



# DIGITAL PORTFOLIO

Roel Westrik



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MSc. Architecture, TU Delft

[roelwestrik.nl](http://roelwestrik.nl)

[roelwestrik@gmail.com](mailto:roelwestrik@gmail.com)

+31 6 13 70 56 12

Celsiusstraat 38A2  
3112 VB Schiedam



# Portfolio

This portfolio is a showcase of my work as a student architect, programmer and musician.

I have studied classical music and composition since I was 12, and started my bachelor architecture at the TU Delft in 2012. Over the years I have learned how all forms of art and design are not separated, but rather, are connected. This portfolio displays my skills and capabilities, based on my understanding of the connection of the fields of architecture, music and other creative fields.

First, you will find the design of my graduation studio project, Synesthesia, in the chapter Architecture. In the second chapter, Programming, you will find the research leading up to my design, focussing on computational ideas regarding music and form. In the third chapter, Music, you will read about my experience as a musician and composer.

I hope that by the end of this portfolio, you, the reader, will understand my views on the shared connection between architecture, music and all other fields of research and art.



# ch.1: (Architecture) f

Graduation Project MSc. Architecture, TU Delft, Studio Hyperbody;

Tutors: H.H. Bier  
F. Adema  
S. Mostafavi

2018-2019



# Synesthesia

Synesthesia is my design for the master track Architecture, the conclusion to my education at the Faculty of Architecture, TU Delft. My goal was to design an algorithm which would create an architectural design, where form and geometry are generated from music.

The greatest challenge I faced during my 1,5 year long research was to give meaning to my research in the fields of music and architecture. As a result, music would now function as a quantifier to any architectural input, like acoustics or lighting, instead of generating form from 'nothingness'.

This chapter deals with the material part of the design - how the design is located in the city, and its functionality and production process. The second chapter, programming, deals with the research of the same project.



# Vienna

Vienna has, for centuries, been the center of Western classical music, but has over the years become more and more divided.

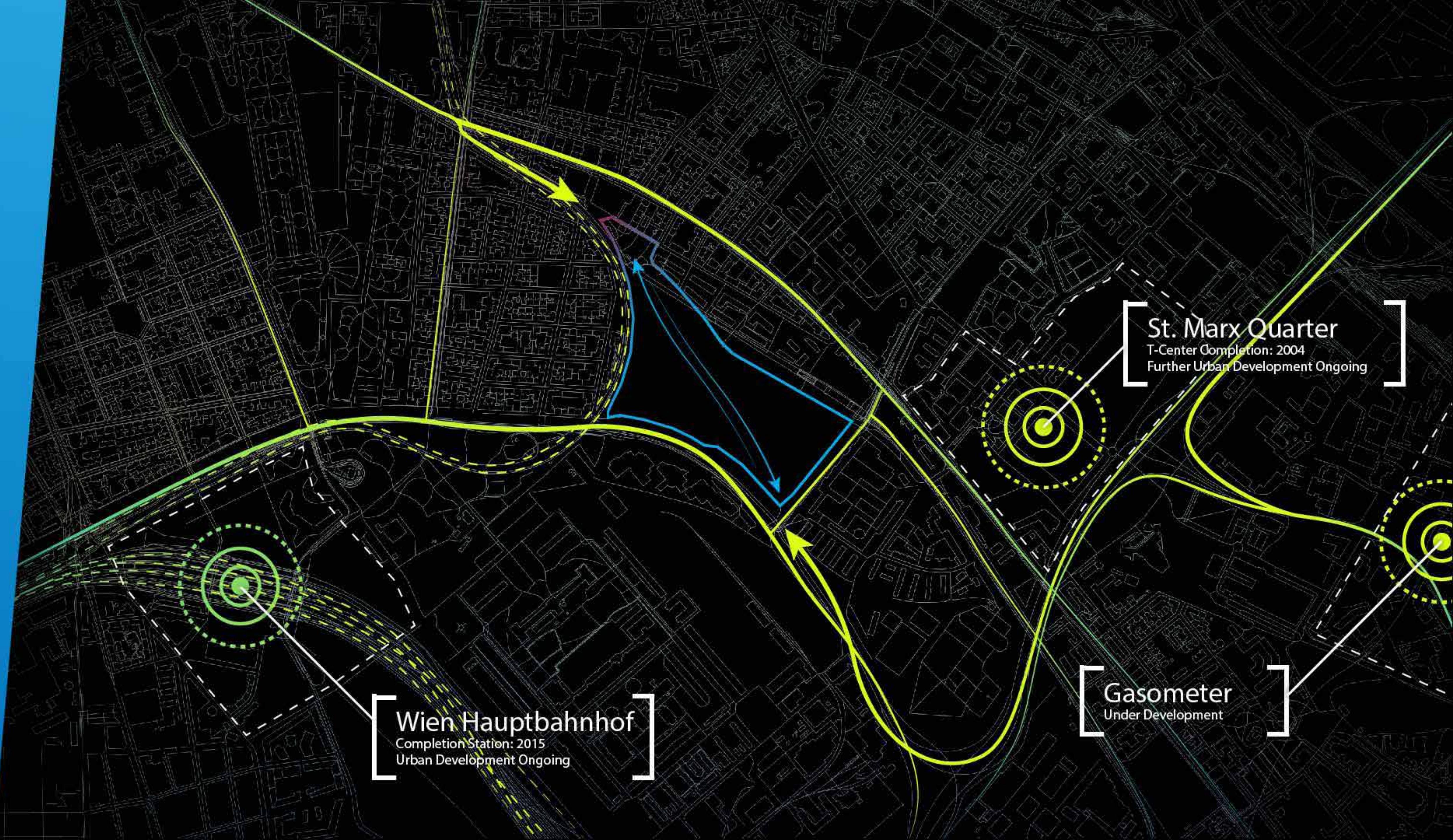
The classical center of the city has become more separated from the outer parts of the city, where the youth of Vienna has transformed many abandoned buildings to concert venues.

The goal of my design is to reconnect these separated groups - drawing tourists out of the overcrowded city center, and bringing the youth back into the realm of classical music.

