
and I had the job at the orchestra camp lined up for a minute.  
I scheduled everything so that they were all back-to-back.  
There was no moment of rest.

But as I scheduled my time, there was a big question to be answered:  
I was starting in Vermont then going to New Jersey then back to  
Long Island then up to Upstate New York then to...?

I had three choices main choices ahead of me: Boston - New York – Atlanta off

(Boston) There I had nothing. No connections, no work lined up, and no place to live.  
But I had a scholarship offer for the Boston Conservatory.  
At the time, I wasn't sure if I wanted to be a percussionist or a composer.  
I thought I had to choose, and I still think I might have to.

(New York) Is where I had some friends, some work, and I could easily find a spot in the city.  
It's where my teacher went, and tons of other people whose names I recognized went there too.  
It was just so expensive. Even with a scholarship offer from the Manhattan School of Music.  
I just couldn't afford it. It couldn't make it work out. But what if I could?

(Atlanta) Was not on my radar until very late in the game.  
I had gotten an offer to do my masters in both composition and percussion there.  
I didn't have to choose. But I knew nothing about the city.  
I didn't know anyone down there and I didn't even know if there was a scene for me.

Something pulled me to Atlanta though.  
The food? The weather? The full ride? No one can really say.  
But could I really just abandon the network I had in New York?  
I had friends, mentors, and jobs on the Island.  
I could drive to ocean within minutes.  
That ocean time was critical for resetting my brain.

I had also developed anxiety in New York.  
And Boston was too cold.  
So maybe I didn't want to stay up there after all?  
Maybe it was time for a new start? I was lost and had to decide quickly.

## 7 – Mountain/Ocean

Picture a friend you haven't seen in a long time. Ideally, you picture someone that you couldn't imagine never knowing. Someone made for you? Platonic soulmates maybe? It's a very intense friendship that develops incredibly quickly. Maybe it even fades as soon and as powerfully as it began?

That often hurts more, doesn't it, recessing backwards from someone who understands you. But if they understand you so deeply, you hope, maybe they understand why this tectonic shift has to happen. People drift apart.

My friend and I often chatted about whether we were mountain people or ocean people. Where did we feel more at home? In the silence of the mountains, or standing on the noisy shore? She insisted, intuitively, that she was a mountain person. And I knew that I was an ocean person. This difference made us look for what made each atmosphere similar, so that we could use this imagery to find the common ground between us that we subconsciously knew existed.

We decided the issue was of scope, not necessarily environment. Of course, the mountains and oceans are in different places, different climates, and often don't coexist. But they were the same thing, just on different timetables. Just as Oceans have very noticeable waves, and even less noticeable tides, so do the mountains that form and erode in the same cycle, but on a significantly larger scale. Eons, not days.

But you can see the evidence for both in the layers of sediment they leave on the earth. Each wave leaves small deposits on the shoreline, and the layers of rock are visible in the geological record.

We chatted about whether we would want to live as either the mountains or the oceans. As if we could experience the world as either one. We knew the way that we would experience time would be vastly different; and that our relationship to water would be the opposite: where the oceans are made of water, mountains are destroyed by it.

And we wondered if we both experienced the world at the same rate, would we then experience change? Mountains are largely stagnant, fixed. Yet if you were to view them over millennia you would see that they are continually protruding and corroding, just over vast swathes of land. And so are the oceans. Shorelines are more or less the same as they ever were. But they are frequently changing on the micro level. The tide never reaches the same place twice. There's a cycle to them both, just as there's a cycle to everything.

Did we need to agree on which one we were? No, we never did. We tried over and over again to shape this allegory into new silhouettes so that we could use it to understand each other. But maybe that's why we drifted. We are not metaphors. Our actions have consequences.

The tectonic plates that held our hypothetical oceans and mountains strayed, both rapidly and gradually, away from each other.

## 8 – Collage

Jupiter  
The Old Loft  
Rock Hill  
Sri Lanka  
Yellow  
Luck  
Hand-written  
Safety  
Second Try  
Airport  
Silence  
Montauk  
Toll booth  
New York  
Barns  
Walkthrough  
Warmth  
Bright Green  
One Week  
Turkey  
Long Distance  
Mars  
New House  
13  
Italy  
Blue  
Patience  
Digital  
Security  
First Mistakes  
Driveway  
Peace  
Penland  
Pass  
Baltimore  
Fields  
Closing  
Refuge  
Pale Grey  
Forever  
Home

## 9 – Aether

I have always trusted in something larger than myself. Not quite God or religion. But something smaller, something that permeates everything. For a long time, I thought it was just simply the universe. I would say “the universe provides.” “The universe doesn’t want this to happen.”

I thought that if I believed in something that was truly universal, I could use it to explain the many impossible coincidences that have happened to me.

Circumstances that happened under truly astronomical odds.

I thought if I believed in it, if I voiced my opinion to the universe, I could influence it.

I know that memories influence me. That’s an example of time travel, isn’t it?

But if you act accordingly, knowing that every action will soon be a memory, it forces you to change the way you act. And if you think, like I did, that my actions both in the past and the future would influence my present, then that puts a lot of pressure on the universe.

But for long stretches of time, and often when I was the loneliest, I believed in it – I trusted the universe.

That trust comes from knowing that there actually is something that connects us that isn’t God, or religion, but something smaller and more important. It’s what connects us to ourselves, to each other, to the world, and to the universe.

In ancient times, there was a word for this force and the space it occupied. The Greeks called it the aether, or by describing its quintessence – meaning the fifth element of the natural world – after the four primary elements: earth, water, air, and fire.

They believed it to be what filled the universe; why light filled a room but could not be touched. The thought was that the waves of the ocean used the medium of water to travel, and so light could only travel in a vacuum if there was something more to the vacuum, if there was another field of something that existed to carry light.

Scientists tested this in all sorts of ways, using vacuums and mirrors to try to measure the speed of light in perpendicular directions relative to the movement of the Earth.

Of course, they eventually found that there is no aether field, light exists as both a wave and particle. Something that still makes my head hurt if I think about it too hard.

But there’s something nice about that notion, that light is two things at once. It is known both by its presence and by its absence. It is both its color and its shadow.

Memories, like light, exist as both truth and fiction. Recreated and improvised in the moment based on hazy images which no longer exist.

Yet I believe in them because I see the memories reflected in the shadows of the aether.

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 1. Prelude

**Calmly** ♩ = 132

Bowed Vibraphone

Synthesizer

Video Projection

Night Time Car

1 2 3 4 5 6 7 8 9 10 11

B. Vib.

S. Bells

Synth.

Film

*p* pedal ad lib. - motor on, slow

12 13 14 15 16 17 18 19 20 21 22 23 24

B. Vib.

Synth.

Film

When I was a kid...

25 26 27 28 29 30 31 32

**A**

Musical score for measures 33-40. The score is divided into five systems. The first system includes B. Vib., S. Bells, and Vib. The second system includes Synth. and Film. The first system has a dynamic marking of *mf*. The second system has a dynamic marking of *mp*. The third system has a dynamic marking of *p*. The Film part is a single line of music with a dynamic marking of *p*. The measures are numbered 33, 34, 35, 36, 37, 38, 39, and 40.

*Being young, almost...*

Musical score for measures 41-48. The score is divided into two systems. The first system includes B. Vib. and Vib. The second system includes Synth. and Film. The first system has a dynamic marking of *mf*. The second system has a dynamic marking of *mp*. The Film part is a single line of music with a dynamic marking of *mp*. The measures are numbered 41, 42, 43, 44, 45, 46, 47, and 48.

**B** *Are there families in those cars too?*

B. Vib. *mf*

S. Bells

Vib. *mp*

Synth.

Film

49 50 51 52 53 54 55 56

B. Vib.

Vib.

Synth.

Film

57 58 59 60 61 62 63 64

**C**

B. Vib.

S. Bells

Vib.

*mp*

Synth.

*p*

Film

65 66 67 68 69 70 71 72

*There was one day...*

B. Vib.

Vib.

Synth.

Film

73 74 75 76 77 78 79 80

**D** *I asked them if they were real...*

Musical score for measures 81-89. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. A key signature change to D major is indicated by a 'D' in a box at the beginning of the system. The lyrics 'I asked them if they were real...' are written above the B. Vib. staff. The Vib. part starts at measure 82 with a dynamic marking of *mp*. The Film part has a steady eighth-note accompaniment. Measure numbers 81, 82, 83, 84, 85, 86, 87, 88, and 89 are printed below the Film staff.

*I asked if I was real...*

Musical score for measures 90-96. The score is for four instruments: B. Vib., Vib., Synth., and Film. The lyrics 'I asked if I was real...' are written above the B. Vib. staff. The Vib. part has a steady eighth-note accompaniment. The Film part has a steady eighth-note accompaniment. Measure numbers 90, 91, 92, 93, 94, 95, and 96 are printed below the Film staff.

**E** *They told me that...*

B. Vib.  
S. Bells  
Vib.  
Synth.  
Film

*mp*

*p*

97 98 99 100 101 102 103 104

*When you're a child...* *But I feared...*

B. Vib.  
Vib.  
Synth.  
Film

105 106 107 108 109 110 111 112

*And what if...*

B. Vib.

S. Bells

Vib. *mp*

Synth.

Film

113 114 115 116 117 118 119 120

**F**

*Because I know there...*

B. Vib.

Vib. **F**

Synth.

Film

121 122 123 124 125 126 127 128

Musical score for measures 129-136. The score includes parts for B. Vib., S. Bells, Vib., Synth., and Film. The B. Vib. part features a series of dotted half notes with a slur. The S. Bells part has a few notes at the beginning followed by rests. The Vib. part has a melodic line starting at measure 130 with a *mp* dynamic. The Synth. part has a piano (*p*) introduction in measure 129. The Film part has a bass line with notes corresponding to the measures below.

129 130 131 132 133 134 135 136

Musical score for measures 137-144. The score includes parts for B. Vib., Vib., Synth., and Film. A double bar line is present at the start of this section. A box containing the letter 'G' is placed above the B. Vib. staff. The text *And if those weren't...* is written above the B. Vib. staff. The B. Vib. part features a series of dotted half notes with a slur. The Vib. part has a melodic line starting at measure 138. The Synth. part has a piano (*p*) introduction in measure 137. The Film part has a bass line with notes corresponding to the measures below.

**G** *And if those weren't...*

137 138 139 140 141 142 143 144

*Maybe I was only the...*

B. Vib.  
S. Bells  
Vib.  
Synth.  
Film

*mp*

145 146 147 148 149 150 151 152

*Did that pose any...*

[Press →]

B. Vib.  
Vib.  
Synth.  
Film

2 3  
2 3  
2 3

153 154 155 156

Version Correct As Of: April 4, 2024

Instruments in this Movement:

Snare Drum - Cowbell - Kick Drum - Guiro

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 2. Control

Very Fast, Groovy ♩ = 184 *The first time I went to Italy...*

Drum Set

Synthesizer

Video Projection

1 2 3 4 5 6 7 8 9

Dr.

Synth.

Film

(12) Snare Drum 1 Kick Drum 3

*f* Rim Knock

3

1 3

1 3

10 11 12 13 14 15

Dr.

Synth.

Film

*ff*

A

*It was sometime in July...*

A

1 1

1 1

1 1

19 20 21 22 23 24 25 26

(12)

Dr. Synth. Film.

27 28 29 30 31 32 33 34

*I was there by myself...*

Dr. Synth. Film.

35 36 37 38 39 40 41

*Then it hit me.*

Dr. Synth. Film.

42 43 44 45 46

Dr. Synth. Film

47 48 49 50

Dr. Synth. Film

51 52 53 54 55 56

Dr. Synth. Film

**C** I remember waking up in the water...

57 58 59 60 61 62 63 64 65

(10)

Dr. *ff*

Synth.

Film

66 67 68 69 70

Dr. *Cowbell*

Synth.

Film

71 72 73 74

Dr. *Ping*

Synth.

Film

75 76 77 78

Dr. Synth. Film

79 80 81 82

Dr. Synth. Film

**D**

83 84 85 86

Dr. Synth. Film

87 88

Dr. Synth. Film.

Musical score for measures 89-92. The score is for three parts: Drums (Dr.), Synth., and Film. The time signature changes from 4/4 to 3/4, then 2/4, then 3/4, and finally 4/4. The Drums part features a complex rhythmic pattern with many sixteenth notes and rests. The Synth. part has a melodic line in the treble clef and a bass line in the bass clef. The Film. part has a bass line in the bass clef. Measure numbers 89, 90, 91, and 92 are indicated below the Film. staff.

Dr. Synth. Film.

Musical score for measures 93-96. The score is for three parts: Drums (Dr.), Synth., and Film. The time signature is 4/4. The Drums part features a complex rhythmic pattern with many sixteenth notes and rests. The Synth. part has a melodic line in the treble clef and a bass line in the bass clef. The Film. part has a bass line in the bass clef. Measure numbers 93, 94, 95, and 96 are indicated below the Film. staff.

Dr. Synth. Film.

Musical score for measures 97-101. The score is for three parts: Drums (Dr.), Synth., and Film. The time signature is 2/4. The Drums part features a complex rhythmic pattern with many sixteenth notes and rests. The Synth. part has a melodic line in the treble clef and a bass line in the bass clef. The Film. part has a bass line in the bass clef. Measure numbers 97, 98, 99, 100, and 101 are indicated below the Film. staff.

Dr. **1** **E** *It was freezing...*  
*f p*

Synth. **1** **E**

Film **1**

102 103 104 105 106 107

(9)

Dr. **1**

Synth. **1**

Film **1**

108 109 110 111 112 113 114

(18)

Dr. **1**

Synth. **1**

Film **1**

115 116 117 118 119 120

The musical score is divided into three systems, each separated by a double bar line. Each system contains three staves: Drums (Dr.), Synth., and Film.

- System 1 (Measures 121-124):** The Drums staff starts with a box containing the letter 'F' and a dynamic marking of *f*. It features a rhythmic pattern of eighth notes with accents and cross-sticks. The Synth. staff has a melodic line in the treble clef and a bass line in the bass clef. The Film staff is empty.
- System 2 (Measures 125-128):** The Drums staff begins with a double bar line and a *p* dynamic marking. The Synth. staff continues with its melodic and bass lines. The Film staff remains empty.
- System 3 (Measures 129-132):** The Drums staff starts with a box containing the letter 'F' and a dynamic marking of *f*. It repeats the rhythmic pattern from the first system. The Synth. staff continues with its melodic and bass lines. The Film staff remains empty.

Dr. **2** *p*

Synth. *8<sup>va.</sup>* *15<sup>ma.</sup>*

Film

133 134 135 136

Dr. *to 2 sticks* **f**

Synth. *22<sup>ma.</sup>*

Film

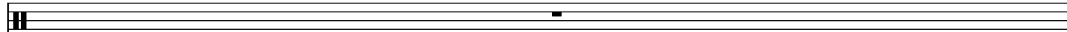
137

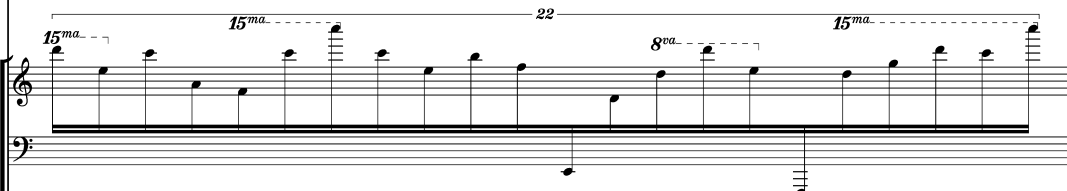
Dr. *Twice* **mp** **mp**

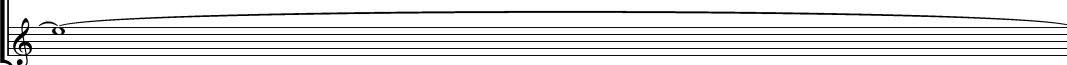
Synth.

Film

138 139 140 141 142 143

Dr. 

Synth. 

Film 

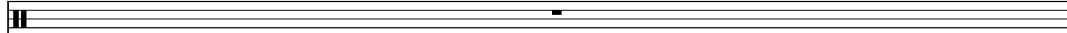
144

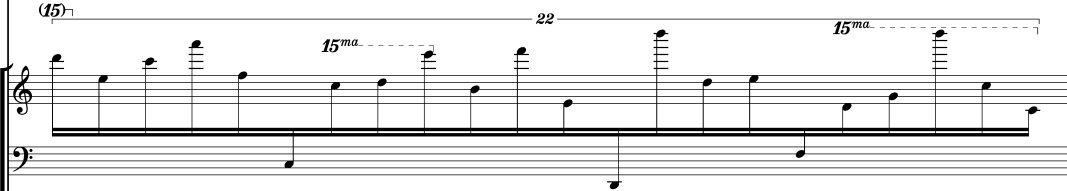
Dr. 

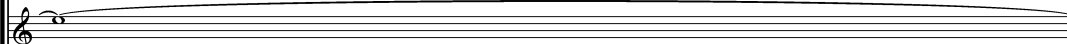
Synth. 

Film 

145 146 147 148 149

Dr. 

Synth. 

Film 

150

*I knew that it was my girlfriend...*

Dr. Synth. Film

151 152 153 154 155 156

*Wanting to see... and if I made it...*

*f p*

Dr. Synth. Film

157 158 159 160 161

*Things weren't going... She hated me, and I probably deserved it.*

Dr. Synth. Film

162 163 164 165 166 167 168

22 15<sup>ma</sup> 15<sup>ma</sup>

**G**

Dr. *f* Rims

Synth.

Film Beach Vista

169 170 171 172

Dr. *f*

Synth.

Film

173 174 175 176

Dr. *f*

Synth.

Film

177 178 179

Dr. Synth. Film

180 181 182

This system contains measures 180, 181, and 182. The drum part (Dr.) features a complex rhythmic pattern with frequent sixteenth-note runs and rests. The synth part (Synth.) consists of two staves: the upper staff has a melodic line with eighth and sixteenth notes, while the lower staff provides a bass line with similar rhythmic values. The film part (Film) is a single staff with a long, sustained note that spans across all three measures, indicated by a long horizontal line with a fermata.

Dr. Synth. Film

183 184 185

This system contains measures 183, 184, and 185. The drum part (Dr.) continues with rhythmic patterns, including some accents and a change in the pattern around measure 184. The synth part (Synth.) shows a melodic line in the upper staff and a bass line in the lower staff. The film part (Film) remains a single staff with a long, sustained note across the three measures.