## Mahnmal

Aspangbahnhof für die Opfer der Deportation

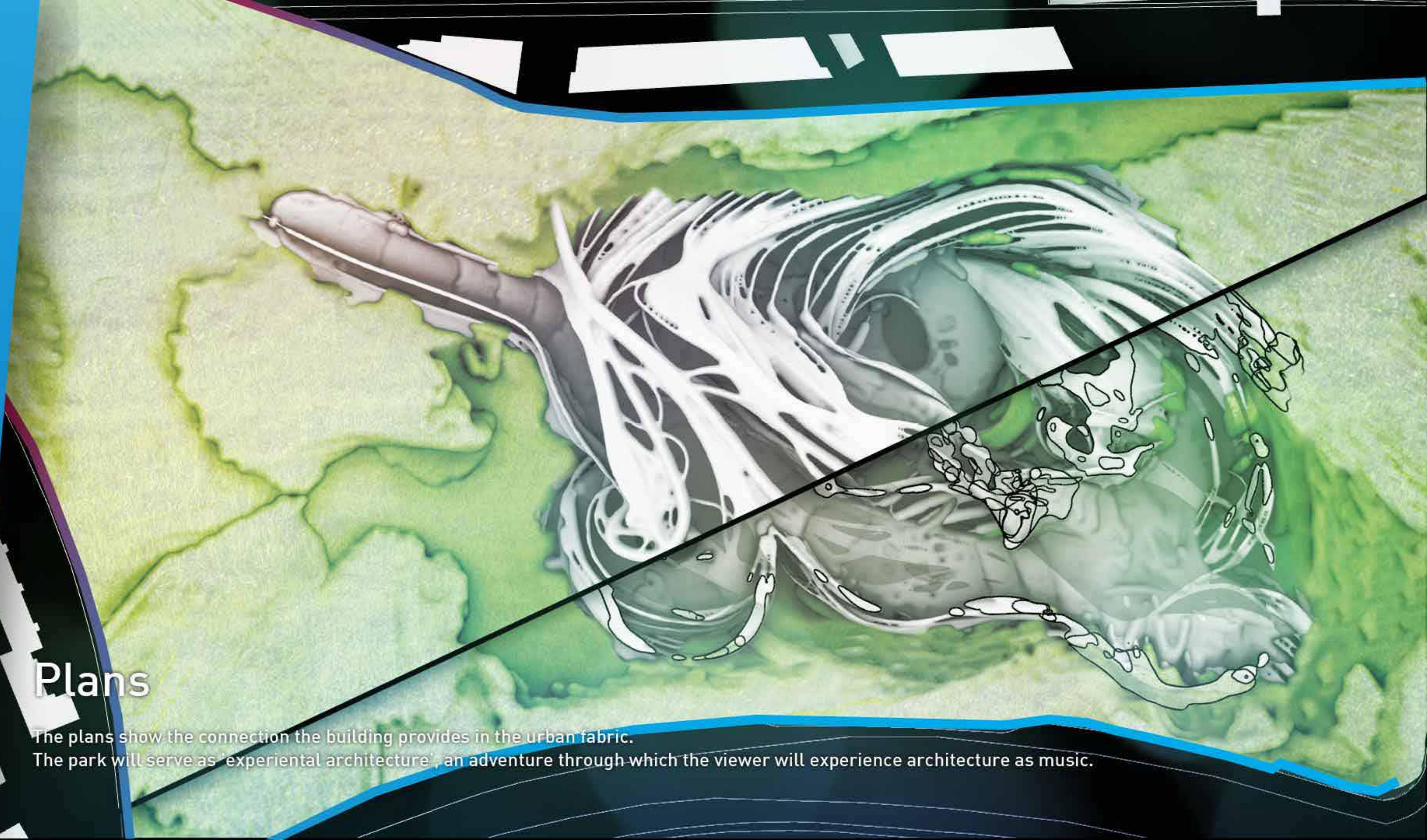
## Mozart Denkmal

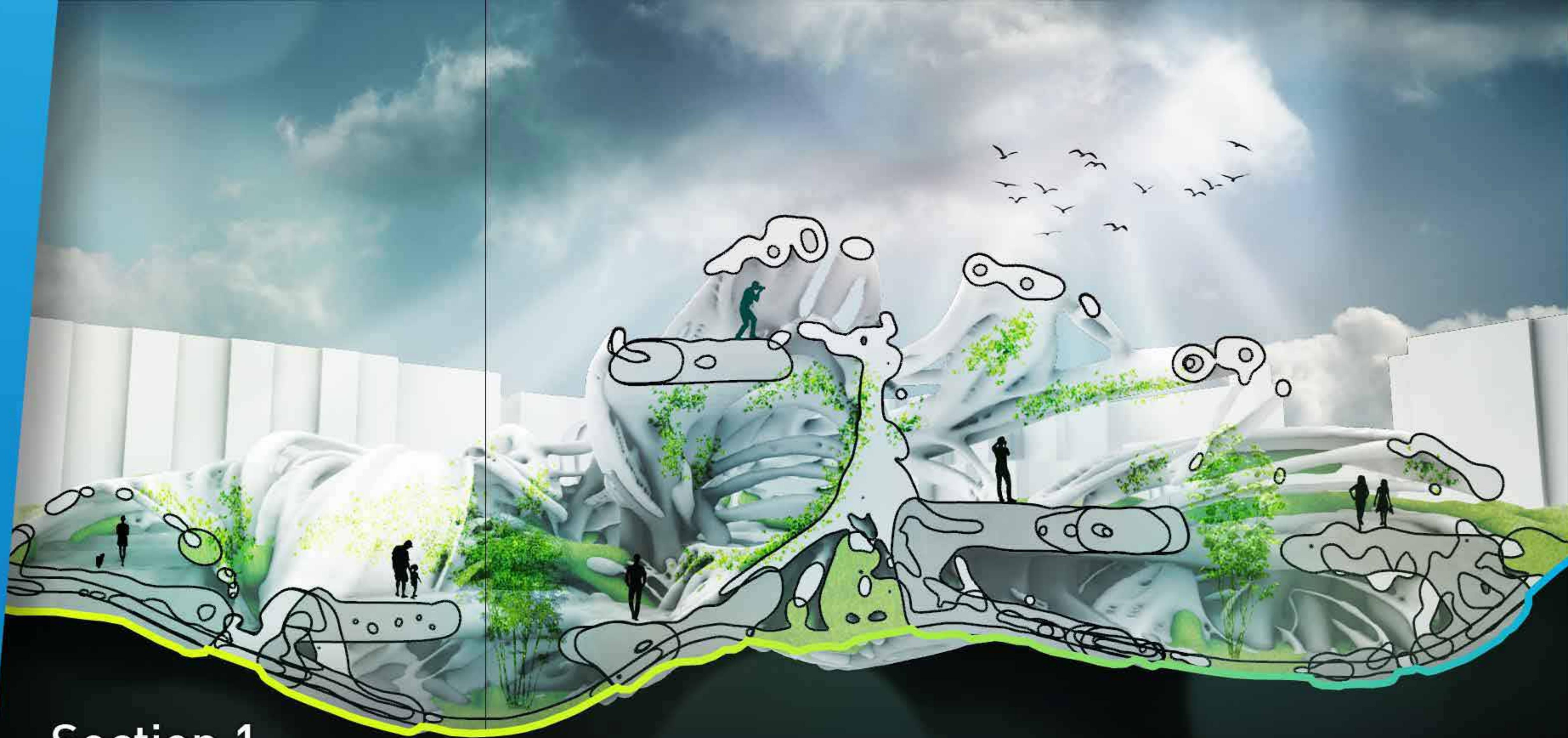


## Plans

The plans show the connection the building provides in the urban fabric.

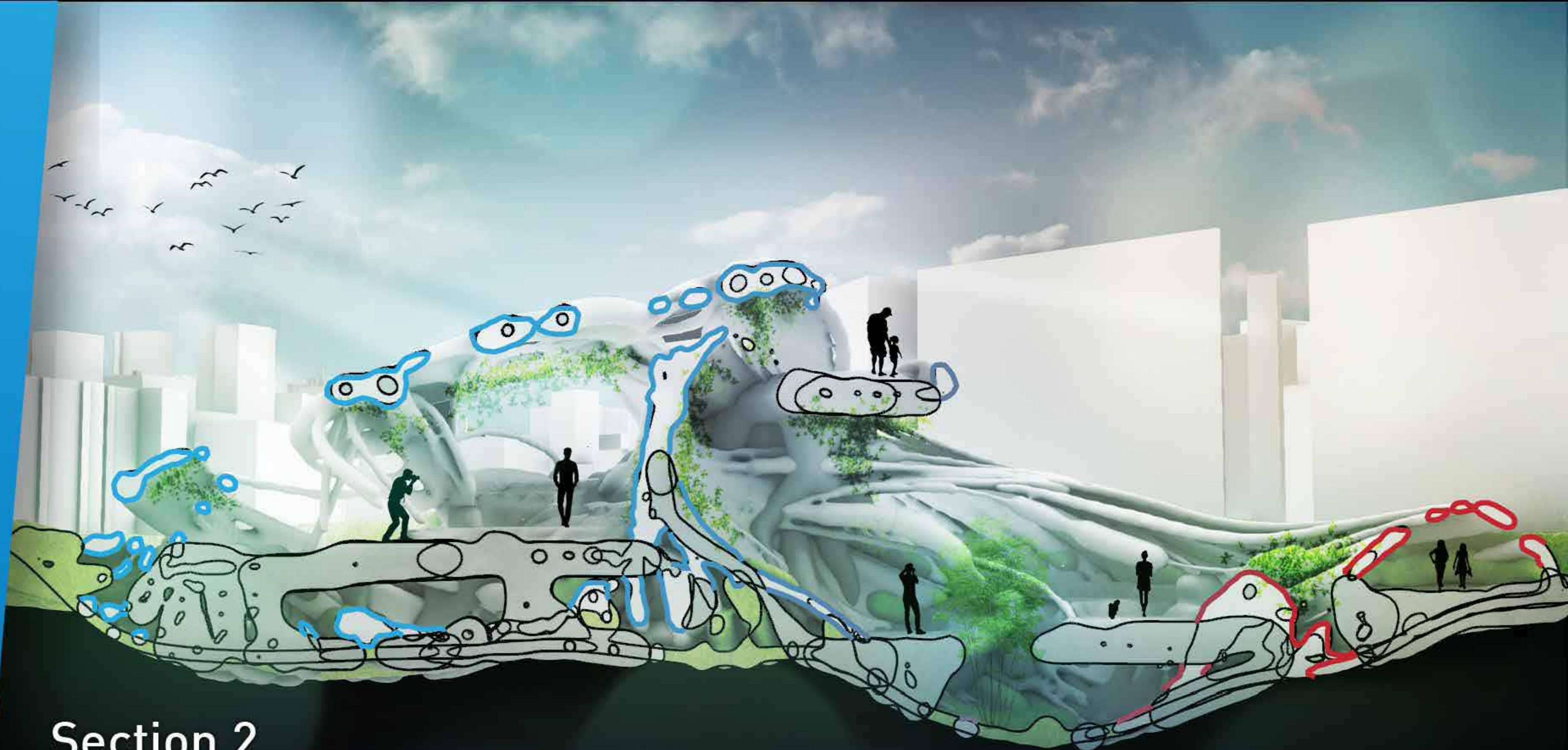
The park will serve as 'experiential architecture', an adventure through which the viewer will experience architecture as music.





## Section 1

The sections of the building show the nature of the the design - a moze-like park, which invites the visitors to explore, and experience the architecture, which is constantly changing, and provided new experiences around every corner.



## Section 2

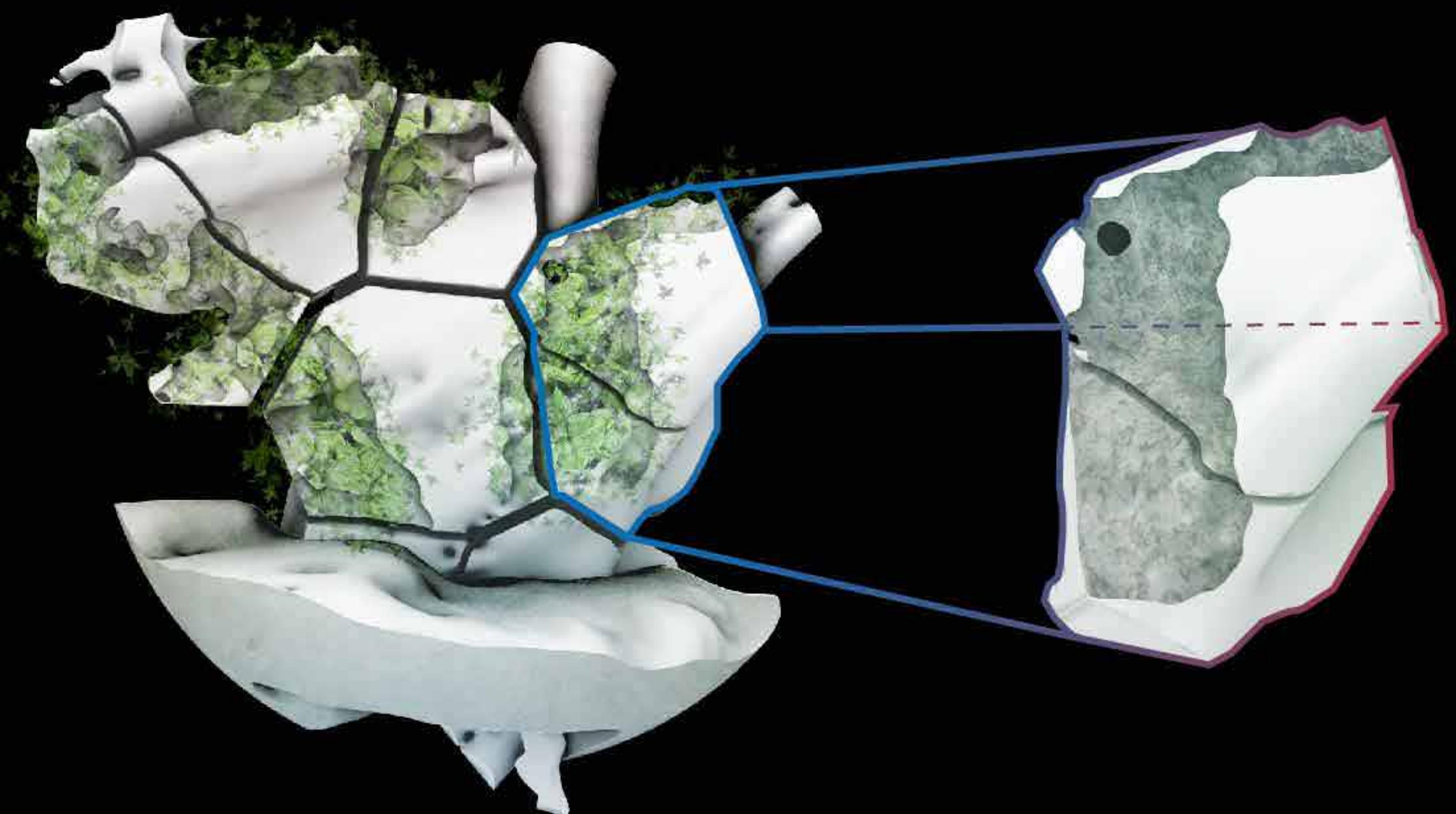
The material of the design provides not only a tangible experience (touch and texture of the building), but also an acoustic experience, loudening or dampening city sounds in different parts of the building. Absence of material will provide a organic play of lighting in the building.

# Materiality

The material of the building provides not only the geometry of the building, but also acoustic and tectonic experience of the design.

Acoustic pockets can make the building more quiet by trapping soundwaves, or, by reflecting soundwaves, make the building louder. A gradient throughout the entire building will provide the visitor with a constantly changing experience.

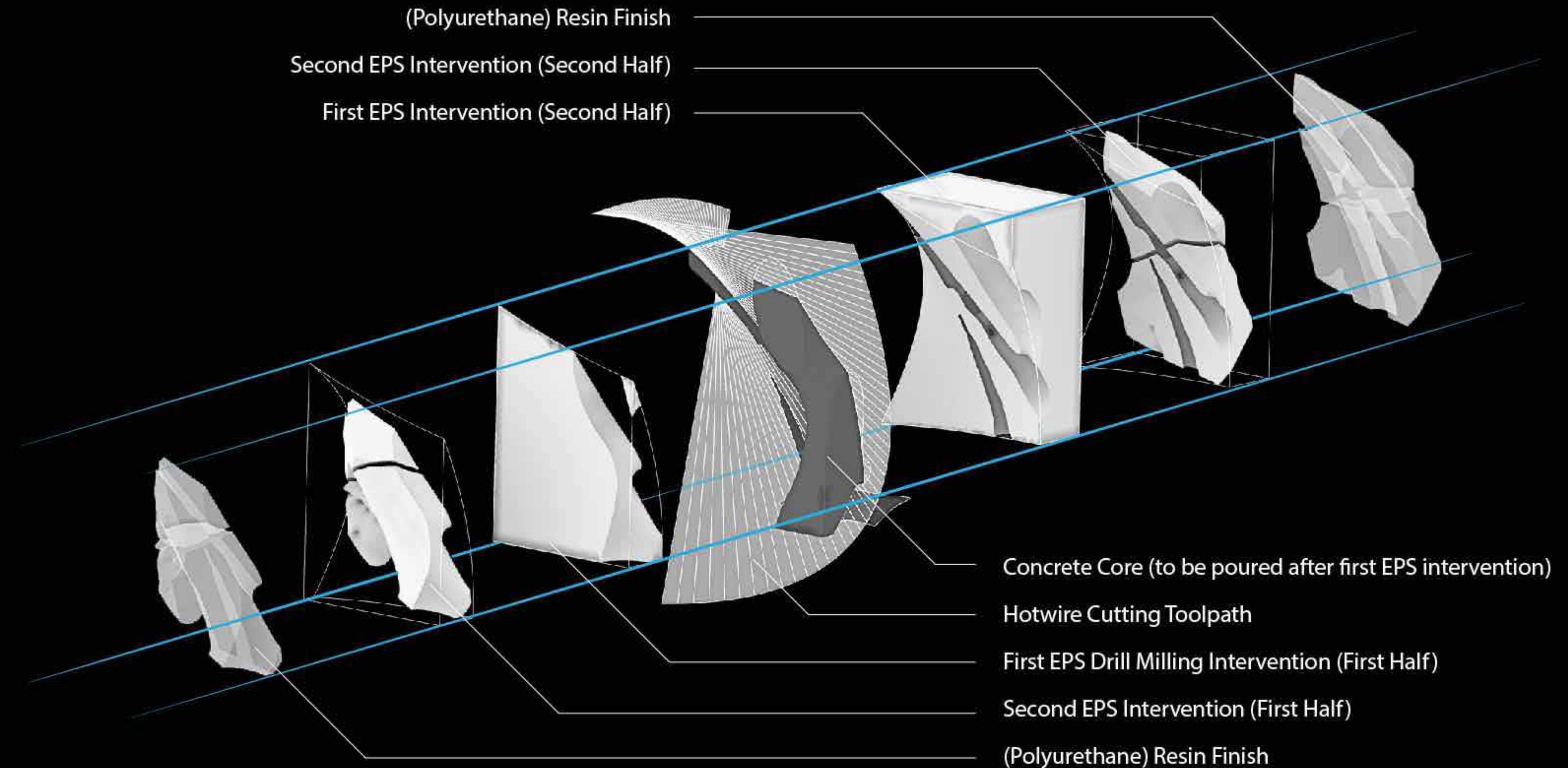
By designing where the material will be more or less porous, we can provide the building with a path through which flora can grow - largely eliminating the need for garden maintenance.