Dr. Synth. Film

**H** *At some point...*

*f*

186 187 188 189

This system contains measures 186, 187, 188, and 189. The drum part (Dr.) starts with a dynamic marking of *f* and features a rhythmic pattern with accents. The synth part (Synth.) has a melodic line in the upper staff and a bass line in the lower staff. The film part (Film) is a single staff with a long, sustained note across the four measures. A rehearsal mark **H** is placed at the beginning of the system with the instruction *At some point...*.

Dr. Synth. Film

190 191 192 193

This system contains measures 190 through 193. The Dr. part features a rhythmic pattern of quarter notes with accents and some eighth notes. The Synth. part consists of a melodic line in the treble clef with eighth notes and rests, and a bass line with whole notes. The Film part has a single melodic line with a long, sweeping slur across all four measures.

Dr. Synth. Film

194 195 196 197

This system contains measures 194 through 197. The Dr. part continues with a similar rhythmic pattern. The Synth. part has a melodic line with eighth notes and rests, and a bass line with whole notes. The Film part has a single melodic line with a long, sweeping slur across all four measures.

Dr. Synth. Film

198 199 200 201

*fp*

This system contains measures 198 through 201. The Dr. part features a rhythmic pattern that becomes more complex in measure 201, including sixteenth notes. The Synth. part has a melodic line with eighth notes and rests, and a bass line with whole notes. The Film part has a single melodic line with a long, sweeping slur across all four measures. A dynamic marking of *fp* (fortissimo) is present in measure 201.

**I**

Dr. *f*

Synth.

Film

202 203 204 205

Dr.

Synth.

Film

206 207 208 209

*The moon was so bright*

Dr.

Synth.

Film

210 211 212 213

Musical score for measures 214-217. The score is for three parts: Dr. (Drum), Synth. (Synthesizer), and Film (Film). The Dr. part starts with a dynamic marking of *f* and features a complex rhythmic pattern of eighth and sixteenth notes. The Synth. part consists of two staves, with the upper staff playing a melodic line and the lower staff providing a bass line. The Film part features a long, sustained note with a fermata. The measures are numbered 214, 215, 216, and 217. A time signature change to 2/4 is indicated at the end of measure 217.

Musical score for measures 218-219. The score is for three parts: Dr. (Drum), Synth. (Synthesizer), and Film (Film). The Dr. part continues with a complex rhythmic pattern. The Synth. part consists of two staves, with the upper staff playing a melodic line and the lower staff providing a bass line. The Film part features a long, sustained note with a fermata. The measures are numbered 218 and 219.

Musical score for measures 220-222. The score is for three parts: Dr. (Drum), Synth. (Synthesizer), and Film (Film). The Dr. part starts with a dynamic marking of *f* and features a complex rhythmic pattern. The Synth. part consists of two staves, with the upper staff playing a melodic line and the lower staff providing a bass line. The Film part features a long, sustained note with a fermata. The measures are numbered 220, 221, and 222. A time signature change to 4/4 is indicated at the end of measure 222. The text *I didn't look like myself...* is written above the Dr. part in measure 222.

[Press →]

Dr. **1** **3**

Synth. **1** **3**

Film **1** **3**

223

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Version Correct As Of: April 4, 2024  
Instruments in this Movement:  
Vibraphone

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 3. Peach

**Slower than before** ♩ = 108

Bowed Vibraphone

Synthesizer

Video Projection

*p*

Daytime Car

1 2 3 4 5 6 7 8 9 10

*Do you remember...*

B. Vib.

*p* pedal ad lib.

Synth.

Film

11 12 13 14 15 16 17 18 19

B. Vib.

Synth.

Film

20 21 22 23 24 25 26

**A** *I was a kid, maybe...*

B. Vib. *mf*

Vib. *mp*

Synth. *p*

Film

27 28 29 30 31 32 33 34

*I remember that I was at my...*

B. Vib.

Vib.

Synth.

Film

35 36 37 38 39 40 41 42

**B** *I grew up on the shores...*

B. Vib. *mf*

Vib. *mp*

Synth. *p*

Film

43 44 45 46 47 48 49 50

Musical score for measures 51-58. The score is for four parts: B. Vib., Vib., Synth., and Film. The key signature is three flats (B-flat major/D-flat minor). The time signature is 4/4. The B. Vib. part consists of a single melodic line of eighth notes. The Vib. part consists of a single melodic line of quarter notes. The Synth. part consists of a single melodic line of quarter notes. The Film part consists of a single melodic line of quarter notes. Measure numbers 51, 52, 53, 54, 55, 56, 57, and 58 are indicated below the Film part.

Musical score for measures 59-67. The score is for four parts: B. Vib., Vib., Synth., and Film. The key signature is three flats (B-flat major/D-flat minor). The time signature is 4/4. The B. Vib. part consists of a single melodic line of eighth notes. The Vib. part consists of a single melodic line of quarter notes. The Synth. part consists of a single melodic line of quarter notes. The Film part consists of a single melodic line of quarter notes. Measure numbers 59, 60, 61, 62, 63, 64, 65, 66, and 67 are indicated below the Film part. A box containing the letter 'C' is placed above the Vib. part at measure 59. The lyrics "I remember taking a bite..." are written above the Vib. part. The dynamic marking *mp* is placed below the Vib. part at measure 59. The dynamic marking *p* is placed below the Synth. part at measure 65.

Musical score for measures 68-74. The score is for four parts: B. Vib., Vib., Synth., and Film. The key signature is three flats (B-flat major/D-flat minor). The time signature is 4/4. The B. Vib. part consists of a single melodic line of eighth notes. The Vib. part consists of a single melodic line of quarter notes. The Synth. part consists of a single melodic line of quarter notes. The Film part consists of a single melodic line of quarter notes. Measure numbers 68, 69, 70, 71, 72, 73, and 74 are indicated below the Film part. The lyrics "I could look around..." are written above the Vib. part at measure 68. The lyrics "If I try to think about..." are written above the Vib. part at measure 73.

**D**

B. Vib.  
Vib.  
Synth.  
Film

*mp*

75 76 77 78 79 80 81 82

*Maybe the sweetness of the peach...*

B. Vib.  
Vib.  
Synth.  
Film

83 84 85 86 87 88 89 90

**E** *But I could look around...*

B. Vib.  
Vib.  
Synth.  
Film

*mp*

*p*

91 92 93 94 95 96 97 98

*I could see my mom.*

B. Vib.

Vib.

Synth.

Film.

99 100 101 102 103 104 105 106

**F** *I took another bite...*

B. Vib.

Vib.

Synth.

Film.

107 108 109 110 111 112 113 114 115

B. Vib.

Vib.

Synth.

Film.

116 117 118 119 120 121 122

**G** *The tree trunks and the peach pit were both brown...*

B. Vib.  
Vib.  
Synth.  
Film

*mp* *p*

123 124 125 126 127 128 129 130

*I looked back at my mom...* *I asked her why I couldn't see the wind.*

B. Vib.  
Vib.  
Synth.  
Film

131 132 133 134 135 136 137

[Press →]

B. Vib.  
Vib.  
Synth.  
Film

*p* **3** **3** **3** **3**

138 139 140 141 142

Version Correct As Of: April 4, 2024  
Instruments in this Movement:  
Concert Bass Drum - Jar of Beads - Saucer  
Bells

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 4. Big Sky Country

**Drifting** ♩ = 78

Bass Drum

Synthesizer

Video Projection

1 2 3 4

---

**Pour beads onto head**      **Swirl beads on head**

B. Dr.

Synth.

Film

5 6 7 8 9 10 11 12

---

**Pour beads onto head**      **Swirl beads on head**

B. Dr.

Synth.

Film

Clouds 2

13 14 15 16 17 18 19 20

**A** *I think I was in...*

S. Bells  
B. Dr.  
Synth.  
Film

21 22 23 24 25 26

S. Bells  
B. Dr.  
Synth.  
Film

27 28 29 30 31 32

*There was nothing but road...*

Pour beads onto head

S. Bells  
B. Dr.  
Synth.  
Film

33 34 35 36 37 38

**B**

*I don't remember...*

Musical score for measures 39-44. The score is for S. Bells, B. Dr., Synth., and Film. The key signature is two sharps (F# and C#). Measure 39 has a fermata over the S. Bells staff. Measure 40 has a fermata over the B. Dr. staff with the annotation "Swirl beads on head". Measure 41 has a fermata over the Synth. staff. Measure 42 has a fermata over the Film staff. Measure 43 has a fermata over the Synth. staff. Measure 44 has a fermata over the Film staff.

*Through the haze...*

Musical score for measures 45-50. The score is for S. Bells, B. Dr., Synth., and Film. The key signature is two sharps (F# and C#). Measure 45 has a fermata over the S. Bells staff. Measure 46 has a fermata over the B. Dr. staff. Measure 47 has a fermata over the Synth. staff. Measure 48 has a fermata over the Film staff. Measure 49 has a fermata over the Synth. staff. Measure 50 has a fermata over the Film staff.

*I remember the sketchy hotel...*

Musical score for measures 51-56. The score is for S. Bells, B. Dr., Synth., and Film. The key signature is two sharps (F# and C#). Measure 51 has a fermata over the S. Bells staff. Measure 52 has a fermata over the B. Dr. staff. Measure 53 has a fermata over the Synth. staff. Measure 54 has a fermata over the Film staff. Measure 55 has a fermata over the Synth. staff. Measure 56 has a fermata over the Film staff.

Pour beads onto head Swirl beads on head **C**

B. Dr.

Synth.

Film

57 58 59 60 61 62

*I remember having a cooler...*

S. Bells

B. Dr.

Synth.

Film

63 64 65 66 67 68

*I remember my legs...*

S. Bells

B. Dr.

Synth.

Film

69 70 71 72 73 74

*But these are all slightly...*

Musical score for measures 75-80. The score is for S. Bells, B. Dr., Synth., and Film. The key signature is two sharps (F# and C#). The S. Bells part has a melodic line starting at measure 75. The B. Dr. part has a bass line with notes and rests, including a long note in measure 77 with the instruction "Pour beads onto head" and another in measure 79 with "Swirl beads on head". The Synth. part is mostly silent. The Film part has a bass line with notes and rests.

Musical score for measures 81-86. The score is for S. Bells, B. Dr., Synth., and Film. The key signature is two sharps (F# and C#). The S. Bells part has a melodic line starting at measure 81 with the instruction "...is the sky." and continuing through measure 86 with "I remember feeling small in comparison...". The B. Dr. part has a bass line with notes and rests. The Synth. part has a melodic line starting at measure 81. The Film part has a bass line with notes and rests.

Musical score for measures 87-92. The score is for S. Bells, B. Dr., Synth., and Film. The key signature is two sharps (F# and C#). The S. Bells part has a melodic line starting at measure 87. The B. Dr. part has a bass line with notes and rests. The Synth. part has a melodic line starting at measure 87. The Film part has a bass line with notes and rests.

*But there's a reason it's called...*

S. Bells

B. Dr.

Synth.

Film

Pour beads onto head

93 94 95 96 97 98

S. Bells

B. Dr.

Synth.

Film

Swirl beads on head

E

E

99 100 101 102 103 104

S. Bells

B. Dr.

Synth.

Film

*The sky was almost oppressive...* *Most of all when we got...*

105 106 107 108 109 110

Musical score for measures 111-116. The score is for four parts: S. Bells, B. Dr., Synth., and Film. The key signature is one sharp (F#) and the time signature is 4/4. The S. Bells part has a melodic line with eighth notes. The B. Dr. part has a simple rhythmic pattern. The Synth. part is mostly silent. The Film part has a bass line with long notes and ties.

Musical score for measures 117-122. The score is for four parts: S. Bells, B. Dr., Synth., and Film. The key signature is one sharp (F#) and the time signature is 4/4. The S. Bells part has a melodic line with eighth notes. The B. Dr. part has a simple rhythmic pattern. The Synth. part has a melodic line starting in measure 119. The Film part has a bass line with long notes and ties. A dynamic marking **F** is present in measures 117 and 119. A text annotation "When you drive at night..." is above measure 117. A text annotation "Driving at Night" is above measure 117.

Musical score for measures 123-128. The score is for four parts: S. Bells, B. Dr., Synth., and Film. The key signature is one sharp (F#) and the time signature is 4/4. The S. Bells part has a melodic line with eighth notes. The B. Dr. part has a simple rhythmic pattern. The Synth. part has a melodic line starting in measure 123. The Film part has a bass line with long notes and ties. A text annotation "In the day, the sky..." is above measure 123.

*Grasping for clouds...*

S. Bells

B. Dr.

Synth.

Film

129 130 131 132 133 134

*They shift like memories...*

S. Bells

B. Dr.

Synth.

Film

135 136 137 138 139 140

B. Dr.

B. Dr.

Synth.

Film

141 142

Version Correct As Of: April 4, 2024  
Instruments in this Movement:  
Vibraphone / Saucer Bells

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 5. Lego

**Calmly** ♩ = 112

Bowed Vibraphone

Synthesizer

Video Projection

*p* San Francisco

1 2 3 4 5 6 7 8

B. Vib.

Synth.

Film

9 10 11 12 13 14 15 16

**A** My mom tells...  
(MV)

B. Vib.

S. Bells

Synth.

Film

*p* pedal ad lib.

*mp*

17 18 19 20 21 22 23 24 25

Musical score for measures 26-32. The score is divided into four systems. The first system contains B. Vib. and S. Bells. The second system contains Synth. and Film. The key signature is one flat (B-flat). Measure numbers 26, 27, 28, 29, 30, 31, and 32 are indicated at the bottom of the Film staff.

Musical score for measures 33-41. The score is divided into two systems. The first system contains B. Vib., S. Bells, and Vib. The second system contains Synth. and Film. The key signature is one flat (B-flat). A box labeled 'B' is placed above the first measure of the B. Vib. staff, with the lyrics "I mean who doesn't?". Dynamic markings include *mf* for B. Vib., *mp* for S. Bells and Vib., and *p* for Synth. Measure numbers 33, 34, 35, 36, 37, 38, 39, 40, and 41 are indicated at the bottom of the Film staff.

Musical score for measures 42-48. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is one flat (B-flat major/D minor). The time signature is 4/4. The B. Vib. part features a melodic line of eighth notes with a slur. The S. Bells part has a rhythmic pattern of eighth notes. The Vib. part has a rhythmic pattern of eighth notes. The Synth. part has a melodic line with slurs. The Film part has a rhythmic pattern of eighth notes. Measure numbers 42, 43, 44, 45, 46, 47, and 48 are indicated at the bottom.

Musical score for measures 49-57. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is one flat (B-flat major/D minor). The time signature is 4/4. The B. Vib. part features a melodic line of eighth notes with a slur, starting with a *mf* dynamic. The S. Bells part has a rhythmic pattern of eighth notes, starting with a *mp* dynamic. The Vib. part has a rhythmic pattern of eighth notes, starting with a *mp* dynamic. The Synth. part has a melodic line with slurs. The Film part has a rhythmic pattern of eighth notes. Measure numbers 49, 50, 51, 52, 53, 54, 55, 56, and 57 are indicated at the bottom. A section marker 'C' is present at the beginning of the system.

Musical score for measures 58-64. The score is written for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is one flat (B-flat major/D minor). The time signature is 4/4. The B. Vib. part features a melodic line with a slur over measures 58-64. The S. Bells part has a rhythmic pattern of eighth notes. The Vib. part has a rhythmic pattern of eighth notes. The Synth. part has a melodic line with a slur over measures 58-64. The Film part has a rhythmic pattern of eighth notes. Measure numbers 58, 59, 60, 61, 62, 63, and 64 are indicated below the Film staff.

Musical score for measures 65-73. The score is written for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is one flat (B-flat major/D minor). The time signature is 4/4. The B. Vib. part features a melodic line with a slur over measures 65-73. The S. Bells part has a rhythmic pattern of eighth notes, starting at measure 65. The Vib. part has a rhythmic pattern of eighth notes, starting at measure 65. The Synth. part has a melodic line with a slur over measures 65-73. The Film part has a rhythmic pattern of eighth notes. Measure numbers 65, 66, 67, 68, 69, 70, 71, 72, and 73 are indicated below the Film staff. A dynamic marking of *mp* is present in the S. Bells and Vib. parts starting at measure 65. A dynamic marking of *p* is present in the Synth. part starting at measure 65. A section marker 'D' is present above the B. Vib. staff at measure 65.

Musical score for measures 74-80. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. The second system includes Synth. and Film. The key signature has one flat (B-flat). Measure numbers 74, 75, 76, 77, 78, 79, and 80 are indicated at the bottom of the Film staff.

Musical score for measures 81-89. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. The second system includes Synth. and Film. The key signature has one flat (B-flat). A box containing the letter 'E' is placed above the first measure of the B. Vib. staff in both systems. The dynamic marking *mp* is present in the S. Bells and Vib. staves. Measure numbers 81, 82, 83, 84, 85, 86, 87, 88, and 89 are indicated at the bottom of the Film staff.

*Often, as she tells it...*

Musical score for measures 90-97. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. parts. The second system includes Synth. and Film parts. The key signature has one flat (B-flat). Measure numbers 90 through 97 are indicated at the bottom of the score. A dynamic marking of *p* is present in the Synth. part at measure 96.

Musical score for measures 98-106. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. parts. The second system includes Synth. and Film parts. The key signature has one flat (B-flat). Measure numbers 98 through 106 are indicated at the bottom of the score. A dynamic marking of *mp* is present in the S. Bells part at measure 98 and in the Vib. part at measure 99. A boxed 'F' is present above the first staff of the second system.

*I can see the house...*

Musical score for measures 107-113. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has one flat (B-flat). The B. Vib. part features a melodic line with a slur over measures 107-113. The S. Bells part has a rhythmic pattern of eighth notes. The Vib. part has a rhythmic pattern of eighth notes. The Synth. part has a melodic line with a slur over measures 107-113. The Film part has a rhythmic pattern of eighth notes. Measure numbers 107, 108, 109, 110, 111, 112, and 113 are indicated at the bottom of the score.

Musical score for measures 114-122. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has one flat (B-flat). The B. Vib. part features a melodic line with a slur over measures 114-122. The S. Bells part has a rhythmic pattern of eighth notes, starting with a *mp* dynamic marking. The Vib. part has a rhythmic pattern of eighth notes, starting with a *mp* dynamic marking. The Synth. part has a melodic line with a slur over measures 114-122. The Film part has a rhythmic pattern of eighth notes. Measure numbers 114, 115, 116, 117, 118, 119, 120, 121, and 122 are indicated at the bottom of the score. A box containing the letter 'G' is placed above the first measure of the B. Vib. part.

Musical score for measures 123-129. The score is in 3/4 time and features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has one flat (B-flat). The B. Vib. part consists of a series of dotted half notes. The S. Bells part has a sparse melody. The Vib. part has a rhythmic pattern of eighth notes. The Synth. part has a melodic line with a *p* dynamic marking at the end. The Film part has a bass line with a *p* dynamic marking at the end. Measure numbers 123 through 129 are indicated below the Film staff.

Musical score for measures 130-138. The score is in 3/4 time and features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has one flat (B-flat). A rehearsal mark **H** is placed above the first measure. The lyrics "There's another..." are written above the B. Vib. staff. The B. Vib. part consists of a series of dotted half notes. The S. Bells part has a rhythmic pattern of eighth notes with a *mp* dynamic marking. The Vib. part has a rhythmic pattern of eighth notes with a *mp* dynamic marking. The Synth. part has a melodic line. The Film part has a bass line. Measure numbers 130 through 138 are indicated below the Film staff.

Musical score for measures 139-145. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. staves. The second system includes Synth. and Film staves. The key signature has one flat (B-flat). Measure numbers 139, 140, 141, 142, 143, 144, and 145 are indicated at the bottom of the Film staff.

Musical score for measures 146-154. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. staves. The second system includes Synth. and Film staves. The key signature has one flat (B-flat). Measure numbers 146, 147, 148, 149, 150, 151, 152, 153, and 154 are indicated at the bottom of the Film staff. A section marker 'I' is present at the beginning of the first system. Dynamics markings 'mp' are present in the S. Bells and Vib. staves.

*So I'd sit there...*

Musical score for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The score is divided into two systems. The first system covers measures 155 to 160, and the second system covers measures 161 to 165. The B. Vib. part features a melodic line with a slur over measures 155-160. The S. Bells part has sparse notes, including a triplet in measure 157. The Vib. part has a few notes in measures 156 and 158. The Synth. part has a melodic line with a slur over measures 155-160. The Film part has a bass line with a slur over measures 155-160. In the second system, measures 161-165, the B. Vib. part has a rest followed by a thick black bar in measure 165. The Synth. part has a rest followed by a thick black bar in measure 165. The Film part has a rest followed by a thick black bar in measure 165. A "[Press ->]" instruction is located above measure 165. Measure numbers 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, and 165 are printed below the staves.

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# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 6. Accident

**Fast, decisive** ♩ = 132 *Right after undergrad...*

Drum Set

**Fast, decisive** ♩ = 132 *mp*

Synthesizer *note: all tuning is medium-low*

Video Projection

Rhythmic delay: 227ms

*sim.*

1 2 3 4 5

*I went to and finished...* *I had to...*

Dr.

Synth.

Film

6 7 8 9 10 11

*I knew the summer programs...*

Dr.

Synth.

Film

12 13 14 15 16 17

*But as I scheduled...*

Dr.

Synth.

Film

18 19 20 21 22 23

Dr.

Synth.

Film

24 25 26 27 28

*I had three main choices ahead of me...*

*Boston*      *New York*      *Atlanta*

*ff*      *3*      *1*

Dr.

Synth.

Film

29 30 31 32 33 34

Musical score for measures 35-38. The score is for three parts: Dr., Synth., and Film. The Dr. part features a rhythmic pattern of eighth notes with dynamic markings *f* and *p*, and a triplet of eighth notes. The Synth. part has a bass line with notes corresponding to the locations: Boston, New York, and Atlanta. The Film part has a bass line with notes corresponding to the locations: City Street, NYG Waterfront, and Train. Measure numbers 35, 36, 37, and 38 are indicated below the Film staff.

Musical score for measures 39-44. The score is for three parts: Dr., Synth., and Film. The Dr. part starts with a section labeled 'A' and 'On Spokes or Rims' with a *p* kick, followed by a sequence of rests marked with a slash and a percentage sign (%). A measure rest of (4) is indicated. The Synth. part has a bass line with notes corresponding to the locations: Boston, Boston, New York, New York, Atlanta, Atlanta, and sim. The Film part has a bass line with notes corresponding to the locations: City Street, NYG Waterfront, and Train. Measure numbers 39, 40, 41, 42, 43, and 44 are indicated below the Film staff.

Musical score for measures 45-50. The score is for three parts: Dr., Synth., and Film. The Dr. part consists of a sequence of rests marked with a slash and a percentage sign (%). Measure rests of (8) and (12) are indicated. The Synth. part has a bass line with notes corresponding to the locations: City Street, NYG Waterfront, and Train. The Film part has a bass line with notes corresponding to the locations: City Street, NYG Waterfront, and Train. Measure numbers 45, 46, 47, 48, 49, and 50 are indicated below the Film staff.

Dr. **B** *fp* *fp* *fp* Pitch Bend Up

Synth. **B**

Film

51 52 53 54

Dr. *fp* *fp* *fp* Pitch Bend Up

Synth.

Film

55 56 57 58

Dr. *fp* *fp* *fp* Pitch Bend *f* *snare*

Synth.

Film

59 60 61 62

**C**

Dr. *mf*

Synth.

Film

City Stree NYG Waterfront Train

63 64 65 66

Dr. **4**

Synth.

Film

67 68 69 70

Dr. *p* *f* *mf*

Synth.

Film

71 72 73

Dr. Synth. Film.

74 75 76 77

Dr. Synth. Film.

78 79 80 81

Dr. Synth. Film.

*p* *f* *mp* On Spokes (4)

D

D

82 83 84 85 86

*There I had nothing...* *But I had a scholarship offer...*

Dr. *p* 2/4

Synth.

Film *City Street* 87 88 89 90 91 92

*At the time...*

Dr. 2/4

Synth.

Film 93 94 95 96 97 98

Dr. *f* 2/4

Synth.

Film 99 100 101 102

**E**

Dr. *mf* *f*

Synth.

Film

103 104 105 106

**E**

Dr. *mf* *f*

Synth.

Film

107 108 109 110

**F**

Dr. *f* *mp*

Synth.

Film

111 112 113 114

*Is where I had some friends...*

Dr. *p*

Synth.

Film *NYC Waterfront*

115 116 117 118

*It's where my teacher...*

Dr. **4**

Synth.

Film

119 120 121 122

Dr. **4**

Synth.



Film

123 124 125 126

*I just couldn't afford it...*

Dr.  Synth.  Film   
127 128 129 130

Dr.  Synth.  Film   
131 132 133 134

Dr.  Synth.  Film   
135 136 137 138

Dr. *mf* *f*

Synth.

Film

139 140 141 142

Dr. **4**

Synth.

Film

143 144 145 146

Dr. **H** *f* *mp*

Synth. **H**

Film

147 148 149 150

*Was not on my radar...*

Musical score for measures 151-154. The score is for three parts: Dr., Synth., and Film. The Dr. part features a complex rhythmic pattern of eighth and sixteenth notes. The Synth. part has a bass line with rests and notes. The Film part has a melodic line with a 'Train' icon above it. Measure numbers 151, 152, 153, and 154 are indicated below the Film staff.

*I had gotten an offer...*



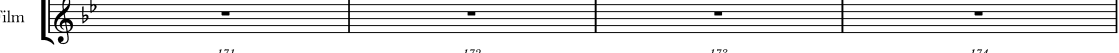
Musical score for measures 155-158. The Dr. part has a drum roll marked with a '4' above it. The Synth. and Film parts continue with their respective parts. Measure numbers 155, 156, 157, and 158 are indicated below the Film staff.

*I didn't have to choose...*

Musical score for measures 159-162. The Dr. part has a drum roll marked with a '4' above it. The Synth. and Film parts continue with their respective parts. Measure numbers 159, 160, 161, and 162 are indicated below the Film staff.

Dr.  Synth.  Film   
163 164 165 166

Dr.  Synth.  Film   
167 168 169 170

Dr.  Synth.  Film   
171 172 173 174

Dr. *mf* *f*

Synth.

Film

175 176 177 178

Dr.  $\frac{4}{4}$

Synth.

Film

179 180 181 182




Dr. **J** *fp*



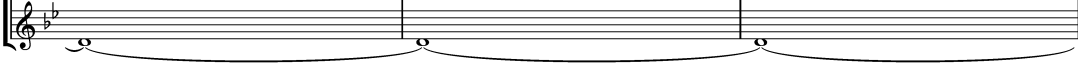
Synth. **J**



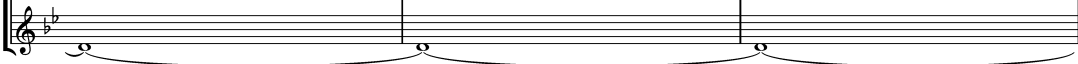
Film

183 184 185 186

Something pulled me to Atlanta...

Dr.  Synth.  Film   
187 188

Dr.  Synth.  Film   
189 190 191

Dr.  Synth.  Film   
192 193 194

Dr. Synth. Film

195 196 197

This system contains measures 195, 196, and 197. The Drums part features a complex, rhythmic pattern of eighth notes with accents. The Synth part has a sparse melody in the treble clef and a bass line in the bass clef. The Film part consists of a single melodic line in the treble clef. The key signature has two flats, and the time signature is 4/4.

Dr. Synth. Film


198 199 200


This system contains measures 198, 199, and 200. The Drums part continues with a similar rhythmic pattern. The Synth part features a more active bass line. The Film part has a melodic line with some rests. The key signature and time signature remain the same.

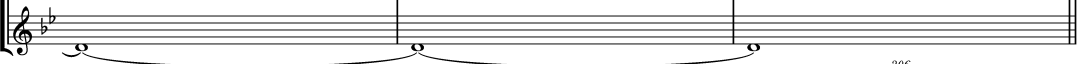
Dr. Synth. Film

201 202 203

This system contains measures 201, 202, and 203. The Drums part maintains its rhythmic intensity. The Synth part has a melodic line in the treble clef and a bass line. The Film part has a melodic line in the treble clef. The key signature and time signature remain the same.

Dr. 

Synth. 

Film 

204 205 206

**K** *I had also developed...*

Dr. 

R l r r L r l l sim...

Synth. 

Film 

207 208 209 210


Dr. 

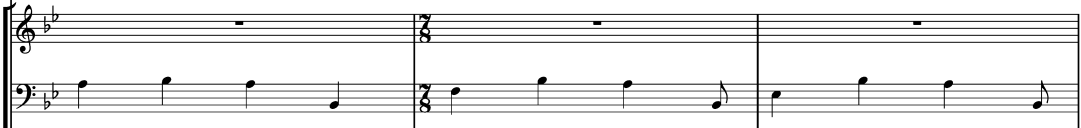

R l r r L r l l sim...

Synth. 

Film 


211 212 213



Dr.   
R l r r L r l l R l l r L r l R l r r L r l l R l l r L r l

Synth.   
Film   
214 215 216




Dr.   
R l r r L r l l r



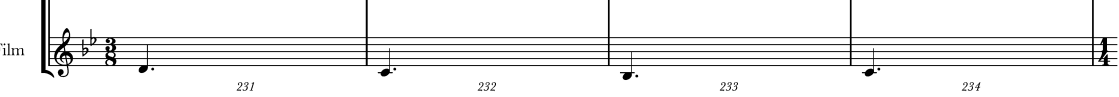
Synth.   
Film   
217 218 219

Dr.   
L R l R l r r L r l l r L R l

Synth.   
Film   
220 221 222

Dr.   
Synth.   
Film 

Dr.   
R l r l l r r L r l r r l l R l r l l r r L r l r r l l  
Synth.   
Film 

Dr.   
R l r r l l R L R l r r l l R L R l r r l l R L R l r r l l R L  
Synth.   
Film 

Dr.   
R l r r l l R L r l l r r L R l r r l l R L

Synth.

Film

Dr.

Synth.

Film

Dr.   
R l r r l l R L r l l r r L R l r r l l R L R l r r l l R L R l l r L r r l R l l r L r l R L

Synth.

Film

**L**

Dr.   
*Crank Drum Tension on all 3* *f p* *f p*

Synth. 

Film 

246 247 248 249

**M**

Dr.   
*mf*

Synth. 

Film 

250 251 252 253

**4**

Dr. 

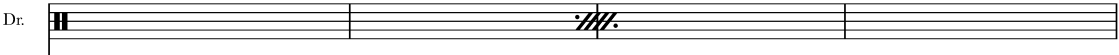

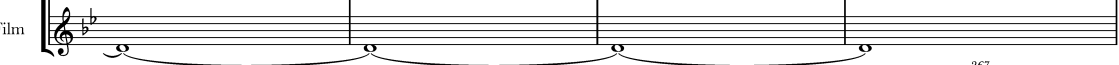
Synth. 

Film 

254 255 256 257

Dr.   
Synth.   
Film   
258 259

Dr.   
Synth.   
Film   
260 261 262 263

Dr.   
Synth.   
Film   
264 265 266 267

Dr. *p* *f* *p* *f*

Synth.

Film

268 269 270

Dr. **N**

Synth. **N**

Film

271 272 273

Dr. **N**

Synth.

Film

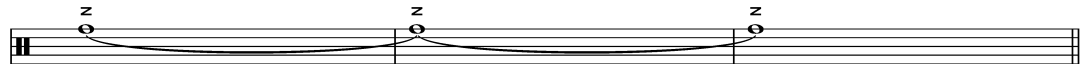
274 275 276 277


Dr. 

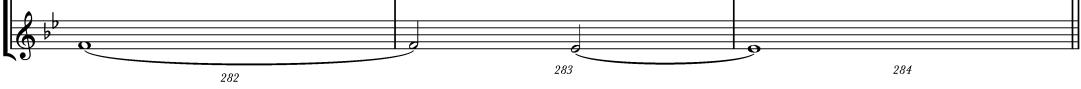
Synth. 

Film 


278 279 280 281

Dr. 

Synth. 

Film 


282 283 284

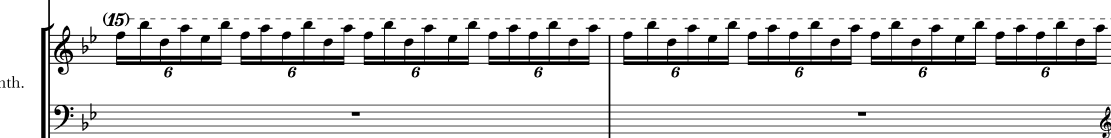
Dr.   
R l r r l l R L r l l r r L R l r r l l R L R l r r l l R L r l l r r L R l r r l l R L


Synth. 

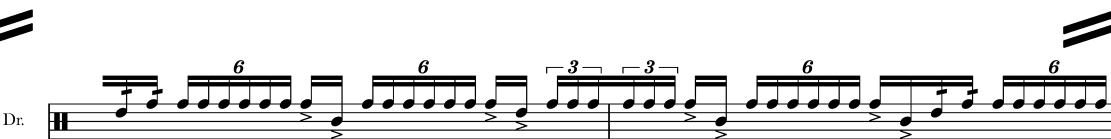
Film 

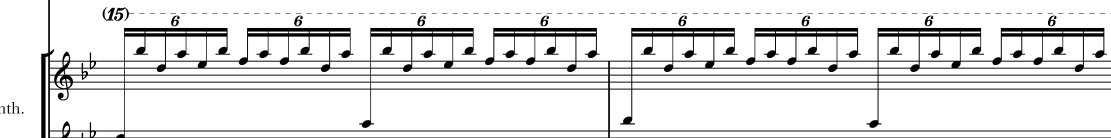
285 286


Dr.    
 R l r r l l R L r l l r r L R l r r l l R L R l r r l l R L r l l r r L R l r r l l R L


Synth.    
 (15)   
 6 6 6 6 6 6 6 6

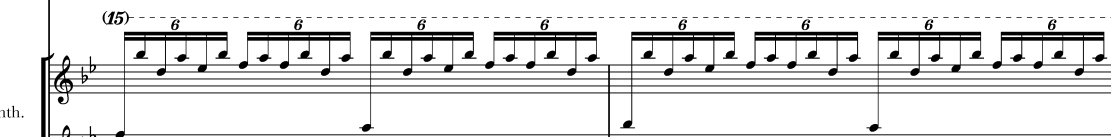
Film    
 287 288

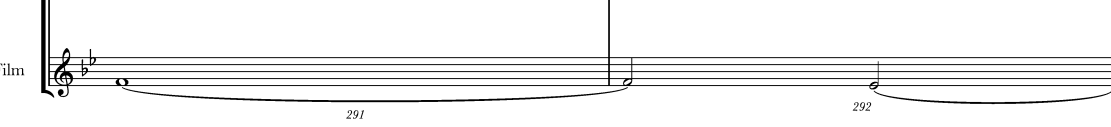
Dr.    
 r r l l r l l R L r l r r l l R L r l r r l l R L r l r r l l R L r r l l r l r l l

Synth.    
 (15)   
 6 6 6 6 6 6 6 6

Film    
 289 290

Dr.    
 r l r r l l r l r r l l r l r r l l r l r r l l


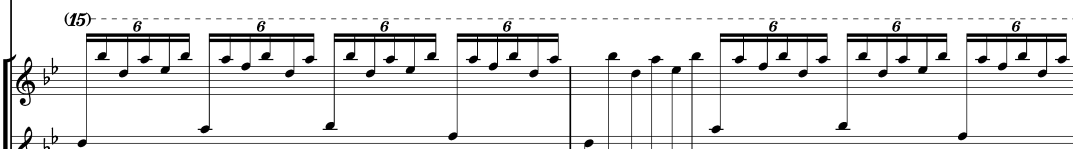
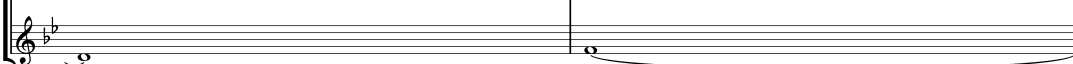
Synth.    
 (15)   
 6 6 6 6 6 6 6 6

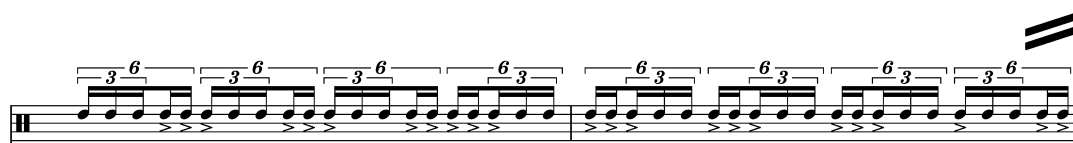
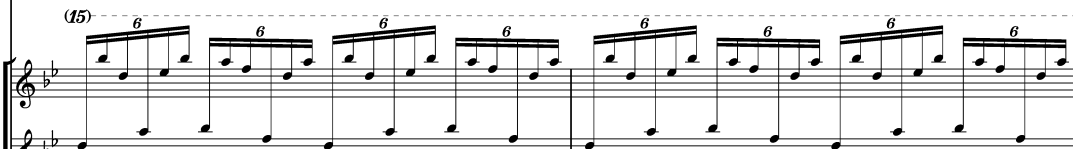

Film    
 291 292


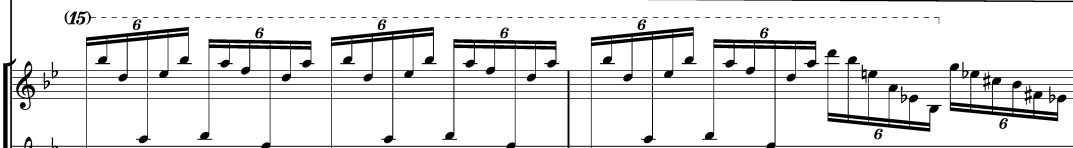

Dr.   
 R L r l r r l l R L r l r r l l R L r l r r l l R L r l r r l l R L   
 Synth.   
 Film   
 293 294

Dr. **P**   
 R l r r l l R L r l l r r L R l r r l l R L r l l r r L R l r r l l R L r l l r r L R l r   
 Synth. **P**   
 Film   
 295 296

Dr.   
 r l l R L r l l r r L R l r r l l R L r l l r r L R l r r l l R L r l l   
 Synth.   
 Film   
 297 298

Dr.    
 R L r l l r r L R l r r l l R L r l l r r L R L R l r L R L r l   
 Synth.    
 Film    
 299 300

Dr.    
 Synth.    
 Film    
 301 302

Dr.    
 R L   
 Synth.    
 Film    
 303 304

[Press →]

**3**

Dr.