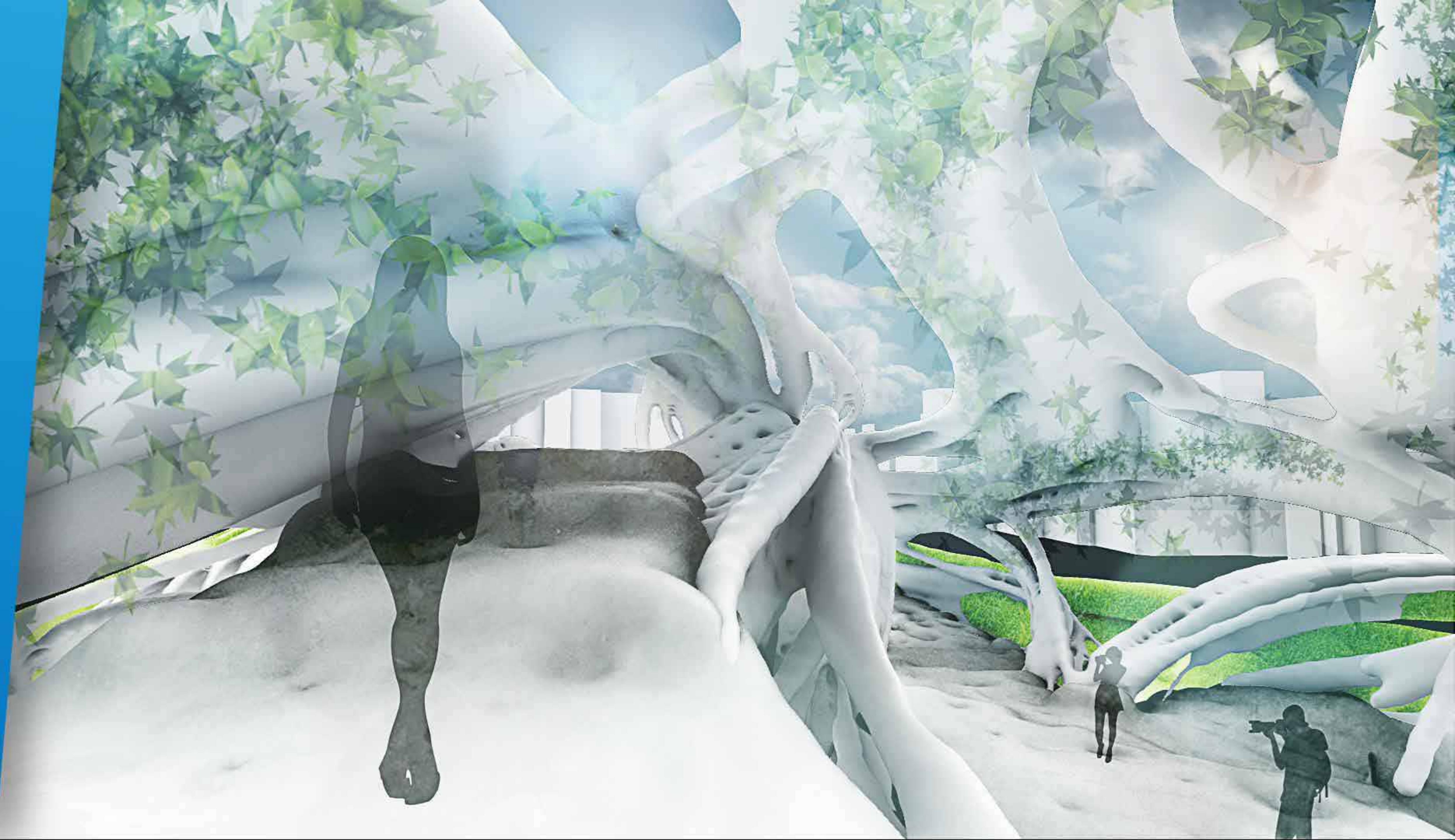


# Production

Organic form requires clever use of material and design of the production process. I designed a simple system in which blocks of EPS can be milled in two stages. The first stage provides a mould in which concrete support can be poured. After a second round of EPS milling, the final shape of every EPS block emerges.









# Synesthesia

The research preceding the design deals largely with color (read more about this in the second chapter, 'programming'). However, color was largely absent in the first versions of the design.

LED lights will provide the building with a new layer of experience during evening hours or winter days. Not only do the LED's provide the building with a new experience, but they will also draw more visitors to the building as the building will start to 'glow' from the outside on dark days.





```
98
99
100 for (var j=0; j<=11; j++){
101   TextLocX[j]=(MainRadius/2+offset*2)*sin((j*TWO_PI)/12);
102   TextLocY[j]=(MainRadius/2+offset*2)*-cos((j*TWO_PI)/12);
103 }
104
105
106
107 function mousePressed() {
108   if (testON == 0){
109     testON = 1;
110
111     mic = new p5.AudioIn();
112     mic.start();
113
114     fft = new p5.FFT();
115     fft.setInput(mic);
116
117     if (getAudioContext().state !== 'running'){
118       getAudioContext().resume();
119     }
120
121   }
122
123   //-----FFT ANALYSIS-----
124   var spectrum = fft.analyze();
125   micLevel = mic.getLevel();
126   micLevel = pow(micLevel, 1/MicSensitivity);
127   for (var i=0; i<11; i++){
128     for (var j=0; j<NumberOctaves; j++){
129       Amplitude[i] = Amplitude[i] + fft.getEnergy(Octave[i]*pow(2, j));
130     }
131   }
132   Amplitude[0] = Amplitude[0] / NumberOctaves;
133   Amplitude[1] = micLevel * Amplitude[0];
134
135   //-----BOUNDS TO POWER REMAPPER-----
136   var maxValue = Amplitude[0];
137   var maxIndex = 0;
138   amplitudesSum = Amplitude.reduce(getSum);
139
140   for (var i=0, i<11; i++) {
141     if (Amplitude[i] > maxValue) {
142       maxValue = Amplitude[i];
143       maxIndex = i;
144     }
145   }
146
147   if (amplitudeSum > micCutoff){
148     for (var i=0; i<11; i++){
149       AmplitudeMap[i]=map(Amplitude[i], 0, maxValue, 0, 1);
150       AmplitudeMap[i]=pow(AmplitudeMap[i], PeakSensitivity);
151       AmplitudeMap[i]=map(AmplitudeMap[i], 0, 1, 0, maxValue);
152     }
153   } else {
154     for (var i=0; i<11; i++){
155       AmplitudeMap[i]=map(Amplitude[i], 0, 1, 0, maxValue);
156     }
157   }
158
159   //-----EQUATED AVERAGES OF ALL PITCHES, RETIRE-----
160   PointerPosX = 0;
161   PointerPosY = 0;
```