R  
*fff*

Synth.

**3**

Film

**3**

305

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Version Correct As Of: April 4, 2024  
Instruments in this Movement:  
Vibraphone / Saucer Bells

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 7. Mountain/Ocean

**Serenly**  $\text{♩} = 97$

Bowed Vibraphone

Synthesizer

Video Projection

1 2 3 4 5 6 7 8

B. Vib.

Synth.

Film

9 10 11 12 13 14 15 16

**A** *Picture a friend...*

B. Vib.

**A** *p pedal ad lib.*

Synth.

Film

17 18 19 20 21 22 23 24

B. Vib.

Synth.

Film

25 26 27 28 29 30 31 32



**B** *That often hurts more...*

B. Vib. *mf*

S. Bells *mp*

Vib. *mp*

33 34 35 36 37 38 39 40

**B**

Synth. *p*

Film

33 34 35 36 37 38 39 40

Musical score for measures 41-48. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is three sharps (F#, C#, G#). The B. Vib. part consists of a series of dotted half notes. The S. Bells part features a rhythmic pattern of eighth and sixteenth notes. The Vib. part has a simple accompaniment of quarter notes. The Synth. part has a melodic line with a slur over measures 41-43. The Film part has a bass line of dotted half notes. Measure numbers 41 through 48 are indicated at the bottom.

Musical score for measures 49-56, starting with a section marked 'C' and the title 'My friend and I...'. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is three sharps (F#, C#, G#). The B. Vib. part starts with a dynamic marking of *mf*. The S. Bells part starts with a dynamic marking of *mp*. The Vib. part starts with a dynamic marking of *mp*. The Synth. part has a melodic line with a slur over measures 49-51. The Film part has a bass line of dotted half notes. Measure numbers 49 through 56 are indicated at the bottom.

Musical score for measures 57-64. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. The second system includes Synth. and Film. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. Measure numbers 57, 58, 59, 60, 61, 62, 63, and 64 are indicated at the bottom of the score.

Musical score for measures 63-72. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. The second system includes Synth. and Film. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. A dynamic marking of *mp* is present in the S. Bells part at measure 65. A dynamic marking of *p* is present in the Synth. part at measure 65. A box containing the letter 'D' is placed above the first staff of each system. The text "We decided..." is written above the first staff of the first system. Measure numbers 63, 66, 67, 68, 69, 70, 71, and 72 are indicated at the bottom of the score.

Musical score for measures 73-80. The score is in E major (three sharps) and 4/4 time. It features three staves: B. Vib. (top), S. Bells (middle), and Vib. (bottom). The B. Vib. part consists of a series of dotted half notes. The S. Bells part features a rhythmic pattern of eighth notes and rests. The Vib. part has a simple accompaniment of quarter notes. Below the staves, there are two systems of staves: Synth. (top) and Film. (bottom). The Synth. part has a melodic line with a slur over measures 73-74. The Film. part has a bass line with a slur over measures 73-80. Measure numbers 73, 74, 75, 76, 77, 78, 79, and 80 are indicated at the bottom.

Musical score for measures 81-88. The score is in E major (three sharps) and 4/4 time. It features three staves: B. Vib. (top), S. Bells (middle), and Vib. (bottom). The B. Vib. part consists of a series of dotted half notes. The S. Bells part features a rhythmic pattern of eighth notes and rests. The Vib. part has a simple accompaniment of quarter notes. Below the staves, there are two systems of staves: Synth. (top) and Film. (bottom). The Synth. part has a melodic line with a slur over measures 81-82. The Film. part has a bass line with a slur over measures 81-88. Measure numbers 81, 82, 83, 84, 85, 86, 87, and 88 are indicated at the bottom. A box containing the letter 'E' is placed above the first measure of the B. Vib. staff. The text "But you can..." is written above the B. Vib. staff in measures 81-82. The dynamic marking *mp* is present in the S. Bells and Vib. staves.

We chatted

Musical score for measures 89-96. The score is in 3/4 time and features three staves: B. Vib., S. Bells, and Vib. in the upper system, and Synth. and Film in the lower system. The key signature has three sharps (F#, C#, G#). The B. Vib. part consists of a series of half notes. The S. Bells part features a rhythmic pattern of quarter notes and rests. The Vib. part has a simple accompaniment of quarter notes. The Synth. part has a melodic line with a slur over measures 89-91. The Film part has a bass line with a slur over measures 89-91. Measure numbers 89, 90, 91, 92, 93, 94, 95, and 96 are indicated at the bottom.

Musical score for measures 97-104. The score is in 3/4 time and features three staves: B. Vib., S. Bells, and Vib. in the upper system, and Synth. and Film in the lower system. The key signature has three sharps (F#, C#, G#). A box containing the letter 'F' is placed above the first measure of the upper system. The B. Vib. part consists of a series of half notes. The S. Bells part features a rhythmic pattern of quarter notes and rests, with a *mp* dynamic marking. The Vib. part has a simple accompaniment of quarter notes, also with a *mp* dynamic marking. The Synth. part has a melodic line with a slur over measures 97-99 and a *p* dynamic marking. The Film part has a bass line with a slur over measures 97-99. Measure numbers 97, 98, 99, 100, 101, 102, 103, and 104 are indicated at the bottom.

*And we wondered...*

Musical score for measures 105-112. The score is in G major (one sharp) and 4/4 time. It features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The B. Vib. staff has a melodic line of dotted half notes. The S. Bells staff has a rhythmic pattern of eighth notes. The Vib. staff has chords. The Synth. staff has a melodic line with a slur. The Film staff has a bass line of dotted half notes. Measure numbers 105, 106, 107, 108, 109, 110, 111, and 112 are indicated at the bottom.

Musical score for measures 113-120. The score is in G major (one sharp) and 4/4 time. It features five staves: B. Vib., S. Bells, Vib., Synth., and Film. A box with the letter 'G' is placed above the first staff of this section. The B. Vib. staff has a melodic line of dotted half notes. The S. Bells staff has a rhythmic pattern of eighth notes, with a *mp* dynamic marking. The Vib. staff has chords, with a *mp* dynamic marking. The Synth. staff has a melodic line with a slur. The Film staff has a bass line of dotted half notes. Measure numbers 113, 114, 115, 116, 117, 118, 119, and 120 are indicated at the bottom.

Musical score for measures 121-128. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. staves. The second system includes Synth. and Film staves. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. Measure numbers 121 through 128 are indicated at the bottom of the Film staff.

Musical score for measures 129-136. The score is divided into two systems. The first system includes B. Vib., S. Bells, and Vib. staves. The second system includes Synth. and Film staves. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. A rehearsal mark 'H' is present at the beginning of the first system, with the text 'Did we need...'. Dynamic markings 'mp' and 'p' are used. Measure numbers 129 through 136 are indicated at the bottom of the Film staff.

Musical score for measures 137-144. The score is in G major (one sharp) and 4/4 time. It features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The B. Vib. part consists of a series of dotted half notes. The S. Bells part has a rhythmic pattern of eighth notes and rests. The Vib. part has a simple harmonic accompaniment. The Synth. part has a melodic line with a slur. The Film part has a simple harmonic accompaniment. Measure numbers 137, 138, 139, 140, 141, 142, 143, and 144 are indicated at the bottom.

Musical score for measures 145-152. The score is in G major (one sharp) and 4/4 time. It features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The B. Vib. part consists of a series of dotted half notes. The S. Bells part has a rhythmic pattern of eighth notes and rests, with a *mp* dynamic marking. The Vib. part has a simple harmonic accompaniment, also with a *mp* dynamic marking. The Synth. part has a melodic line with a slur. The Film part has a simple harmonic accompaniment. Measure numbers 145, 146, 147, 148, 149, 150, 151, and 152 are indicated at the bottom. A section marker 'I' is present at the beginning of the system.

[Press →]

B. Vib.

S. Bells

Synth.

Film

153 154 155 156 157

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Version Correct As Of: April 4, 2024  
Instruments in this Movement:  
Triangle - Coil - Trine - 5 Assorted Wind  
Chimes

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 8. Collage

Precisely ♩ = 94

Triangle Jupiter

Metals

Synthesizer

Video Projection

Lighthouse

1 2 3 4

Coil The old loft

Met.

Synth.

Film

Mountain View

5 6 7 8

Trine To W. Ch.

Met.

Synth.

Film

Carousel

9 10 11 12

W. Ch. W. Ch.

Synth.

Film

Department Store

13 14 15 16

**A** Triangle

Met.

W. Ch.

Synth.

Film

17 18 19 20

Coil

Met.

W. Ch.

Synth.

Film

21 22 23 24

**Trine**

Met.  
W. Ch.  
Synth.  
Film

25 26 27 28

**Triangle**

Met.  
W. Ch.  
Synth.  
Film

29 30 31 32

**B** **Coil**

Met.  
W. Ch.  
Synth.  
Film

33 34 35 36

Trine Triangle

Met.

W. Ch.

Synth.

Film

37 38 39 40

Coil

Met.

W. Ch.

Synth.

Film

41 42 43 44

Trine

Met.

W. Ch.

Synth.

Film

45 46 47 48

**C** **Triangle**

Met.

W. Ch.

Synth.

Film

49 50 51 52

**Coil**

Met.

W. Ch.

Synth.

Film

53 54 55 56

**Trinc**

Met.

W. Ch.

Synth.

Film

57 58 59 60

**Triangle**

Met.  
W. Ch.  
Synth.  
Film

61 62 63 64

**D** **Coil**

Met.  
W. Ch.  
Synth.  
Film

65 66 67 68

**Trine**

Met.  
W. Ch.  
Synth.  
Film

69 70 71 72

Triangle

Met.

W. Ch.

Synth.

Film

73 74 75 76

Coil

Met.

W. Ch.

Synth.

Film

77 78 79 80

E Trine Triangle

Met.

W. Ch.

Synth.

Film

81 82 83 84

Coil

Met.

W. Ch.

Synth.

Film

85 86 87 88

Trine

Met.

W. Ch.

Synth.

Film

89 90 91 92

Triangle

Met.

W. Ch.

Synth.

Film

93 94 95 96

**F** **Coil**

Met.

W. Ch.

Synth.

Film

97 98 99 100

**Trine**

Met.

W. Ch.

Synth.

Film

101 102 103 104

**Triangle**

Met.

W. Ch.

Synth.

Film

105 106 107 108

**Coil**

Met.  
W. Ch.  
Synth.  
Film

109 110 111 112

**G** **Trine**

Met.  
W. Ch.  
Synth.  
Film

113 114 115 116

**Triangle**

Met.  
W. Ch.  
Synth.  
Film

117 118 119 120

**Coil**

Met.  
W. Ch.  
Synth.  
Film

121 122 123 124

**Trine** **Triangle**

Met.  
W. Ch.  
Synth.  
Film

125 126 127 128

**H** **Coil**

Met.  
W. Ch.  
Synth.  
Film

129 130 131 132

Trine

Met.  
W. Ch.  
Synth.  
Film

133 134 135 136

Triangle

Met.  
W. Ch.  
Synth.  
Film

137 138 139 140

Coil

Met.  
W. Ch.  
Synth.  
Film

141 142 143 144

**I** Trine

Met.  
W. Ch.  
Synth.  
Film

145 146 147 148

**Coil** Refuge

Met.  
W. Ch.  
Synth.  
Film

149 150 151 152

**Triangle**

Met.  
W. Ch.  
Synth.  
Film

153 154 155 156

Trine

Met.

W. Ch.

Synth.

Film

157 158 159 160

Home [Press ->]

1 1 3

161 162 163 164

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Version Correct As Of: April 4, 2024  
Instruments in this Movement:  
Vibraphone - Saucer Bells

written for my Doctoral Dissertation, University of Georgia

# Playing With Shadows

for Solo Percussion and Multimedia

Bryan Michael Wysocki (b. 1995)

## 9. Aether

Calmly  $\text{♩} = 94$

Saucer Bells

Synthesizer

Video Projection

Street View

1 2 3 4 5 6 7 8

To B. Vib.

S. Bells

Synth.

Film

9 10 11 12 13 14 15 16

I have always...  
(MV)

B. Vib.

S. Bells

Synth.

Film

*p* pedal ad lib.

*mp*

A

17 18 19 20 21

Musical score for measures 22-28. The score is in 3/4 time and features four staves: B. Vib., Vib., Synth., and Film. The key signature has four flats (B-flat, E-flat, A-flat, D-flat). The B. Vib. staff has a melodic line with slurs and accents. The Vib. staff has a rhythmic accompaniment with slurs and accents, starting at measure 22 with a *mp* dynamic. The Synth. staff has a melodic line with slurs and accents. The Film staff has a bass line with slurs and accents. Measure numbers 22, 23, 24, 25, 26, 27, and 28 are indicated at the bottom.

Musical score for measures 29-36. The score is in 3/4 time and features four staves: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has four flats (B-flat, E-flat, A-flat, D-flat). The B. Vib. staff has a melodic line with slurs and accents, with the instruction *For a long...* above it. The S. Bells staff has a rhythmic accompaniment with slurs and accents. The Vib. staff has a rhythmic accompaniment with slurs and accents. The Synth. staff has a melodic line with slurs and accents, with *mf* dynamic at measure 32 and *mp* dynamic at measure 33. The Film staff has a bass line with slurs and accents. Measure numbers 29, 30, 31, 32, 33, 34, 35, and 36 are indicated at the bottom.

**B**

Musical score for measures 37-44. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has four flats (B-flat major/D-flat minor). The time signature is 4/4. The score is divided into two systems. The first system contains measures 37-44. The B. Vib. part has a melodic line of half notes with a *mf* dynamic. The S. Bells part has a melodic line of quarter notes with a *mf* dynamic. The Vib. part has a rhythmic pattern of eighth notes with a *mp* dynamic. The Synth. part has a melodic line of quarter notes. The Film part has a melodic line of half notes. Measure numbers 37, 38, 39, 40, 41, 42, 43, and 44 are indicated at the bottom of the score.

*I thought*

Musical score for measures 45-52. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has four flats (B-flat major/D-flat minor). The time signature is 4/4. The score is divided into two systems. The first system contains measures 45-52. The B. Vib. part has a melodic line of half notes with a *p* dynamic. The S. Bells part has a melodic line of quarter notes. The Vib. part has a rhythmic pattern of eighth notes. The Synth. part has a melodic line of quarter notes with a *p* dynamic. The Film part has a melodic line of half notes with a *mp* dynamic. The text *I thought* is written above the B. Vib. part. Measure numbers 45, 46, 47, 48, 49, 50, 51, and 52 are indicated at the bottom of the score.

**C**

Musical score for measures 53-60. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is three flats (B-flat major/D-flat minor). The time signature is 4/4. The score is divided into two systems. The first system contains measures 53-59, and the second system contains measures 60. The B. Vib. part has a dynamic of *mf* and consists of a series of half notes with a slur. The S. Bells part has a dynamic of *mf* and consists of a series of quarter notes with a slur. The Vib. part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The Synth. part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The Film part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The measures are numbered 53, 54, 55, 56, 57, 58, 59, and 60.

**C**

*I know that memories...*

Musical score for measures 61-68. The score is for five instruments: B. Vib., S. Bells, Vib., Synth., and Film. The key signature is three flats (B-flat major/D-flat minor). The time signature is 4/4. The score is divided into two systems. The first system contains measures 61-64, and the second system contains measures 65-68. The B. Vib. part has a dynamic of *mp* and consists of a series of half notes with a slur. The S. Bells part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The Vib. part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The Synth. part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The Film part has a dynamic of *mp* and consists of a series of quarter notes with a slur. The measures are numbered 61, 62, 63, 64, 65, 66, 67, and 68.

**D**

Musical score for measures 69-76. The score is in 4/4 time and features three staves: B. Vib., S. Bells, and Vib. The key signature has four flats. The B. Vib. staff contains a series of dotted half notes with a slur. The S. Bells staff starts with a *p* dynamic and contains a series of notes with a slur. The Vib. staff contains pairs of notes with a slur and a *mp* dynamic. Below the staves are measures 69 through 76. A double bar line is present at the end of measure 76.

B. Vib.

S. Bells

Vib.

*p*

*mp*

Synth.

Film

69 70 71 72 73 74 75 76

Musical score for measures 77-84. The score is in 4/4 time and features three staves: B. Vib., S. Bells, and Vib. The key signature has four flats. The B. Vib. staff contains a series of dotted half notes with a slur. The S. Bells staff contains a series of notes with a slur. The Vib. staff contains pairs of notes with a slur. Below the staves are measures 77 through 84. A double bar line is present at the end of measure 84.

B. Vib.

S. Bells

Vib.

Synth.

Film

*p*

*mp*

77 78 79 80 81 82 83 84

**E**

B. Vib.

S. Bells

Vib.

*mp*

Synth.

Film

85 86 87 88 89 90 91 92

B. Vib.

S. Bells

Vib.

Synth.

Film

*mp*

93 94 95 96 97 98 99 100

**F** *In Ancient times...*

B. Vib.

S. Bells

Vib.

Synth.

Film

101 102 103 104 105 106 107 108

*p*

*mp*

*they believed...*

B. Vib.

S. Bells

Vib.

Synth.

Film

109 110 111 112 113 114 115 116

*p*

*mp*

Musical score for measures 117-124. The score is in 3/4 time and features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has four flats. The B. Vib. part consists of a series of half notes with a slur. The S. Bells part has a melodic line in the first two measures followed by rests. The Vib. part has a rhythmic pattern of eighth notes in the second measure, with a *mp* dynamic marking. The Synth. part has a melodic line with rests. The Film part has a bass line with a slur. Measure numbers 117, 118, 119, 120, 121, 122, 123, and 124 are indicated at the bottom.

Musical score for measures 125-132. The score is in 3/4 time and features five staves: B. Vib., S. Bells, Vib., Synth., and Film. The key signature has four flats. The B. Vib. part consists of a series of half notes with a slur. The S. Bells part has a melodic line in the first two measures followed by rests. The Vib. part has a rhythmic pattern of eighth notes in the second measure. The Synth. part has a melodic line with rests, and a *mp* dynamic marking appears in measure 129. The Film part has a bass line with a slur. The word "Scientists..." is written above the B. Vib. staff in measure 129. Measure numbers 125, 126, 127, 128, 129, 130, 131, and 132 are indicated at the bottom.

**G**

B. Vib.

S. Bells *p*

Vib. *mp*

Synth.

Film

133 134 135 136 137 138 139 140

Detailed description: This block contains the musical score for section G, measures 133 to 140. It features five staves: B. Vib. (top), S. Bells, Vib., Synth., and Film (bottom). The key signature is three flats (B-flat major/D-flat minor). The B. Vib. part consists of a series of half notes with a slur. The S. Bells part starts with a half note followed by a quarter note, then rests. The Vib. part has a half note followed by a quarter note, then rests. The Synth. part has a half note followed by a quarter note, then rests. The Film part has a half note followed by a quarter note, then rests. The dynamics are *p* for S. Bells and *mp* for Vib. Measure numbers 133-140 are indicated at the bottom.

**H**

B. Vib. *its color*

S. Bells

Vib.

Synth.

Film

141 142 143 144 145 146 147 148

Detailed description: This block contains the musical score for section H, measures 141 to 148. It features five staves: B. Vib., S. Bells, Vib., Synth., and Film (bottom). The key signature is three flats (B-flat major/D-flat minor). The B. Vib. part consists of a series of half notes with a slur. The S. Bells part starts with a half note followed by a quarter note, then rests. The Vib. part has a half note followed by a quarter note, then rests. The Synth. part has a half note followed by a quarter note, then rests. The Film part has a half note followed by a quarter note, then rests. The dynamic *its color* is written above the B. Vib. staff. Measure numbers 141-148 are indicated at the bottom.

*and its shadow...*

Musical score for measures 149-155. The score is for four instruments: B. Vib., S. Bells, Synth., and Film. The key signature is three flats (B-flat major/D-flat minor). The B. Vib. part features a series of chords with a slur over them. The S. Bells part has a melodic line with a slur. The Synth. part is mostly rests. The Film part has a bass line with a slur. Measure numbers 149, 150, 151, 152, 153, 154, and 155 are indicated below the staves.

*Memories...*

Musical score for measures 156-164. The score is for four instruments: B. Vib., S. Bells, Synth., and Film. The key signature is three flats. The B. Vib. part features a series of chords with a slur over them. The S. Bells part has a melodic line with a slur. The Synth. part has a melodic line with a slur. The Film part has a bass line with a slur. Measure numbers 156, 157, 158, 159, 160, 161, 162, 163, and 164 are indicated below the staves.

Musical score for measures 165-173. The score is for three instruments: B. Vib., Synth., and Film. The key signature is three flats. The B. Vib. part has a rest for most of the measures, with a final measure containing a '1'. The Synth. part has a melodic line with a slur, and the final measure contains a '1'. The Film part has a bass line with a slur, and the final measure contains a '1'. Measure numbers 165, 166, 167, 168, 169, 170, 171, 172, and 173 are indicated below the staves.

Bryan Michael Wysocki

# There Is A Light

For Terminus Ensemble

*For Percussion, Piano, Mixed Ensemble, and Electronics*

Bryan Wysocki  
8-24-2019

## Program Notes

*There Is A Light* for Percussion, Piano, Mixed Ensemble, and Audio-sensitive Lighting is an interactive, semi-improvised piece of music for an ensemble of flexible instrumentation. The piano and percussion parts are given loose instructions about what to play and how to play it; however, the Ensemble parts are for a non-specified instrumentation and can be made up of any number of mixed players. In *There Is A Light*, the sound of the percussionist and pianist playing their instruments triggers the Audio-sensitive lighting, which translates the information of the sound into a related color. Each Ensemble member is then assigned a color that corresponds to one that is shown on The Light. When their corresponding color is shown on The Light, that triggers the ensemble member to perform a musical gesture. Since the piece is semi-improvised, the “rules” of each formal section are fixed, but the manner in which the gestures are to be interpreted is left up to the ensemble performers’ individual musical discretion.

The goal of *There Is A Light* is to create an experience that is vastly different on the micro level but still structurally familiar on the macro, for both the audience and the performer, in every iteration of this piece. The details of each musical gesture and event on the atomic level are malleable, amorphous, and perhaps quite volatile, but consistent and easily understandable on the global level. *There Is A Light* was commissioned and written for the Terminus Ensemble. The coding and construction of the lighting was done by Dominic Ryder.

## Performance Notes

### *The Light*

The Light is a MAX Patch called [filename:*ThereIsALight.maxpat*], that, when connected to The Lighting Apparatus and receiving audio input, sends one of six colors to The Light. Each Mixed Ensemble performer will be assigned to one of the corresponding colors on The Light, and this will determine when they should play. The six colors are as follows: red, purple, white, green, yellow, and blue. The patch listens to the audio input it receives from the piano and percussion input and then determines what colors should be displayed. Experimenting with these frequencies will create different effects and affects.

The Patch listens to and analyzes the frequencies from the percussion and piano audio input and then decides what color should be displayed. The Patch selects the frequency and then relates it to a bank of ranges that dictate the color; the ranges of which are controlled by the user before the Patch runs. It's possible to change and manipulate what color corresponds to which range of frequencies, and this might be an interesting avenue of experimentation with the ensemble. However, the frequency bank should not be changed in the middle of the performance – once it initializes, it should not be manipulated.

### *Form*

*There Is A Light* is a variable-length piece, meaning that the duration can be adjusted based on performance requirements and restraints without effecting the overall structure of the piece. Adjusting the overall duration will, naturally, effect the piece's affect; (however, this might be an interesting avenue for experimentation). The four individual sections of the piece are held together with proportional timings that can be adjusted at will, creating a valid realization, as long as the ratio between the sections is maintained.

The timings of the sections are as follows:

3 : 4 : 3 : 4

The most obvious realization of these ratios is a performance where the first section is 3 minutes long, the second section is 4 minutes long, etc., for an overall duration of 14 minutes. However, another possibility is a performance that lasts 7 minutes, created by halving all of the durations. Further durations are possible through some further calculations. The maximum duration for this piece is one that lasts two weeks, with the duration of the sections each lasting that number of days.

Due to the flexible nature of the sections, each instrument has blank timing indications in their instructions, so that performers can write in the durations that they will use for a certain performance. The Patch has a timer built into the performance view of the display. There are a few ways to ensure that everyone is on the same page in terms of timing:

1. An array of stopwatches that are individually synched up at the start of the performance
2. A "conductor" with one central stopwatch showing when the sections start/end.
3. Giving stopwatches to only the Percussion and Piano parts and having the change of chord/instrument delineate when the section changes.

## ***Instrumentation***

The Percussion part has a set of instructions that determine what instruments they should use.

The Piano part should not be played on an electronic keyboard, and none of the other instruments should be amplified, for example, an electric guitar would not be permissible.

The Mixed Ensemble parts should be played by any monophonic non-idiophone instruments. That is to say, winds, brass, strings (playing single notes only), and voices are permitted, but keyboard and percussion instruments are not.

## ***Setup***

The piano and the percussion should be next to each other, each amplified, with the input being fed into the MAX Patch that is connected to The Light. Each instrument, unless called for by extenuating circumstances, should not be amplified – only the Piano and Percussion should be mic'd and sent to the Patch. The Mixed Ensemble should then be set up on stage (or around stage) in equal proportions so that they can all easily see The Light – that is to say, if there are six mixed ensemble instrumentalists, that three of them are on one side of The Light, and the other three are on the opposite side of The Light.

## ***Percussion***

The Percussion part is independent of The Light, and as such, performs with the Piano part the whole time. Particular care should be given to following the dynamic shape outlined in the score and part. The 4 sections are divided into 4 different instruments, using only one instrument per section. Further, each section should use a different instrument, made of a different material. Each instrument should also be “unpitched;” that is to say, not a keyboard or “tuned” instrument. The way in which to perform each section is left to the performer, but each section should follow the “mantra” described in the section.

It's desirable to have each section flow into each other suddenly, without pause (for mallet or stick switches). In this instance, it's preferred to have the instruments set up in a way that negates any physical challenges in getting to or playing the instruments and minimizes the time in between each instrument change. The instrument change indicates to the Mixed Ensemble when a section has changed, so it is imperative to have these moments coordinated with the Piano part.

## ***Piano***

The Piano part is independent of The Light, and as such, performs the whole time with the Percussion part. Particular care should be given to following the dynamic shape outlined in the score and part. The Piano sections are divided into 4 different ostinati: fast, medium, slow, and medium'. These descriptors refer to the speed at which you play the figures in each section. The nature in which you perform the figures is up to the performer, as long as they conform to the speed described for the section. Fast is quicker than medium, and medium is quicker than slow, and medium' is about the same speed as medium, just performed in a different manner.

It's desirable to have each section flow into each other suddenly, without pause. The chord change indicates to the Mixed Ensemble when a section has changed, so it is imperative to have these moments coordinated with the Percussion part.

### ***Mixed Ensemble***

The MAX Patch is optimized to work with 6 individual groups, since there are six colors on The Light: red, purple, white, green, yellow, and blue. When The Light is displaying the color Red, the group assigned to Red should perform their action, and so on and so forth with the other colors and their groups. It's possible to operate this piece with as few as 4 groups with 1 performer per group, but if possible, it's preferred to have all 6 groups present, with at least 1 performer per group. It is possible to have more than 1 performer per group; however, each group should have the same number of performers and "like" instrumentations, that is to say, similar timbres or constructions, (do not pair a stringed instrument with a wind instrument in the same group).

It's desirable to have each section flow into each other suddenly, without pause. The section change is indicated by a chord change in the Piano and an instrument change in the Percussion. Care should be given to following the dynamic shape outlines in the score and part.

### ***Miscellaneous***

The microphones should be near the sound source for both the piano and percussion, and picking up, within relative convenience, all of the sound from each instrument.

The Piano pedal should be depressed for the duration of the piece.

All pitches are written in concert pitch and are freely octaviating as long as it's in a natural and idiomatic register for the instrument's characteristic sound.

The dynamics indicated in the part are:

*n* – niente, nothing

*m* – mezzo, medium

*f* – forte, loud

# There Is A Light

for Terminus Ensemble

Bryan Michael Wysocki

<p><b>3</b></p> <p><i>On/Off</i> Sustain <i>n</i></p>	<p><b>4</b></p> <p><i>Ebb/Flow</i> Blossom <i>m</i></p>	<p><b>3</b></p> <p><i>Repeat</i> Bright <i>f</i></p>	<p><b>4</b></p> <p><i>Up/Down</i> Reaching <i>m</i></p>
<p>Mixed Ensemble</p>	<p>Percussion</p>	<p>Piano</p>	<p>Piano</p>
<p>"Come from nothing" Instrument 1 <i>n</i></p>	<p>"Fill the space" Instrument 2 <i>m</i></p>	<p>"Fast bursts" Instrument 3 <i>f</i></p>	<p>"Steady, controlled" Instrument 4 <i>m</i></p>
<p>Fast Ostinato</p>	<p>Medium Ostinato</p>	<p>Slow Ostinato</p>	<p>Medium Ostinato'</p>

# Percussion

## Section 1 – “Come from nothing”

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

Think about performing notes that are very quiet, but still perceptible – what would that look like? Or is there another definition of “nothing” that you think applies to this section? What does it sound like to be nothing but still creating sound? And how would you do that for the duration of the section while still climbing in dynamic to the next section?

## Section 2 – “Fill the space”

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

Think about creating a sound that folds inside the Piano sound. Imagine this sound, guided by The Light, extending to the pockets and corners of the performance space, washing over the audience. What would that sound like?

## Section 3 – “Fast bursts”

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

In the last section, the sound was supposed to surround the audience, but in this one, it should startle, and then comfort the audience. The piano is playing a loud, slow, ostinato, so how can your loud, fast notes fit into that? What does it mean to be fast, to be slow? What is different, what is the same about those two “extremes?” How can you show, through sound, what is the same and what is different?

## Section 4 – “Steady, controlled”

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

Create a sound that is completely stable. This is, of course, impossible. But create a sound that gives the appearance of being stable. What’s more important, being something or creating the impression of something? Who’s to say – but create something that could pass for “stable” and is capable of morphing into the soundworld of the first section, almost imperceptible.

Percussion

## *There Is A Light*

for Terminus Ensemble

Bryan Michael Wysocki

3

*"Come from nothing"*  
 Instrument 1  
*p*

4

*"Fill the space"*  
 Instrument 2  
*m*

3

*"Fast bursts"*  
 Instrument 3  
*f*

4

*"Steady, controlled"*  
 Instrument 4  
*m* *n*

# Piano

## Section 1 – Fast Ostinato

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

Think about performing notes that are very quiet, but still perceptible – and fast! Or is there another definition of “fast” that you think applies to this section? What does it sound like to be nothing but still creating sound? And how would you do that for the duration of the section while still climbing in dynamic to the next section?

## Section 2 – Medium Ostinato

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

Think about creating a sound that folds inside the Percussion sound. Imagine this sound, guided by The Light, extending to the pockets and corners of the performance space, washing over the audience. What would that sound like?

## Section 3 – Slow Ostinato

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

In the last section, the sound was supposed to surround the audience, but in this one, it should startle, and then comfort the audience. The percussion is playing loud fast bursts, so how can your loud, slow notes fit into that? What does it mean to be fast, to be slow? What is different, what is the same about those two “extremes?” How can you show, through sound, what is the same and what is different?

## Section 4 – Medium’ Ostinato

(\_\_:\_\_\_\_ - \_\_:\_\_\_\_)

Create a sound that much like the sound you made in the second section, but this time it has the capability, no, the propensity, to become nothing, naturally, almost as if it was meant to. It should be about the same speed as before but played completely differently. What does that mean?

Piano

## *There Is A Light*

for Terminus Ensemble

Bryan Michael Wysocki

The image shows four musical staves for piano, each with a box containing a number (3, 4, 3, 4) and a title (Fast Ostinato, Medium Ostinato, Slow Ostinato, Medium Ostinato'). Each staff shows a piano part with a sustain pedal line and a dynamic marking (n, m, f, m).

*The sustain pedal should remain depressed for the duration of the piece.*

## Mixed Ensemble

My Color is: Red – Purple – White – Green – Yellow – Blue

**Section 1 – On/Off, *Sustain*** ( \_\_\_\_:\_\_\_\_ - \_\_\_\_:\_\_\_\_ )

When you see your color, sustain one pitch in the collection until you see your color disappear and come back again; at that point, once it has come back, stop playing that pitch. Begin again once you see your color repeated. Stay on one pitch at a time, only changing when your color reappears.

**Section 2 – Ebb/Flow, *Blossom*** ( \_\_\_\_:\_\_\_\_ - \_\_\_\_:\_\_\_\_ )

When you see your color, sustain one pitch in the collection for the duration of the color, adding a slight crescendo/decrescendo to the pitch. Begin again once you see your color again. Stay on one pitch at a time, only changing when your color reappears.

**Section 3 – Repeat, *Bright*** ( \_\_\_\_:\_\_\_\_ - \_\_\_\_:\_\_\_\_ )

When you see your color, play fast repeated notes on one pitch in the collection for the duration of the color. Begin again once you see your color again. Stay on one pitch at a time, only changing when your color reappears.

**Section 4 – Up/Down, *Reaching*** ( \_\_\_\_:\_\_\_\_ - \_\_\_\_:\_\_\_\_ )

When you see your color, casually, but purposefully play multiple notes in the collection for the duration of the color. Stop when the color changes and begin again once you see your color again.

Mixed Ensemble

***There Is A Light***  
for Terminus Ensemble

Bryan Michael Wysocki

3 On/Off  
Sustain  
*p*

4 Ebb/Flow  
Blossom  
*m*

3 Repeat  
Bright  
*f*

4 Up/Down  
Reaching  
*m*

All pitches are in written in concert pitch.

Bryan Michael Wysocki

# Suffusion

Quartet for Two Treble Instruments & Two Bass  
Instruments, with Lighting Apparatus

*For Kevin Kay*

Bryan Wysocki  
6-26-2019

## Program Notes

There's a certain craftsmanship inherently built into the art of stained glass that, without fail, seems to capture the hearts of those that are surrounded by it. I personally find some austere curiosity in why we even use stained glass in the first place. Given how brittle and delicate glass can be, why use it to hold up and protect our most sacred relics from the elements? Even outside the confines of religion, even the most pedestrian work of stained glass has a kind of rugged and beautiful sense of purpose and action beholden to it. You can almost see the physicality and movement of the craftsman as they worked to stop the slow-moving currents of molten glass in just the right places.