## ch.2: (Programming){

Visualizing Music as an Expression of Color using Computational Mathematics;



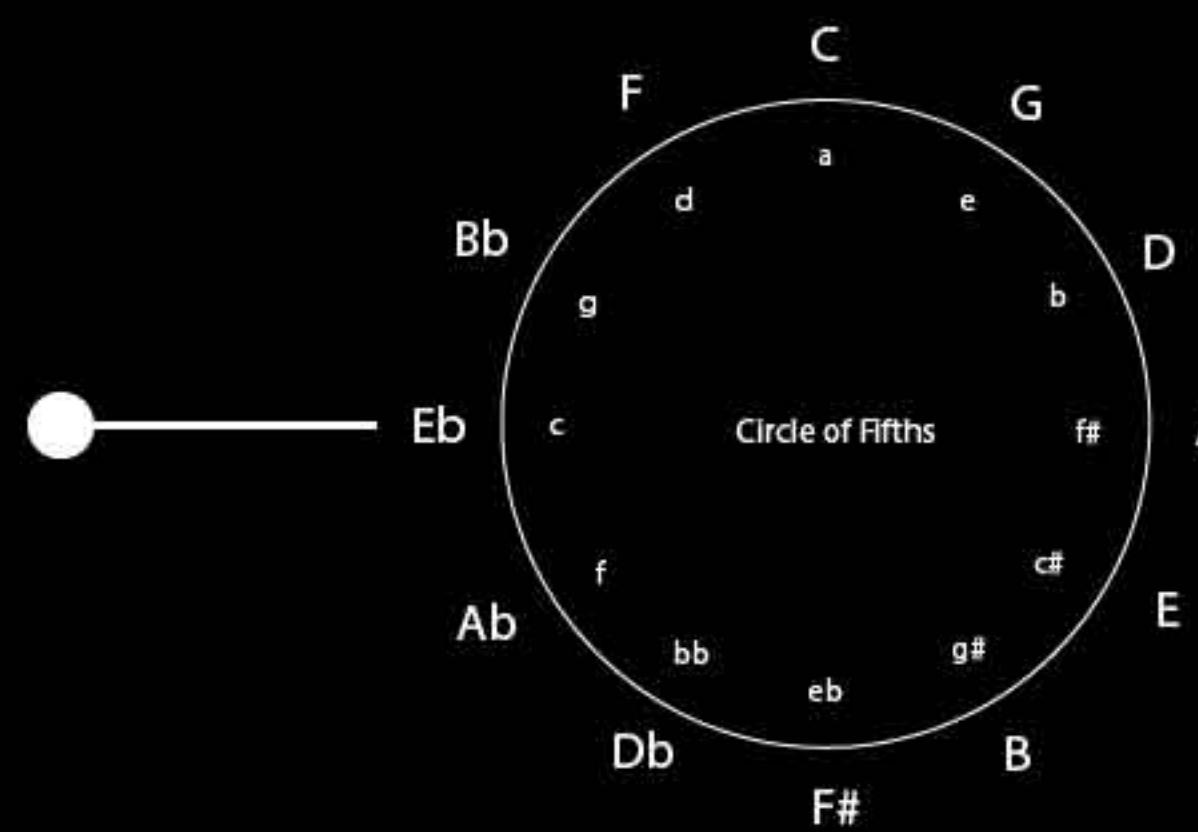
# Synesthesia

The research of my master thesis dealt with color as a basis for translating music into geometry.

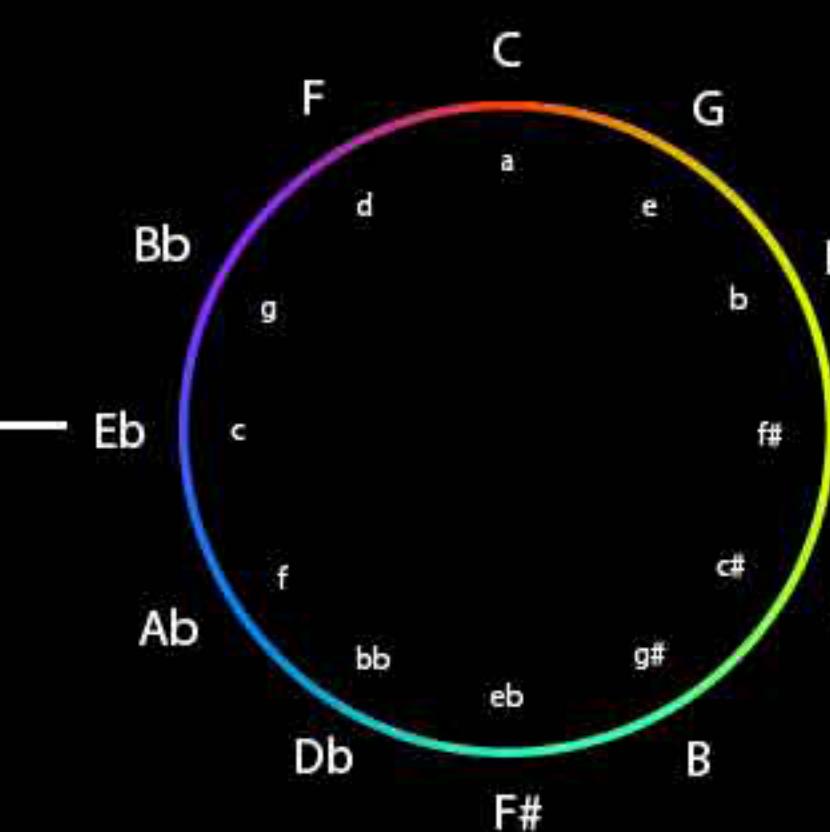
After laying a foundation of representing music as simple colors, I did several studies on geometry and moving sculptures, to find behaviors and artworks which would create a visual representation of music.

This chapter will showcase several of these studies, after a short explanation of the concept of harmonic coloring.