As someone who has spent their life outside of the church, I always felt as if there was an isolation or disconnect between the imagery of the church, and the attainability of the message it attempts to convey. Outside of those with profligate means, stained glass is something of an extravagance; it's not something that the general congregation can see in their own homes. Which might be the intention; to see this beauty is to see enlightenment. But if you can't see it in your daily life, how can you find it every day?

Most families have these mason jars; they're for preserving jams and jellies, making layered desserts and parfaits, and for pickling cucumbers or any other food you can think of. They have this hackneyed air to them that I find quite endearing, especially since it's the kind of glass that people actually have access to in their kitchens and cellars. Maybe this is where one could find this beauty in the way glass can help light to dance?

---

*Suffusion* as a work is influenced by suffusion as a word and concept, which means "to spread over or through in the manner of fluid or light." How can music sound like the diffusion and transformation of light, and how can these household objects recall a more "refined" state of being, and what would it mean to put these elements together?

## Lighting Apparatus Notes

### Construction

Gather materials

- 4 clear glass Mason Jars, I recommend the 48oz jars, but any size should be fine.
- 4 Arduinos, which are the tiny computers inside the jars that will run the program.
- 4 LED Lights, for the program to display the lights.
- Wires, to get the jars connected to the power supply.
- Power Supply, to turn the Arduinos on.
- Power strip with an on/off switch, to run electricity the power supply.
  - When the power supply is turned on, the Program will initialize automatically, starting the beginning of the piece. It is also permissible to install an on/off switch somewhere on the power supply.
- Optional: Small hand-held mirrors, to reflect light inside the jars.
- Optional: Hot-glue gun, to keep things in place

The mason jar will be placed upside-down, with the Arduino and LED Light housed in the cap of the mason jar, sending light upwards through the light, with the piece of mirror reflecting the light back into the light again, intensifying the light.

### Form and Timings

There are three sections in this piece: *Begin*, *Pathways*, and *End*. Sections *Begin* and *End* both last a minute, and *Pathways* lasts 8 minutes. Below is a description of the form in regard to what the light should be doing.

During *Begin*, each individual light should start off, and with a predetermined RGB value of (255, 255, 251) for the Yellow-ish White color. Then, after a few seconds, it should perform a Fade Action into the fullest intensity the LED light has to offer; that is, it should start from an intensity (or brightness) of 0% and fade to an intensity of 100% after 55 seconds. This will ensure that the lights are at its brightest intensity before switching to *Pathways*. The manner in which the lights turn on and fade into the 100% intensity setting should not be coordinated (that is to say, it should either be randomized, or preset with 4 different timings so that the fade into 100% isn't entirely linear or exponential at the same time for all four lights).

60 seconds after the start of the piece, (which is 5 seconds after the brightest intensity), the lights should immediately display the colors of their individual Pathways. This is a *subito* change in color, at which point each of the four individual colors should be showing on one of the four individual lights (i.e., no repeating colors, there should only be one of each color).

There are two types of Actions that correspond to Color in the section *Pathways*: Steady and Morph. During Steady, the light maintains a steady color for the duration of the section. During Fade, the color of the light should smoothly and evenly transition to the next Steady color by way of an HSV (Hue, Saturation, and Value) gradient. If this proves to be difficult, the color can move to the next color by way of an RGB gradient instead. An HSV gradient is preferred to an RGB because of the wild shifts that can occur when shifting between two colors.

Over the course of *Pathways*, each individual light should have an intensity fade from 100% to 50% and then back to 50% at least three times during the section. The complete duration for one of these intensity fades should be no shorter than 30 seconds, but no more than 90 seconds long. Two of these Fades should happen randomly, independent of the other actions that the individual light is performing, and independent of the other lights, if possible. The third and final Fade should occur during the last 45 seconds of *Pathways*, (8:15 – 9:00); and this should be coordinated and together with all four lights. The intensity of the light should reach 100% right at the moment of the last Purple-ish White Flash to signal the movement into *End*, so that the brightness is at 100% right at the start of *End*.

Below is a map to the timings of *Pathways*. Each cell represents 30 seconds. The durations and relationship of the blocks in each pathway should be constant with every Initialization, however, which particular light is given which particular pathway (and therefor color) should be randomized, and there should be no repeated pathways in each Initialization.

An action of Steady is denoted by a solid-color filled-in cell with white text.

An action of Morph is denoted by a grid-fill cell with black text.

Pathway Timings																
<b>A</b>	1:30		0:30	0:30	1:00		2:30				1:00		1:00			
<b>B</b>	2:30				1:30		1:00		0:30	1:00		0:30	1:00			
<b>C</b>	1:00		0:30	1:00		0:30	1:00		1:30			2:30				
<b>D</b>	0:30	0:30	1:00		1:00		2:30				1:00		1:30			
	<u>1:00</u>	<u>1:30</u>	<u>2:00</u>	<u>2:30</u>	<u>3:00</u>	<u>3:30</u>	<u>4:00</u>	<u>4:30</u>	<u>5:00</u>	<u>5:30</u>	<u>6:00</u>	<u>6:30</u>	<u>7:00</u>	<u>7:30</u>	<u>8:00</u>	<u>8:30</u>

The Letter Indicates the name of the pathway, which will stay constant for every Initialization (i.e., Pathway A *always* starts with a 1-minute block of Steady), however this does not mean that pathway A always starts with the Color Light Blue, since color should also be randomized. This information is not necessary for the performer to know, it is only used in the Program to structure the timings of sections.

This construction should not suggest a Direction, (since it will be decidedly randomly), nor should it suggest assignment of the ensemble (i.e. A & B assigned as the Treble Pair), since the information about which pathway is assigned at the beginning of every Initialization.

Before each change of Action after the start of *Pathways*, (that is to say, the second Action that occurs in Pathways), there should be one second of Purple-ish White: 250, 247, 252 to denote the start of a new Action. Going on to the section *End* is considered a new action; so, there should be one second of Purple-ish White to denote the *End*.

*End* lasts for exactly 1 minute. At the start of *End*, every light should immediately switch to the Purple color (167, 0, 255). And for the first 30 seconds of *End*, Morph to the Yellow-ish White color (255, 255, 251). Over the entire duration of *End*, the lights should fade from 100% intensity to 0% intensity, like the reverse of how they faded in during *Begin*.

## Technical Appendix

### Color Values

In RGB

For *Begin*

Yellow-ish White: 255, 255, 251

For *Pathways*

Blue: 4 – 58 – 229

Light Blue: 193 – 255 – 254

Orange: 255 – 181 – 6

Red: 254 – 51 – 45

Purple-ish White: 250, 247, 252

For *End*

Purple: 167, 0, 255

Yellow-ish White: 255, 255, 251

## Performance Notes

### *Performers*

Each performer should be assigned one of the lights. It does not matter which one, since the operation of each individual light is randomized when the program initializes. It is imperative however, that each performer is comfortable transitioning between every Color. On the Performance Instructions page, you will see exactly which transitions between Colors are possible.

The two pairs of instruments, Treble and Bass, should be matched by instrument; so that if, for example, one of the Treble Instruments is a Flute, the other Treble Instrument is also a Flute. It is permissible to have the same *kind* of instrument in a pair; for example, a Flute and an Alto Flute, or a Trombone and a Bass Trombone, but this is because these instruments are similar, of the same kind, and share similar and overlapping standard registers. It would not be appropriate however to pair a Piccolo and a Bass Flute, since these instruments' registers do not overlap in their standard register.

It is not permissible to use keyboard or percussion instruments for either the Treble or Bass Instruments in this piece. Vocalists, woodwinds, brass, and stringed instruments are permissible; if using a pair of vocalists, they should make a judgement about how to assign and distribute the phonemes they are going to use throughout the duration of the piece. Another entirely permissible realization of this piece is with a standard Saxophone quartet, (soprano, alto, tenor, and baritone) – with the soprano and alto playing the two Treble parts, and the tenor and baritone playing the two Bass parts.

All written music in this piece is written in *concert pitch*; you might need to transpose to different keys depending on the instruments that are being played.

### *Setup*

It is imagined that this piece should be performed from memory, with no score present or visible to the audience. This is so that the performers can be as engaged with the light as possible, without having to check back to their music for instructions; however, this not a problem if this is not attainable – just be sure to have the music stand be non-invasive to the performer/audience. Each of the four lights should be setup in some way on stage that makes clear to the audience that each performer is assigned and responding to their own light. This could be done in a number of ways, below are a few solutions that I've thought of, however, other options might be more feasible or foreseeable based on the performer's space, venue, or individual preferences:

- with a table with the four lights stationed on the four corners with the performers standing adjacent to their own light.
- with each light on its own stool or platform, with a performer standing behind it.
- spatialized, with each the lights setup in the four corners of a space, and the performer standing near it.

### *Duration*

This piece is 10 minutes long, starting from the moment the Program starts. There is no need for a shared sense of time since the piece is improvised and on a fixed and individualized set of rules; as long as each performer is engaged with their light, the piece will start, end, and move together as it is supposed to, regardless and perhaps in spite of a timekeeping device.

### *Form*

The form of the piece is broken into 3 large sections as follows: **Begin**, **Pathways**, and **End**. And the timing of the durations of these sections is as follows: 1:00 – 8:00 – 1:00. Each Player's light will

display a Color and the performer will use the brightness and color as a guide to interpret and then improvise on a set of instructions that correspond to the light. More information about what and how to improvise during these sections will be given in the *Score* section.

Between each of the large sections (*Begin*, *Pathways*, and *End*), the lights will perform a dramatic color change to signify the beginning of the new section.

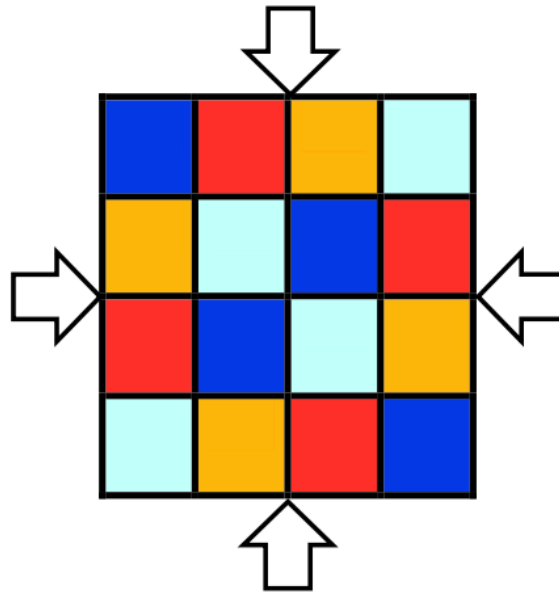
Going from *Begin* to *Pathways*, the light will flash from Yellowish-White to one of four colors: Blue, Light Blue, Orange, or Red.

In the smaller sections of *Pathways*, individual's lights will become Purple-ish White for about a second to signify moving between Actions (per the timing structure in the Lighting Apparatus Notes).

Going from *Pathways* to *End*, the light will turn Purple-ish White to denote a change to a new section, and then will immediately turn Purple, denoting that *End* has started.

## Pathways Guidelines

This 4\*4 grid (below) is a map of all the possible directions the individual lights could take in the duration of the *Pathways* section of this piece. The Direction will not change during the duration of the section, and each performer's light will randomly be assigned one of the {rows:columns} at the initialization of the piece. Which specific {pathway:direction} the light is going is not particularly important; however, it is important that each performer is comfortable transitioning from a given Color to every other Color, since it is possible to go from one Color to any of the other Colors.



In the duration of the section *Pathways*, the color of the light will have two actions, Steady and Morph, which are always in succession. Each individual light starts the *Pathways* section on the action Steady, and after a certain amount of time has passed, the light, through a predetermined structure (listed in the Apparatus Instructions), will move to the next action. The light will blink White before moving between these two actions to indicate that it is about to do start changing. During the Steady action, the light will remain steady. During the Morph action, the light will Morph into the next Color.

There will also be three Fade actions during the course of *Pathways*. This is indicated by a decrease in color intensity (brightness). The performer should map their own dynamic to the intensity of the light by performing a decrescendo that mirrors the brightness of the light.

# Treble Instrument Score

A shorthand guide.

## Begin

Follow the light in F Major. Crescendo as the light gets brighter.

## Pathways

Be sure to play what your color is telling you; the {constant:change} and the brightness.

### Blue

Moderate Speed



in any order, repeat ad. lib.

The 'Blue' pathway is a musical exercise in F Major, 4/4 time, marked 'Moderate Speed'. It consists of four measures, each starting with a circled number 1 through 4. Measure 1: quarter notes F4, A4, C5, B4. Measure 2: quarter notes G4, F4, E4, D4. Measure 3: quarter notes C4, B3, A3, G3. Measure 4: quarter notes F3, E3, D3, C3. Dashed lines connect the notes between measures, indicating a glissando effect. The instruction 'in any order, repeat ad. lib.' is written below the staff.

### Light Blue

Very Fast



in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series

The 'Light Blue' pathway is a musical exercise in F Major, 4/4 time, marked 'Very Fast'. It consists of six measures, each starting with a circled number 1 through 6. Measure 1: quarter notes F4, A4, C5, B4. Measure 2: quarter notes G4, F4, E4, D4. Measure 3: quarter notes C4, B3, A3, G3. Measure 4: quarter notes F3, E3, D3, C3. Measure 5: quarter notes B3, A3, G3, F3. Measure 6: quarter notes E3, D3, C3, B2. Dashed lines connect the notes between measures, indicating a glissando effect. The instruction 'in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series' is written below the staff.

### Orange

Briskly, with exuberance



in any order, in rapid succession, ad. lib.

The 'Orange' pathway is a musical exercise in F Major, 4/4 time, marked 'Briskly, with exuberance'. It consists of eight measures, each starting with a circled number 1 through 8. Measure 1: quarter notes F4, A4, C5, B4. Measure 2: quarter notes G4, F4, E4, D4. Measure 3: quarter notes C4, B3, A3, G3. Measure 4: quarter notes F3, E3, D3, C3. Measure 5: quarter notes B3, A3, G3, F3. Measure 6: quarter notes E3, D3, C3, B2. Measure 7: quarter notes A2, G2, F2, E2. Measure 8: quarter notes D2, C2, B1, A1. Dashed lines connect the notes between measures, indicating a glissando effect. The instruction 'in any order, in rapid succession, ad. lib.' is written below the staff.

### Red

Moderately, Evenly



in any order, ad. lib. | even rhythm, with occasional rubato; quasi-baroque

The 'Red' pathway is a musical exercise in F Major, 4/4 time, marked 'Moderately, Evenly'. It consists of eight measures, each starting with a circled number 1 through 8. Measure 1: quarter notes F4, A4, C5, B4. Measure 2: quarter notes G4, F4, E4, D4. Measure 3: quarter notes C4, B3, A3, G3. Measure 4: quarter notes F3, E3, D3, C3. Measure 5: quarter notes B3, A3, G3, F3. Measure 6: quarter notes E3, D3, C3, B2. Measure 7: quarter notes A2, G2, F2, E2. Measure 8: quarter notes D2, C2, B1, A1. Dashed lines connect the notes between measures, indicating a glissando effect. The instruction 'in any order, ad. lib. | even rhythm, with occasional rubato; quasi-baroque' is written below the staff.

## End

Follow the light in C Major. As the color changes, glissando from {C Major – F Major}

Highs and Lows must sustain their notes.

Fade out.

**Begin** (0:00 – 1:00)

Your individual light will start to glow.

And as it grows, I want you to create a note that sounds how the light looks.

It'll get brighter during this section;  
and I imagine you might want to crescendo.  
(or create some other sort of gradual change).

Let it be a long note,  
or at least one that takes a while to get to where it's going.  
But it should live within the world of F major.

It can be a note in the  
{tonic:dominant:subdominant:whatever} triad,  
but it should always be diatonic.

And after each long note,  
you should play another note in that world.  
(But it should always stay in F major.)

Follow the growth of your light.  
As it gets brighter, you should too.

Do you decide to do that with a brighter tone?  
A louder dynamic?  
A more extreme tessitura?

By creating {harmony:dissonance} with your pair?  
By complementing one of the other instruments?

Find a way to create beauty in this moment within  
{yourself :  
your partner :  
your other pair}  
and use that beauty to build until the light changes.

(You must know all things change?)

As the light is growing and glowing  
you must radiate together;  
You must build this tension and beauty  
and hold onto it for as long as you can.

Until suddenly.

You embark on your own path.

By yourself.

With your own light.

Relish in this shared moment of unity.

## *Pathways* (1:00 – 9:00)

Your light will suddenly change to display its own Color, completely separate from the others.

You are now responsible for your own journey.

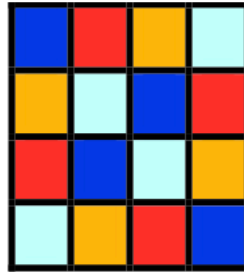
But be wary –

your light will flash White before it starts to change into another Color!  
It's your job to figure out how to create a smooth and natural transition between the two Colors.

Luckily, it always goes like this:

{Steady : Morph : Steady : Morph : Steady : Morph : Steady}

Here is a map to help you figure out what might happen.



Does this map actually help you?

I'd be surprised if it does.

It doesn't tell you where you are,  
like most maps do,  
but instead where you could be.

Which is kind of annoying.

But truthfully,

it doesn't know where you are –

and you probably don't know where you are either.

But you will.

You'll figure it out.

Find a way to create beauty in this moment  
(and in the future moments)  
within {yourself :  
your partner :  
your other pair}.

When your light is Steady and displaying a solid color;

you should improvise with the musical material that corresponds to the color you see.

But when the light is not steady and instead doing a Morph;

you should figure out what color you think it's going to, and then,

how to make the music from the color you were just on,

sound like the music from the color you're going to.

It's tricky,

but you can do it.

And during the Morph,

if you see a color that isn't one of the main four colors,

well then that's pretty cool –

try to make a sound that might represent that color,

but keep it in the confines of morphing to the next color.

Whatever that means.

## Blue

Moderate Speed

*in any order, repeat ad. lib.*

## Light Blue

Very Fast

*in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series*

## Orange

Briskly, with exuberance

*in any order, in rapid succession, ad. lib.*

## Red

Moderately, Evenly

*in any order, ad. lib. | even rhythm, with occasional rubato; quasi-baroque*

All pitches are written in concert pitch.



# Bass Instrument Score

A shorthand guide.

## Begin

Follow the light in F Major. Crescendo as the light gets brighter.

## Pathways

Be sure to play what your color is telling you; the {constant:change} and the brightness.

### Blue

Moderate Speed



① ② ③ ④

*in any order, repeat ad. lib.*

Detailed description: This musical notation is for the 'Blue' pathway. It is written in bass clef with a key signature of one sharp (F#) and a 4/4 time signature. The tempo is marked 'Moderate Speed'. The piece consists of four measures, each starting with a circled number 1 through 4. The notes are: Measure 1: F#2, G2, A2, B2; Measure 2: C3, D3, E3, F3; Measure 3: G3, A3, B3, C4; Measure 4: D4, E4, F4, G4. Each measure contains a series of eighth notes. The instruction 'in any order, repeat ad. lib.' is written below the staff.

### Light Blue

Very Fast




① ② ③ ④ ⑤ ⑥

*in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series*

Detailed description: This musical notation is for the 'Light Blue' pathway. It is written in bass clef with a key signature of one sharp (F#) and a 4/4 time signature. The tempo is marked 'Very Fast'. The piece consists of six measures, each starting with a circled number 1 through 6. The notes are: Measure 1: F#2, G2, A2, B2; Measure 2: C3, D3, E3, F3; Measure 3: G3, A3, B3, C4; Measure 4: D4, E4, F4, G4; Measure 5: A4, B4, C5, D5; Measure 6: E5, F5, G5, A5. Each measure contains a series of eighth notes. The instruction 'in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series' is written below the staff.

### Orange

Stately,



① ② ③ ④ ⑤ ⑥ ⑦

*in any order, repeat ad. lib. | paranthetical notcheads denote optional octave choices*

Detailed description: This musical notation is for the 'Orange' pathway. It is written in bass clef with a key signature of one sharp (F#) and a 4/4 time signature. The tempo is marked 'Stately,'. The piece consists of seven measures, each starting with a circled number 1 through 7. The notes are: Measure 1: F#2, G2, A2, B2; Measure 2: C3, D3, E3, F3; Measure 3: G3, A3, B3, C4; Measure 4: D4, E4, F4, G4; Measure 5: A4, B4, C5, D5; Measure 6: E5, F5, G5, A5; Measure 7: B5, C6, D6, E6. Each measure contains a series of eighth notes. The instruction 'in any order, repeat ad. lib. | paranthetical notcheads denote optional octave choices' is written below the staff.

### Red

Moderately, Evenly



① ② ③ ④ ⑤ ⑥ ⑦ ⑧

*in any order, ad. lib. | even rhythm, with occassional rubato; quasi-baroque*

Detailed description: This musical notation is for the 'Red' pathway. It is written in bass clef with a key signature of one sharp (F#) and a 4/4 time signature. The tempo is marked 'Moderately, Evenly'. The piece consists of eight measures, each starting with a circled number 1 through 8. The notes are: Measure 1: F#2, G2, A2, B2; Measure 2: C3, D3, E3, F3; Measure 3: G3, A3, B3, C4; Measure 4: D4, E4, F4, G4; Measure 5: A4, B4, C5, D5; Measure 6: E5, F5, G5, A5; Measure 7: B5, C6, D6, E6; Measure 8: F6, G6, A6, B6. Each measure contains a series of eighth notes. The instruction 'in any order, ad. lib. | even rhythm, with occassional rubato; quasi-baroque' is written below the staff.

## End

Follow the light in C Major. As the color changes, glissando from {C Major – F Major}

Highs and Lows must sustain their notes.

Fade out.

**Begin** (0:00 – 1:00)

Your individual light will start to glow.

And as it grows, I want you to create a note that sounds how the light looks.

It'll get brighter during this section;  
and I imagine you might want to crescendo.  
(or create some other sort of gradual change).

Let it be a long note,  
or at least one that takes a while to get to where it's going.  
But it should live within the world of F major.

It can be a note in the  
{tonic:dominant:subdominant:whatever} triad,  
but it should always be diatonic.

And after each long note,  
you should play another note in that world.  
(But it should always stay in F major.)

Follow the growth of your light.  
As it gets brighter, you should too.

Do you decide to do that with a brighter tone?  
A louder dynamic?  
A more extreme tessitura?

By creating {harmony:dissonance} with your pair?  
By complementing one of the other instruments?

Find a way to create beauty in this moment within  
{yourself :  
your partner :  
your other pair}  
and use that beauty to build until the light changes.

(You must know all things change?)

As the light is growing and glowing  
you must radiate together;  
You must build this tension and beauty  
and hold onto it for as long as you can.

Until suddenly.

You embark on your own path.

By yourself.

With your own light.

Relish in this shared moment of unity.

## ***Pathways*** (1:00 – 9:00)

Your light will suddenly change to display its own Color, completely separate from the others.

You are now responsible for your own journey.

But be wary –

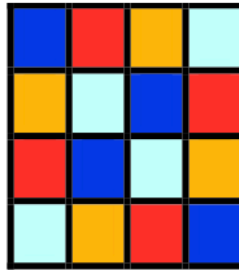
your light will flash White before it starts to change into another Color!

It's your job to figure out how to create a smooth and natural transition between the two Colors.

Luckily, it always goes like this:

{Steady : Morph : Steady : Morph : Steady : Morph : Steady}

Here is a map to help you figure out what might happen.



Does this map actually help you?

I'd be surprised if it does.

It doesn't tell you where you are,

like most maps do,

but instead where you could be.

Which is kind of annoying.

But truthfully,

it doesn't know where you are –

and you probably don't know where you are either.

But you will.

You'll figure it out.

Find a way to create beauty in this moment

(and in the future moments)

within {yourself :

your partner :

your other pair}.

When your light is Steady and displaying a solid color;

you should improvise with the musical material that corresponds to the color you see.

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It's tricky,

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And during the Morph,

if you see a color that isn't one of the main four colors,

well then that's pretty cool –

try to make a sound that might represent that color,

but keep it in the confines of morphing to the next color.

Whatever that means.

## Blue

Moderate Speed

*in any order, repeat ad. lib.*

## Light Blue

Very Fast

*in any order, repeat ad. lib. | pitches can be read in reverse order, with the long note at the end of the series*

## Orange

Stately,

*in any order, repeat ad. lib. | paranthetical noteheads denote optional octave choices*

## Red

Moderately, Evenly

*in any order, ad. lib. | even rhythm, with occassional rubato; quasi-baroque*

*All pitches are written in concert pitch, feel free to take notes up or down the octave when necessary*



---

Bryan Michael Wysocki

# Toy Boat

For Clarinet in Bb, Violin, Cello, Piano and Multimedia

*For Unheard-of // Ensemble Session at UGA*

Bryan Wysocki  
1-25-2022  
Buford, GA

## Program Notes

*Toy Boat* is a piece about deception and trickery. The title comes from one of those old-school playground tongue twisters, where you try saying “toy boat” three times fast and each time it gets more distorted: toy boat toy boyt toa boyt. It’s a simple trick, and I tried to base the piece on a number of these small illusions.

The music is repetitive, energetic, and often imitated in slightly different ways. By changing the core material often enough to that it is never the same, I am trying to imitate the idea of a tongue twister. What makes it even more difficult is the homo-rhythmic textures throughout, which is my way of making the tongue-twister more difficult, by asking the ensemble to do it together.

The video component of this piece is quite literally a toy boat, b-roll footage of an old Hollywood trick where they used a model of a boat to fake the appearance of filming a more expensive real boat. The video has been distorted digitally to change the perception of the video. You cannot tell if the boat is real or fake because it has been digitally altered and abstracted, so your brain chooses the more realistic conclusion, that it must be seeing a real boat (but then why would the piece be called *Toy Boat*?).

The interactive lighting is a new tool for me, and one that I am excited about. In this piece, I use the lights to refer, reframe, and rethink how materials are seen and heard throughout. Do you hear the same chord played in a red light differently than you do in a blue light?

## Electronics Setup

### Version 1

#### Laptop 1, near pianist

- USB 1 in – ENTTEC DMX USB PRO external
- USB 2 in – MIDI Controller, on piano (keyboard, with at least 5 complete octaves)
- Max – ToyBoat.maxpat, with the *Light Controller* option checked
- DMX Lights – 4, 4-Channel LED lights linked together

#### Laptop 2, near clarinetist

- USB 1 in – MIDI Foot Pedal (Logidy UMI 3, with at least three toggles)
- Max – ToyBoat.maxpat, with the *Video Controller* option checked
- HDMI out – *Toy Boat Video Player* full screen on projector

### Version 2

#### Laptop 1, near pianist

- USB 1 in – ENTTEC DMX USB PRO external
- USB 2 in – MIDI Controller, on piano (keyboard, with at least 5 complete octaves)
- USB 3 in – MIDI Foot Pedal, near clarinetist (*suggested Logidy UMI 3*, with at least three toggles)
- Max – ToyBoat.maxpat, with both the *Light Controller* and *Video Controller* options checked
- HDMI out – *Toy Boat Video Player* full screen on projector
- DMX Lights – 4, 4-Channel LED lights linked together



Cl. in Bb

7 8 9 10 11 12 13 14

Perc.

turns on ToyBoat1.mp4

Vln

Vc.

MIDI

Pno

7 8 9 10 11 12 13 14

3/2



The musical score is arranged in six staves from top to bottom: Cl in Bb, Ped, Vln, Vc, MIDI, and Pno. The time signature is 4/4. Measure 26 begins with a 'Pedale In' instruction in the MIDI staff. The Cl in Bb part starts with a piano (*p*) dynamic and a melodic line. The Ped part has a crossed-out note in measure 26. The Vln and Vc parts play sustained chords with a piano (*p*) dynamic. The MIDI part provides a rhythmic accompaniment. The Pno part features a complex texture with a piano (*p*) dynamic. Measure 27-29 continue the melodic and harmonic development. Measure 30 introduces a forte (*f*) dynamic in the Cl in Bb and Vln parts, with accents and slurs. Measure 31-32 show further melodic movement in the Cl in Bb and Vln parts, with a piano (*p*) dynamic. Measure 33 concludes with a fortissimo (*ff*) dynamic in the Pno part and a 'Pedale In' instruction. Performance instructions include 'OVP' (Over Pedal) in the Vln and Vc parts, and 'Pedale In' in the MIDI part.





Musical score for Toy Boat - Transposed Score, page 7. The score is for a full orchestra and piano, spanning measures 45 to 51. It includes parts for Clarinet in Bb, Pedal, Violin, Viola, Violoncello, Piano, and MIDI. The score features various dynamics (mf, p, f, ff), articulations (accents, slurs), and performance instructions like 'Fade Out' and 'Fade In'. The tempo is marked 'Andante'.

Measures 45-51 include:

- Clarinet in Bb: *f* accents, slurs, *f* dynamics.
- Pedal: *f* dynamics.
- Violin: *f* dynamics, *OVVP* and *MST* markings.
- Viola: *f* dynamics, *OVVP* and *MST* markings.
- Violoncello: *f* dynamics, *OVVP* and *MST* markings.
- Piano: *mf*, *p*, *f*, *ff* dynamics, *Andante* tempo marking.
- MIDI: *f* dynamics, *OVVP* and *MST* markings.

Performance instructions include 'Fade Out' at measures 45, 48, and 50, and 'Fade In' at measure 51.

52 54 55 56 57 58 59 60

**C**

Cl. in Bb

Ped.

Vln

Vc.

MIDI

Pno

Cl. in Bb 61 62 63 64 65 66  
 Ped. *f* *p* *f* *p*  
 Vln *col legno battuto* *p* *f*  
 Vc. *fp* *f*  
 MIDI *On* 61 62 63 64 65 66  
 Pno *sfz* *p* *f*  
*Scal.*

Musical score for Toy Boat - Transposed Score, page 9. The score is for measures 61-66 and includes parts for Clarinet in Bb, Pedal, Violin, Viola, MIDI, and Piano. The music is in 8/8 time and features various dynamics and articulations such as sfz, fp, f, p, and accents. A 'col legno battuto' instruction is present for the Violin part. A 'Scal.' marking is at the bottom left.



Toy Boat - TRANSPosed SCORE

The musical score is arranged in a system with six staves. From top to bottom, the staves are: Cl. in Bb, Ped., Vln, Vc., MIDI, and Pno. The music is in 3/4 time. The Cl. in Bb staff has measures 72-77, with dynamics *f* and *p*. The Ped. staff has measures 72-77, with dynamics *f* and *p*. The Vln staff has measures 72-77, with dynamics *p* and *f*, and the instruction "col legno battuto". The Vc. staff has measures 72-77, with dynamics *f* and *p*. The MIDI staff has measures 72-77, with dynamics *f* and *p*. The Pno. staff has measures 72-77, with dynamics *f* and *p*. The score includes various articulations such as accents, slurs, and breath marks. A purple arrow points to a note in the MIDI staff at measure 75, labeled "guitar". A note in the Pno. staff at measure 76 is labeled "turns on ToyBoat2.mp4".

Cl. in B $\flat$  78 79 81

Perc. 78 79 81

Vln 78 79 81

Vc. *mf* 78 79 81

MIDI 78 79 81

Pno 78 79 81

**D**

*p*

Clarinet in Bb  
Ped.  
Violin  
Viola  
MIDI  
Piano

82 83 84 85 86 87 88

*f* *mf* *f* *mf* *f*

MSP arco  
MST

Fade Out

*mp* *f*

Off  
800

Musical score for Toy Boat - Transposed Score, measures 89-94. The score includes parts for Cl in Bb, Ped, Vln, Vc, MIDI, and Pno.

- Cl in Bb:** Measures 89-94. Measure 92 features a *fp* dynamic and a sharp sign (#).
- Ped:** Measures 89-94. Measure 92 features a *fp* dynamic.
- Vln:** Measures 89-94. Measure 89 features *f p* dynamics and a slur. Measure 91 features *f* dynamics. Measure 92 features a slur. Measure 93 features a slur. Measure 94 features a slur.
- Vc:** Measures 89-94. Measure 89 features *f p* dynamics and a slur. Measure 91 features *f* dynamics. Measure 92 features a slur. Measure 93 features a slur. Measure 94 features a slur.
- MIDI:** Measures 89-94. Measure 89 features a circled 8 (8va) and a slur. Measure 91 features a slur. Measure 92 features a slur. Measure 93 features a slur. Measure 94 features a slur.
- Pno:** Measures 89-94. Measure 89 features *sfz* dynamics. Measure 92 features *fp* dynamics.

Performance instructions include: *ord.*, *arco*, *MSP*, *Fade Out*, and *8va*.

**E**

Cl. in Bb  
Ped.  
Vln  
Vc.  
Pno

MIDI

95 96 97 98 99

*sfz* *f* *mf* *p* *f* *ord.* *f* *mf* *f* *sfz*

Pade Out *8<sup>va</sup>* Pade In OFF

Scen.

The image shows a page of a musical score for 'Toy Boat - Transposed Score', page 16. The score is written for a concert band or orchestra and includes parts for Clarinet in B-flat (Cl. in Bb), Pedal (Ped.), Violin (Vln), Viola (Vc.), MIDI, and Piano (Pno). The music is in 4/4 time. The score is divided into measures 100, 101, 102, and 103. The Cl. in Bb part starts with a dynamic of *p* and features a melodic line with slurs. The Ped. part is mostly silent. The Vln and Vc. parts play a rhythmic pattern with dynamics of *f* and *p*, and include a section labeled 'ord.'. The MIDI part has a dynamic of *f* and includes a section labeled 'Pade In' with a circled '8' and a measure marked 'OFF'. The Pno part has dynamics of *f*, *mf*, and *sfz*, and includes a section labeled 'Scal.'. The score concludes with a double bar line and a repeat sign.



The image displays a musical score for the piece "Toy Boat - Transposed Score", covering measures 109 through 114. The score is arranged in a system with six staves: Clarinet in Bb (Cl. in Bb), Percussion (Perc.), Violin (Vln), Viola (Vc.), MIDI, and Piano (Pno). The music is written in 4/4 time. The Clarinet part features a melodic line with dynamics such as *sfz* and *f*, and includes triplet markings. The Percussion part is mostly silent, with some rhythmic notation. The Violin and Viola parts have dynamic markings like *sfz* and *f*, and include triplet markings. The MIDI part shows a sequence of notes with various colors (blue, purple, green, orange, red) and includes performance instructions like "On" and "Off". The Piano part has dynamic markings like *sfz* and *f*, and includes triplet markings. The score is marked with measure numbers 109, 110, 111, 112, 113, and 114.



The musical score is arranged in a system with six staves. From top to bottom, the staves are: Cl. in Bb, Ped., Vln, Vc., MIDI, and Pno. The music spans measures 122 to 126. The Cl. in Bb part features a melodic line with dynamics *p* and *f*. The Vln part includes a *pizz.* section with dynamics *f* and *ff*. The Vc. part has a melodic line with dynamics *f* and *ff*. The MIDI and Pno parts provide harmonic support, with the Pno part including a section marked *ff* in measure 126. Measure numbers 122, 123, 124, 125, and 126 are indicated at the bottom of each staff. The score includes various musical notations such as slurs, accents, and dynamic markings.

Clarinet in Bb: Measures 127-134. Measure 127 starts with a dynamic of *f*. Measure 128 has a dynamic of *pp*. Measure 129 has a dynamic of *pp*. Measure 130 has a dynamic of *pp*. Measure 131 has a dynamic of *pp*. Measure 132 has a dynamic of *pp*. Measure 133 has a dynamic of *pp*. Measure 134 has a dynamic of *pp*.

Pedal: Measures 127-134. Measure 127 has a dynamic of *f*. Measure 128 has a dynamic of *pp*. Measure 129 has a dynamic of *pp*. Measure 130 has a dynamic of *pp*. Measure 131 has a dynamic of *pp*. Measure 132 has a dynamic of *pp*. Measure 133 has a dynamic of *pp*. Measure 134 has a dynamic of *pp*.

Violin: Measures 127-134. Measure 127 has a dynamic of *f*. Measure 128 has a dynamic of *pp*. Measure 129 has a dynamic of *pp*. Measure 130 has a dynamic of *pp*. Measure 131 has a dynamic of *pp*. Measure 132 has a dynamic of *pp*. Measure 133 has a dynamic of *pp*. Measure 134 has a dynamic of *pp*.

Viola: Measures 127-134. Measure 127 has a dynamic of *mf*. Measure 128 has a dynamic of *mf*. Measure 129 has a dynamic of *mf*. Measure 130 has a dynamic of *mf*. Measure 131 has a dynamic of *mf*. Measure 132 has a dynamic of *mf*. Measure 133 has a dynamic of *mf*. Measure 134 has a dynamic of *mf*.