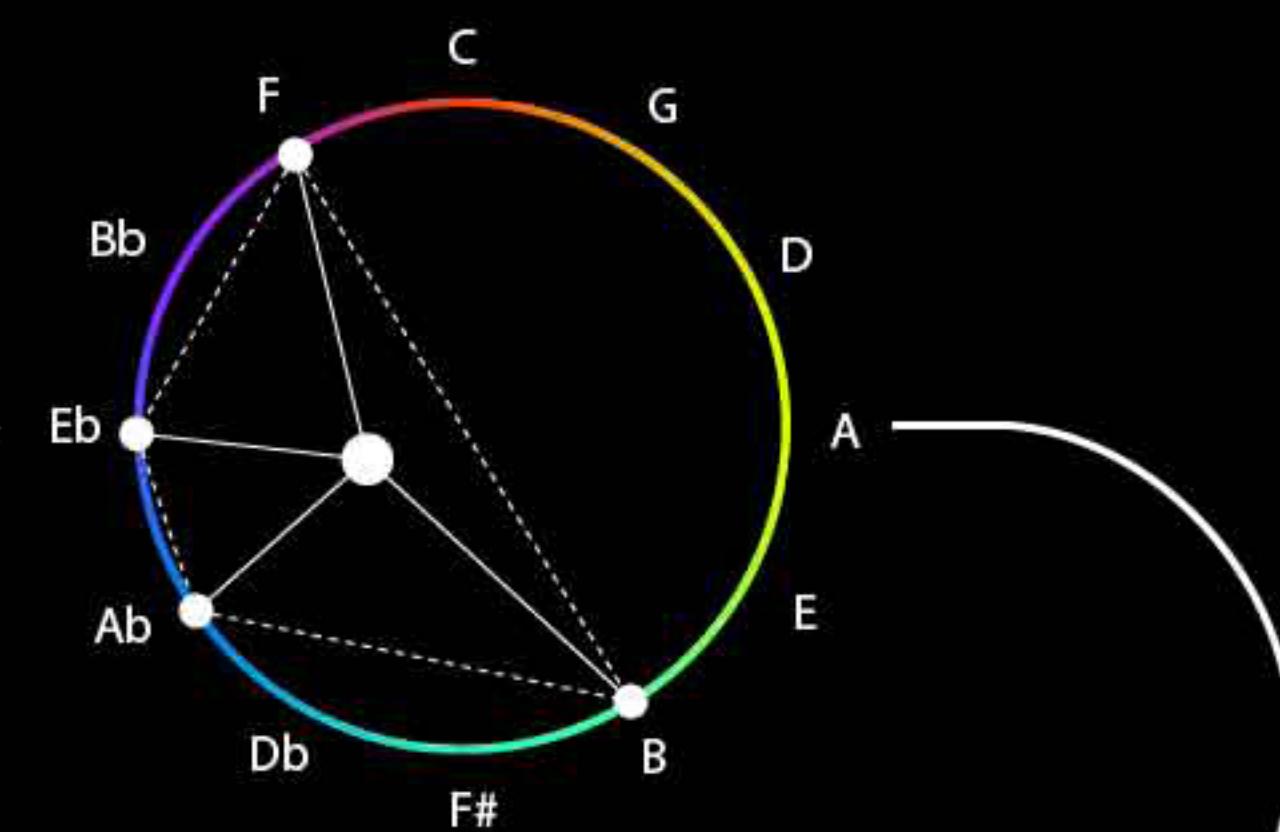




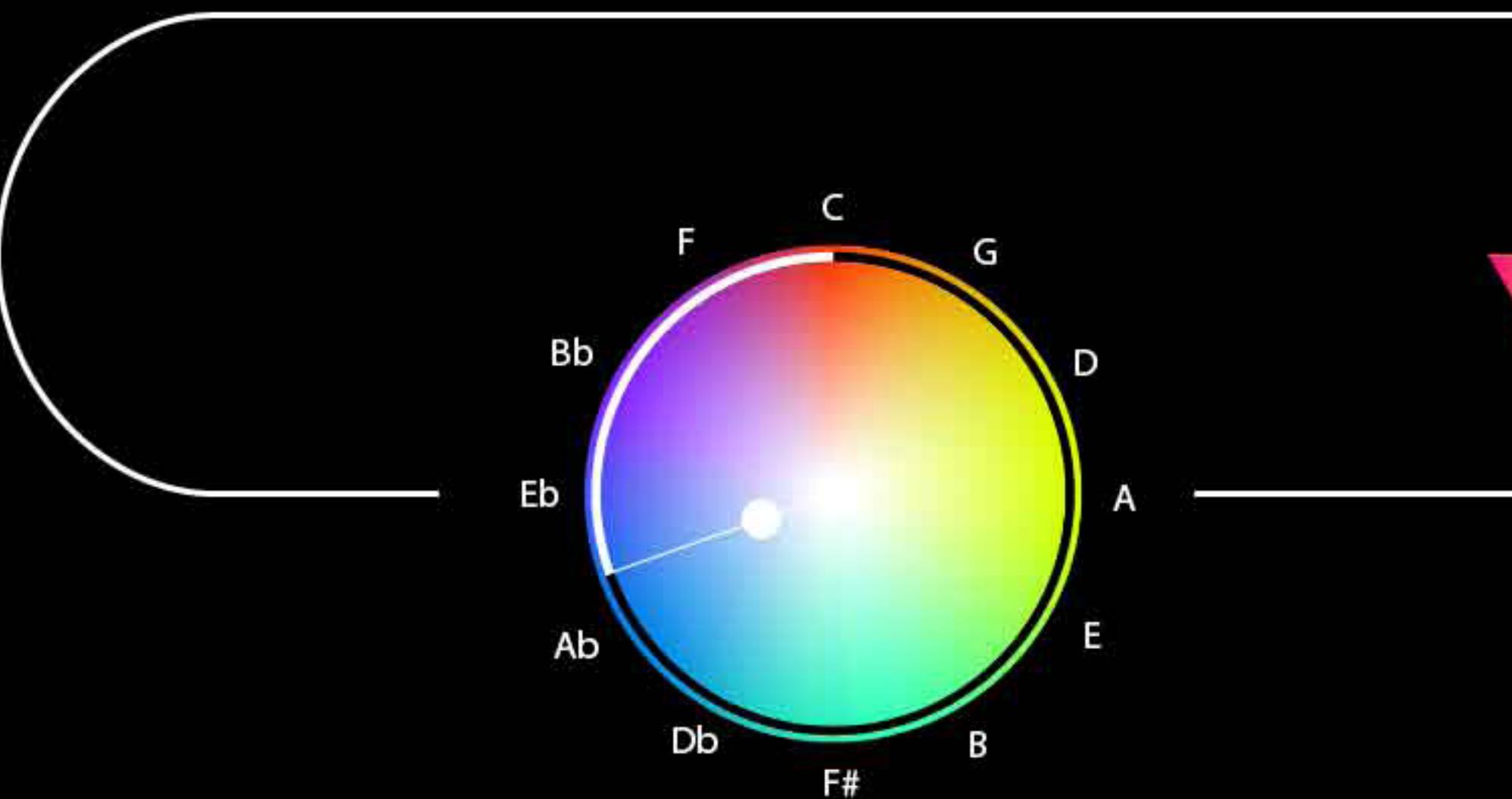
01. Circle of Fifths



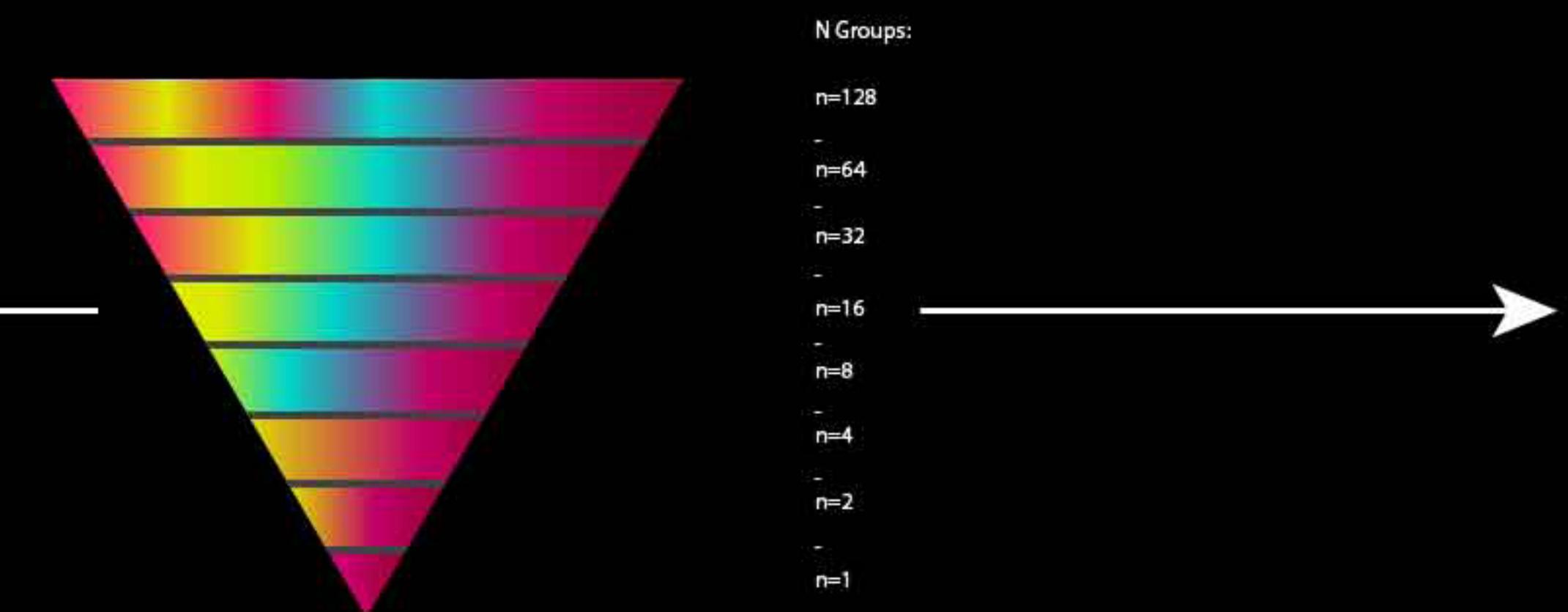
02. Map Hue to Circle



03. Place and Average Input



04. Map Saturation to Distance Center



05. Average groups of notes to find key

# Harmonic Coloring

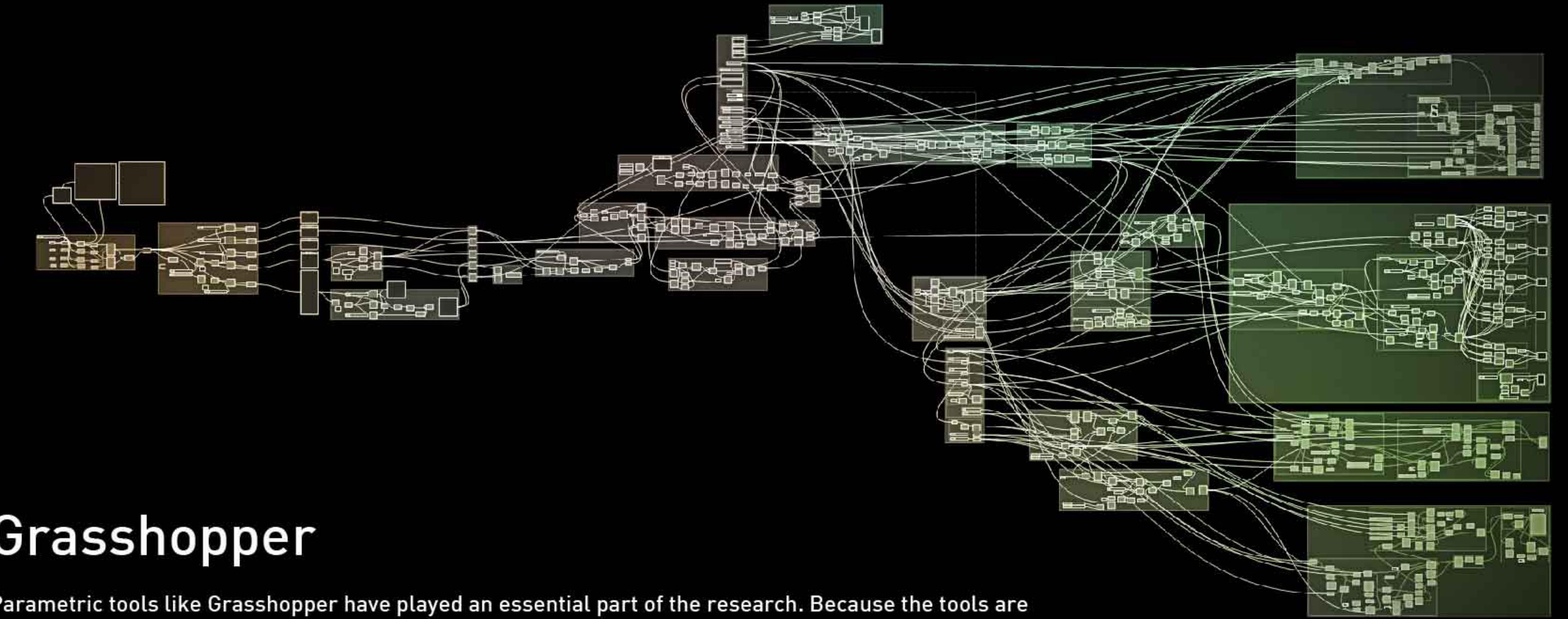
The foundation of my master thesis is what I call harmonic coloring. A simple algorithm which represents music as a simple color, in a meaningful, and musical way.

This is how my research distincts itself from a 'simple' equalizer, which merely shows the music's loudness across different frequencies.

My theory of harmonic coloring is based on music theory, rather than conventional display methods.

As the representation as color is based on music theory, any analysis we perform after the algorithm is also based on music theory. This would ensure that my design is based on musical theory, rather than variations on loudness.

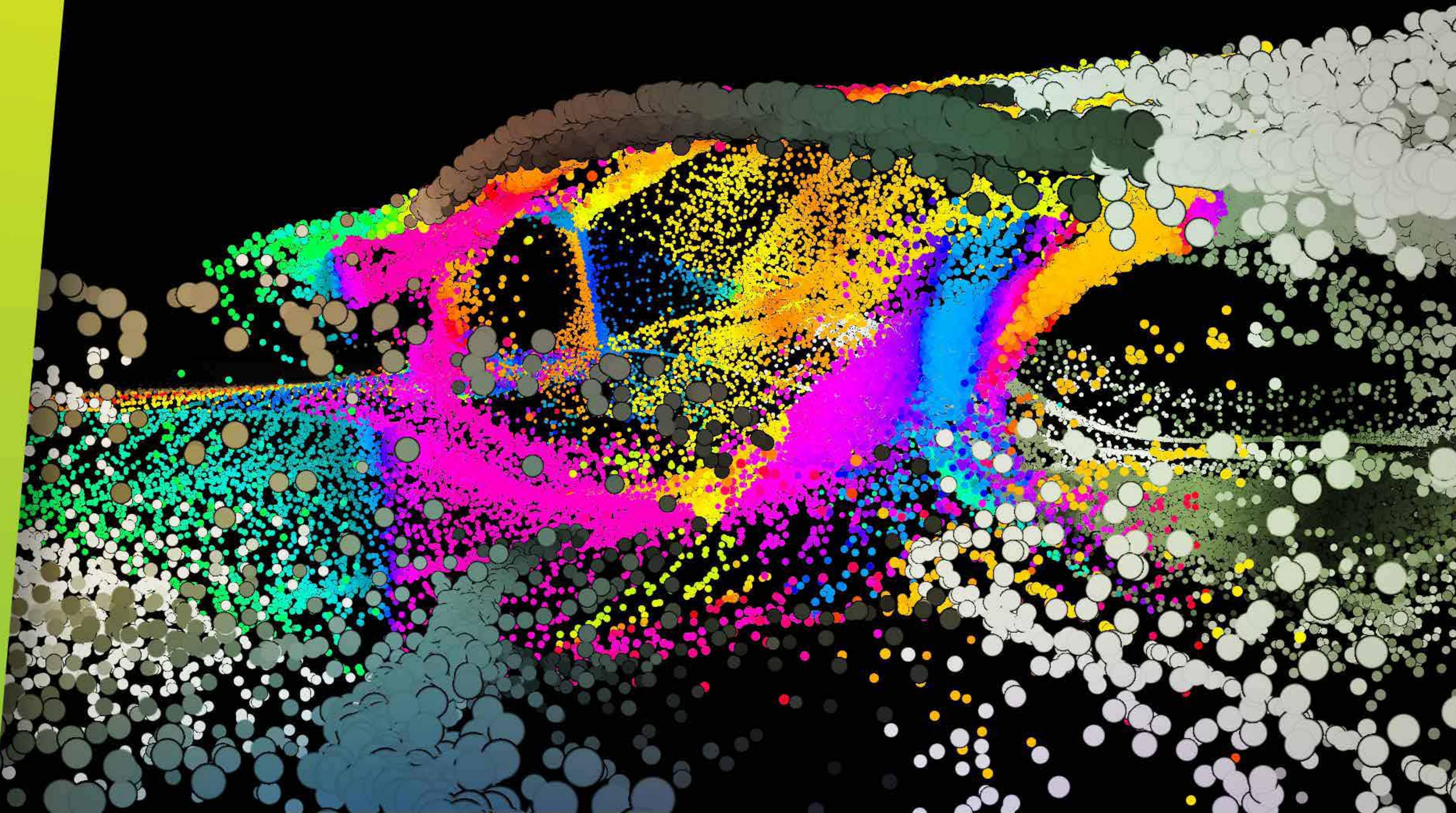




# Grasshopper

Parametric tools like Grasshopper have played an essential part of the research. Because the tools are parametric, any research or visualization that I programmed could directly function as input for my final design.

In essence, the translation of music into matter merely deals with data structures, which is exactly what I learned to do using Grasshopper. In recent months, I have extended this knowledge into programming languages like JavaScript, which I use to create tools and even website - check [roelwestrik.nl](http://roelwestrik.nl) for more information.