MIDI: Measures 127-134. Measure 127 has a dynamic of *p*. Measure 128 has a dynamic of *p*. Measure 129 has a dynamic of *p*. Measure 130 has a dynamic of *p*. Measure 131 has a dynamic of *p*. Measure 132 has a dynamic of *p*. Measure 133 has a dynamic of *p*. Measure 134 has a dynamic of *p*.

Piano: Measures 127-134. Measure 127 has a dynamic of *p*. Measure 128 has a dynamic of *p*. Measure 129 has a dynamic of *p*. Measure 130 has a dynamic of *p*. Measure 131 has a dynamic of *p*. Measure 132 has a dynamic of *p*. Measure 133 has a dynamic of *p*. Measure 134 has a dynamic of *p*.

Annotations: Measure 127: Clarinet in Bb has a dynamic of *f*. Pedal has a dynamic of *f*. Violin has a dynamic of *f*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 128: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 129: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 130: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 131: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 132: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 133: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*. Measure 134: Clarinet in Bb has a dynamic of *pp*. Pedal has a dynamic of *pp*. Violin has a dynamic of *pp*. Viola has a dynamic of *mf*. MIDI has a dynamic of *p*. Piano has a dynamic of *p*.

Musical score for Toy Boat - Transposed Score, measures 135-142. The score includes parts for Cl. in Bb, Perc., Vln, Vc., MIDI, and Pno. The piano part features a triplet of eighth notes marked 'pp' starting at measure 137. A dashed line indicates a section starting at measure 137. The score is written in 4/4 time.

Toy Boat - TRANSPOSED SCORE

Cl. in B $\flat$  143 144 145 146 147 148

Ped. 143 144 145 146 147 148

Vln. *col legno battuto*  
*arco*  
*mp*  
*f*  
143 144 145 146 147 148

Vc. *col legno battuto*  
*arco*  
143 144 145 146 147 148

MIDI 143 144 145 146 147 148

Pno *allegro*  
(8)  
(Seal)  
143 144 145 146 147 148

keywork sounds, or some other noisy, rustling sounds

149 150 151 152 153

Cl. in Bb

Ped.

Vln

Vc.

MIDI

Pno

*pp*

*mf*

*f* 2

2

2

2

2

8

*allegro*

*barely audible, more key noise than tone*

(*rit.*)

Toy Boat - TRANSPOSED SCORE

154 gradually add atr + tone

155

156

157

158

Cl. in Bb

Ped.

Vln

Vc.

MIDI

Pno

8)

Off *g<sup>ua</sup>* *b<sup>e</sup>.*

157

158

ord.

arco

turns off

*f*

*f*

*f*

*p*

OVP arco

gliss.

Musical score for Toy Boat - Transposed Score, measures 159-166. The score includes parts for Cl. in Bb, Ped., Vln, Vc., Pno, MIDI, and Rade In. It features various musical notations such as dynamics (*fp*, *f*, *mf*, *p*), articulation (accents, slurs), and performance instructions (*arco*, *8va*). The Cl. in Bb part includes a breath mark 'H' at measure 159. The Vln part starts with a forte (*fp*) dynamic and a slur. The Vc. part includes an *arco* instruction and dynamics of *mf* and *p*. The Pno part includes a piano (*p*) dynamic and a series of sixteenth notes starting at measure 163. The MIDI part shows a sequence of notes with a blue highlight at measure 165. The Rade In part includes a dynamic of *mf* and an *8va* instruction starting at measure 163.

Clarinet in Bb: 167, 168, 169, 170, 171, 172, 173, 174  
 Pedal: 167, 168, 169, 170, 171, 172, 173, 174  
 Violin: 167, 168, 169, 170, 171, 172, 173, 174  
 Viola: 167, 168, 169, 170, 171, 172, 173, 174  
 MIDI: 167, 168, 169, 170, 171, 172, 173, 174  
 Piano: 167, 168, 169, 170, 171, 172, 173, 174

Dynamics: *p*, *mf*, *p*, *mf*, *p*, *mf*, *p*, *mf*  
 Articulations: *acc.*, *acc.*, *acc.*, *acc.*, *acc.*, *acc.*, *acc.*, *acc.*  
 Performance markings: *mf*, *p*, *mf*, *p*, *mf*, *p*, *mf*, *p*

Musical score for Toy Boat - Transposed Score, measures 175-182. The score is arranged for the following instruments: Cl. in Bb, Perc., Vln, Vc., MIDI, and Pno. The score is written in 2/4 time and features a key signature of one sharp (F#). The music is characterized by a steady, rhythmic accompaniment in the piano and MIDI parts, with melodic lines in the woodwinds and strings. The score includes dynamic markings such as *p* (piano), *mf* (mezzo-forte), and *scen.* (scenariando). A dashed line is present between measures 177 and 178, indicating a section change or a specific performance instruction. The score is oriented vertically on the page.

This musical score page contains measures 183 through 190. The instruments are arranged as follows from top to bottom: Clarinet in Bb, Pedal, Violin, Viola, MIDI, and Piano. The Clarinet part features a melodic line with dynamics ranging from *mp* to *p*. The Violin and Viola parts provide harmonic support with various articulations and dynamics, including a forte (*f*) section. The MIDI part consists of a steady bass line. The Piano part features a complex rhythmic accompaniment with many sixteenth notes. Measure 189 includes a 'Guitar' marking. Measure 190 contains a double bar line and a '(320)' marking.

The image displays a musical score for the piece "Toy Boat - Transposed Score", covering measures 191 through 198. The score is arranged in a system with six staves:

- Cl. in Bb:** Clarinet in B-flat. The melody begins in measure 191 with a first ending bracket (I) and continues through measure 198. Dynamics include *f* (forte).
- Perc.** Percussion. The part consists of a steady, rhythmic accompaniment throughout the measures.
- Vln:** Violin. The part features a melodic line with dynamics *f* and *mf* (mezzo-forte).
- Vc.** Viola. The part features a melodic line with dynamics *f* and *mf*.
- MIDI:** MIDI. This staff shows a sequence of notes corresponding to the MIDI data, with a "Guitar" label and a dashed line indicating a section from measure 191 to 198.
- Pno:** Piano. The part provides a harmonic accompaniment with a dynamic marking of *f*.

The score is written in a key signature of two sharps (F# and C#) and a common time signature (C). Measure numbers 191, 192, 193, 194, 195, 196, 197, and 198 are clearly marked below the staves.

Toy Boat - TRANSPOSED SCORE

The image displays a musical score for the piece "Toy Boat" in a transposed key. The score is arranged in a system with six staves, labeled from top to bottom as Cl. in Bb, Ped., Vln, Vc., MIDI, and Pno. The music spans measures 199 to 205. The Clarinet in Bb part features a melodic line with various ornaments and slurs, including a triplet in measure 200. The Pedal part consists of sustained notes. The Violin and Viola parts have similar melodic lines with slurs and ornaments. The MIDI part shows a sequence of notes with colored markers (green, blue, purple) above them. The Piano part includes chords and a melodic line starting in measure 203, marked with *mf* and *rit.* dynamics. Measure numbers 199, 200, 201, 202, 203, 204, and 205 are clearly indicated at the end of each staff.

Cl. in Bb 206 207 208 209 210 211 212  
*p*  
 Ped.  
 Vln. *mp* *p* *mp* *p* *mp* *p* *mp* *p*  
 Ord. MSP  
 Vc. *mp* *p* *mp* *p* *mp* *p* *mp* *p*  
 Fade Out 206  
 MIDI 207 208 209 210 211 212  
 OFF  
 210 *g<sup>tr</sup>*  
*b<sub>2</sub>*  
 Pno. *g<sup>tr</sup>* *p* *g<sup>tr</sup>* *p* *g<sup>tr</sup>* *p* *g<sup>tr</sup>* *p*  
 (200)



The musical score is arranged in a system with six staves. From top to bottom, the staves are labeled: Cl. in Bb, Ped., Vln, Vc., MIDI, and Pno. The music is in 4/4 time. Measure 221 features a clarinet melody with a forte (*sfz*) dynamic and a slur over two notes. The violin and viola parts also have a forte (*sfz*) dynamic and a slur. The piano part has a piano (*p*) dynamic. Measure 222 shows the clarinet and piano parts continuing with a piano (*p*) dynamic. The violin and viola parts have a piano (*p*) dynamic. Measure 223 continues the piano part with a piano (*p*) dynamic. The MIDI part has a single note in measure 221. The percussion part has a single note in measure 221.



Musical score for Toy Boat - Transposed Score, measures 229-234. The score includes parts for Clarinet in Bb, Pedal, Violin, Viola, MIDI, and Piano. The key signature is one sharp (F#) and the time signature is 4/4. The score features various musical notations including triplets, accents, and dynamic markings such as *mf*, *p*, *f*, and *sfz*. A *scen.* (scene) marking is present at the beginning of measure 229 and the end of measure 234. The MIDI part is represented by a series of rhythmic stems with flags.

Score for Toy Boat - Transposed Score, page 37. The score is in 8/8 time and includes parts for Clarinet in Bb, Pedal, Violin, Viola, MIDI, and Piano.

**Clarinet in Bb:** Measures 235-241. Starts with a half note G4 (marked *p*), followed by a half note A4 (marked *p*). Measures 237-238 feature a half note B4 (marked *f*) with a dynamic hairpin. Measure 241 features a half note C5 (marked *f*) with a dynamic hairpin.

**Pedal:** Measures 235-241. Features a half note G4 (marked *p*), followed by a half note A4 (marked *p*). Measures 237-238 feature a half note B4 (marked *f*) with a dynamic hairpin. Measure 241 features a half note C5 (marked *f*) with a dynamic hairpin.

**Violin:** Measures 235-241. Starts with a half note G4 (marked *p*), followed by a half note A4 (marked *p*). Measures 237-238 feature a half note B4 (marked *f*) with a dynamic hairpin. Measure 241 features a half note C5 (marked *f*) with a dynamic hairpin. Includes a *gliss.* marking in measure 237.

**Viola:** Measures 235-241. Starts with a half note G4 (marked *p*), followed by a half note A4 (marked *p*). Measures 237-238 feature a half note B4 (marked *f*) with a dynamic hairpin. Measure 241 features a half note C5 (marked *f*) with a dynamic hairpin. Includes a *gliss.* marking in measure 237.

**MIDI:** Measures 235-241. Features a half note G4 (marked *p*), followed by a half note A4 (marked *p*). Measures 237-238 feature a half note B4 (marked *f*) with a dynamic hairpin. Measure 241 features a half note C5 (marked *f*) with a dynamic hairpin.

**Piano:** Measures 235-241. Features a half note G4 (marked *f*), followed by a half note A4 (marked *p*). Measures 237-238 feature a half note B4 (marked *f*) with a dynamic hairpin. Measure 241 features a half note C5 (marked *f*) with a dynamic hairpin. Includes a *gliss.* marking in measure 237.

Measures 235, 236, 237, 238, 239, 240, and 241 are indicated below the staves.



The image displays a page from a musical score for the piece "Toy Boat - Transposed Score". The page is numbered 39. The score is arranged in a system with six staves: Cl. in Bb, Ped., Vln, Vc., MIDI, and Pno. The music is written in 8/8 time. The score spans measures 247 to 251. Key performance instructions include dynamics such as *f*, *p*, and *ff*, and specific markings like "ord.", "Fade In", and "Off". The Cl. in Bb part features a melodic line with slurs and accents. The Vln and Vc. parts provide harmonic support with various articulations. The MIDI and Pno parts are primarily accompanimental, with the Pno part including a "Reo" marking. Measure numbers 247, 248, 249, 250, and 251 are clearly indicated at the end of their respective measures.



The musical score is arranged in a system with five staves. From top to bottom, the staves are: Clarinet in Bb (Cl. in Bb), Flute (Fl.), Violin (Vln), Viola (Vc.), and Piano (Pno). The time signature is 3/8. The key signature has one flat (Bb). The score covers measures 260 to 265. The Flute part has a dynamic marking of *mp* and the instruction "col legno battuto" with a *non vib.* marking. The Piano part features a complex rhythmic accompaniment with various rests and notes. The MIDI part shows a sequence of notes with some colored markers (purple, blue, green) at measures 263, 264, and 265. The Clarinet part has a few notes at the beginning of the system.

The image shows a page of a musical score for the piece "Toy Boat - Transposed Score", measures 266 through 271. The score is arranged in a system with six staves:

- Cl. in Bb:** Clarinet in B-flat, treble clef, 8/8 time signature. It features melodic lines with accents and dynamic markings like *pp*.
- Perc.** Percussion, 8/8 time signature. It shows rhythmic patterns with various note values.
- Vln:** Violin, treble clef, 8/8 time signature. It plays a melodic line with accents.
- Vc.:** Viola, treble clef, 8/8 time signature. It plays a melodic line with a long note and a slur. A bracket below the staff indicates "(non vib.)" (non vibrato).
- MIDI:** MIDI controller, treble clef, 8/8 time signature. It contains colored dots (yellow, orange, red, purple, blue, green) representing MIDI notes.
- Pno:** Piano, bass clef, 8/8 time signature. It provides a rhythmic accompaniment.

Measure numbers 266, 267, 268, 269, 270, and 271 are indicated at the bottom of each staff. The time signature is 8/8 throughout. The key signature has one sharp (F#).

The musical score is for a 2+2+3+3 ensemble. It includes parts for Clarinet in Bb, Pedal, Violin, Viola, MIDI, and Piano. The score is in 4/4 time and spans measures 272 to 277. The key signature has one flat (Bb).

**Clarinet in Bb:** Measures 272-277. Dynamics include *mf*, *f*, and *ff*. Features a triplet in measure 273 and a triplet in measure 277.

**Pedal:** Measures 272-277. Dynamics include *mf* and *f*. Features a triplet in measure 273 and a triplet in measure 277.


**Violin:** Measures 272-277. Dynamics include *f* and *ff*. Features a triplet in measure 277.

**Viola:** Measures 272-277. Dynamics include *p*, *f*, and *ff*. Features a triplet in measure 277.

**MIDI:** Measures 272-277. Includes a note in measure 273 labeled "On".

**Piano:** Measures 272-277. Dynamics include *ff*. Features a triplet in measure 277.

Measure 277 includes the instruction "Clear 8va" and "ATCO 3".

Cl. in Bb 278 279  281 282

Wait until the Toy Boat appears

ff *p*

Violin 278 279 281 282

Wait until the Toy Boat appears

ff *p*

Viola 278 279 281 282

Wait until the Toy Boat appears

ff *p*

Vc. 278 279 281 282

Wait until the Toy Boat appears

ff *p*

gtr. On 281 282

ff

MIDI 278 279 281 282

Wait until the Toy Boat appears

Pno 278 279 281 282

Wait until the Toy Boat appears

ff *ff*

The musical score is arranged in a system with six staves. From top to bottom, the staves are labeled: Cl in Bb, Ped., Vln, Vc., MIDI, and Pno. The music is in 4/4 time. Measures 283-288 are shown. The Cl in Bb part starts with a forte (f) dynamic and includes a piano (p) dynamic in a box at measure 286. The Vln and Vc. parts also start with f and include sfz (sforzando) markings. The MIDI part includes a Clarinet (Clair) section starting at measure 285 and an Onychium (On) section starting at measure 288. The Pno part includes a piano (p) dynamic and a 'scen.' (scenari) instruction. The score uses various musical notations including accents (>), slurs, and triplets.

2

289 290 291 292 293

Cl. in Bb

Perc.

Vln

Vc.

MIDI

Pno

(Seal)

(Seal)

On

*f*

*sfz*

*sfz*

*sfz*

*sfz*

Cl. in Bb

295 296 297 298 299 300 R

Ped.

Vln

Vc.

MIDI

295 296 297 298 299 300

Pno

*mp*

*f*

Orgn

*sfz* *>*

*sfz* *>*

*sfz* *>*

Musical score for Toy Boat - Transposed Score, measures 302-307. The score includes parts for Clarinet in Bb, Percussion, Violin, Viola, MIDI, and Piano. A rehearsal mark 'S' is present at measure 307.

**Clarinet in Bb:** Measures 302-307. Measure 305 features a sharp sign and a dynamic marking of *sfz*. Measure 307 features a sharp sign, a dynamic marking of *sfz*, and a rehearsal mark 'S' in a box.

**Percussion:** Measures 302-307. Measure 305 features a dynamic marking of *sfz*.

**Violin:** Measures 302-307. Measure 305 features a dynamic marking of *sfz*.

**Viola:** Measures 302-307. Measure 305 features a dynamic marking of *sfz*.

**MIDI:** Measures 302-307. Measure 307 features a dynamic marking of *f* and an 'On' marking.

**Piano:** Measures 302-307. Measure 302 features a dynamic marking of *p*. Measure 307 features a dynamic marking of *f*. A *mp* marking is present at the bottom of the page.

Musical score for Toy Boat - Transposed Score, page 49. The score is for five instruments: Cl. in Bb, Ped., Vln, Vc., and Pno. It covers measures 309 to 316. The Cl. in Bb part features a melodic line with dynamic markings like *sfz* and accents. The Ped. part is mostly rests. The Vln and Vc. parts play a rhythmic accompaniment with *sfz* markings. The Pno part provides harmonic support with chords and dynamics like *p* and *f*. Measure 314 includes an "On" marking for the Cl. in Bb and Vc. parts, and "OFF" markings for the Vln and Vc. parts. Measure 316 includes "On" markings for the Vln and Vc. parts.

This musical score page covers measures 317 to 321. It features six staves: Cl. in Bb, Ped., Vln., Vc., MIDI, and Pno. The Cl. in Bb staff has a trill (T) starting at measure 317. The Vln. and Vc. staves show complex melodic lines with triplets and accents. The MIDI staff includes a 'Clear' instruction at measure 317 and an 'On' instruction at measure 319. The Pno. staff features a 'Forearm Clusters - exact pitches ad lib.' instruction, with a triplet of clusters in measure 320. Measure numbers 317, 319, 320, and 321 are marked at the beginning of their respective measures.

Violin I (Vln) *ff*

Violin II (Vln) *ff*

Viola (Vc.) *ff*

Cello (C.) *ff*

Double Bass (Cb.) *ff*

Piano (Pno) *mf*

MIDI

322 323 324 325 326 327

*or some other quasi-classical arpeggio trope* *gwa*

324 *gwa* *Off*

326 *Off*

327 *Off*