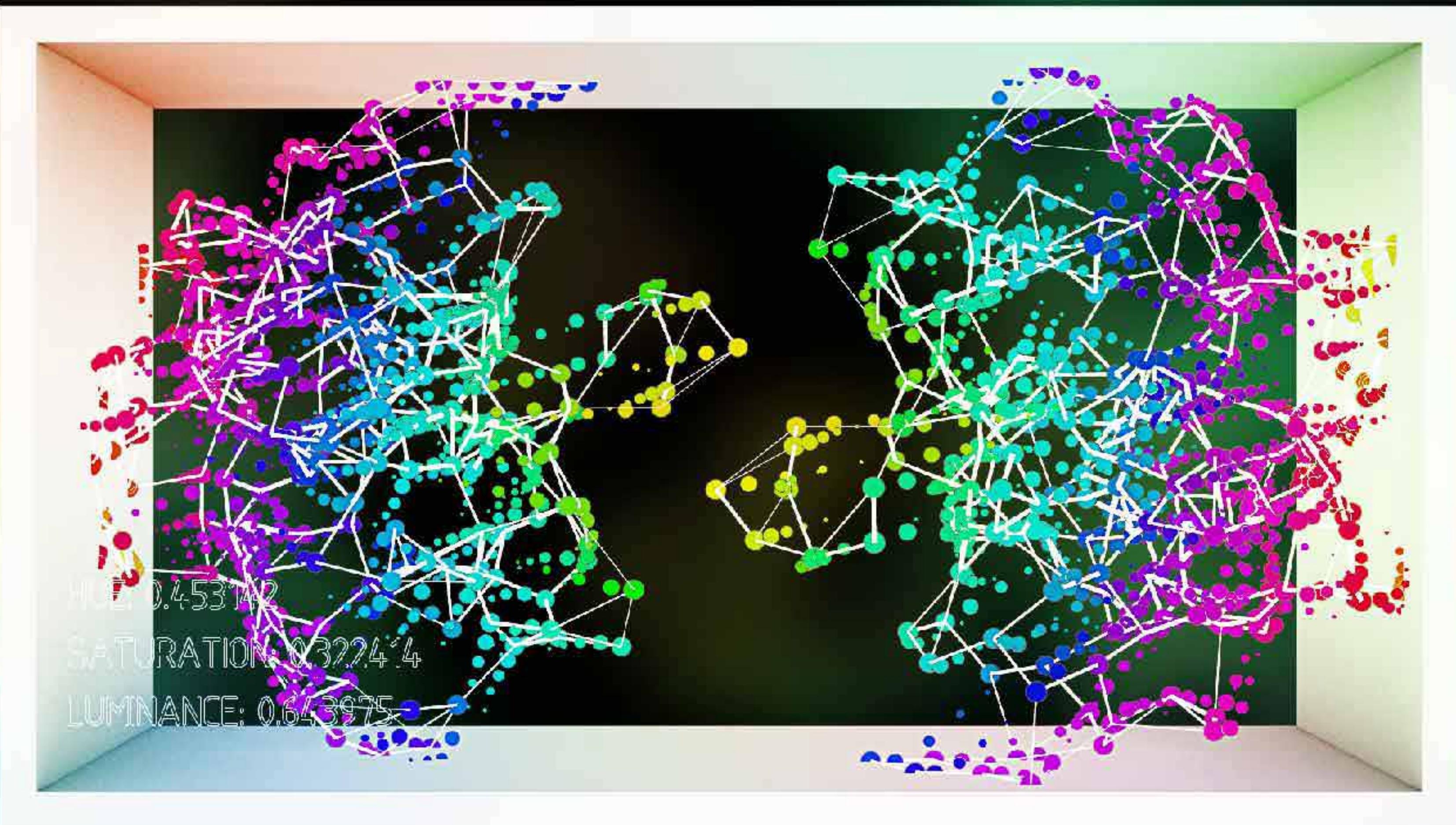


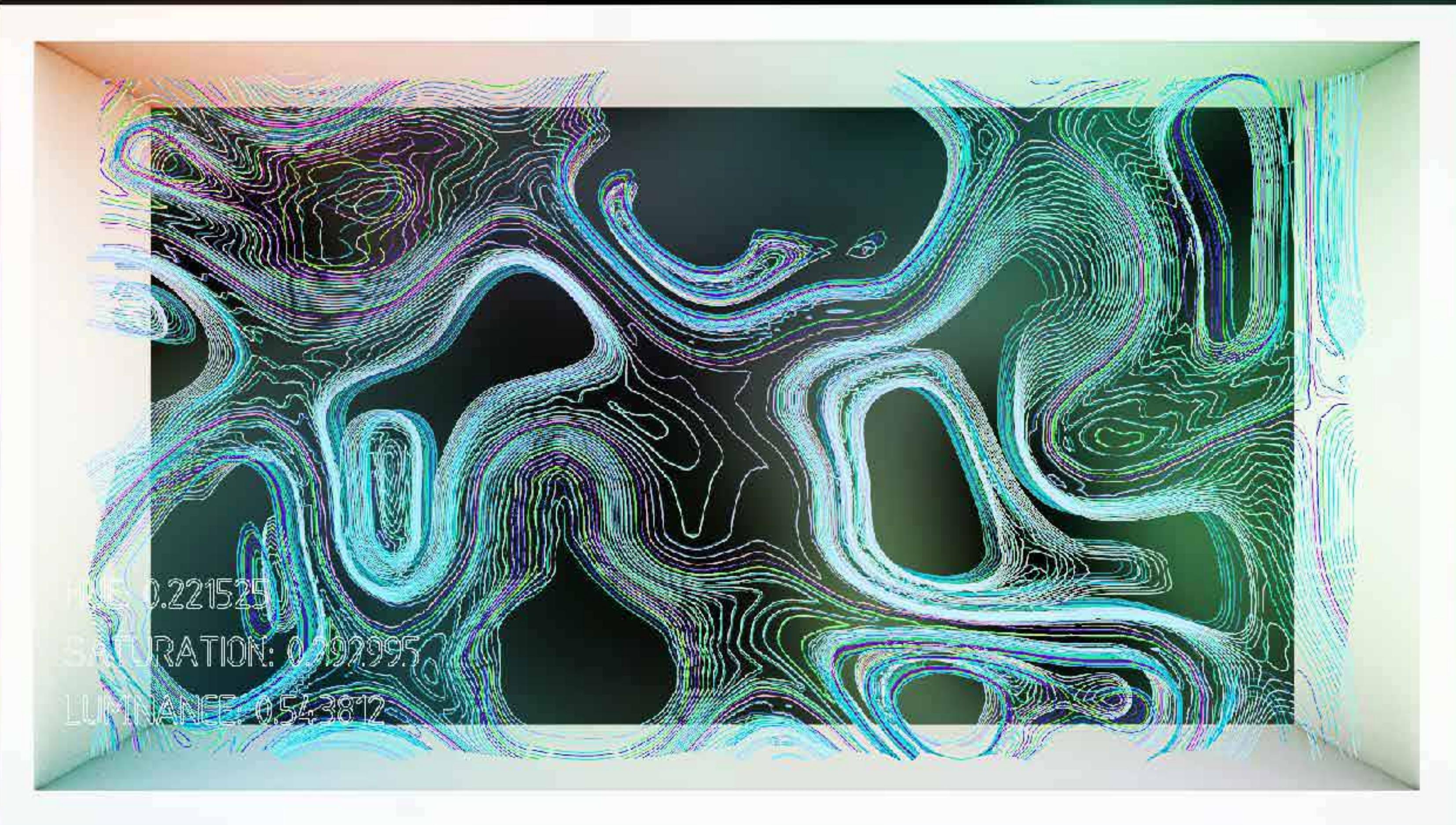
## Music and form

All geometry and form of the final design is generated as a result of the musical analysis.

The most important architectural inputs are: acoustics, illumination and distribution of material. A gradient of surface smoothness is a result of loudness of music. Entrance of sunlight is a result of brightness of music. Division of EPS and concrete materials is a result of roughness and complexity of music.

All elements are implemented as gradients. Like music, the building is constantly changing, constantly offering new experiences to its visitors.







HUE: 0.059782

SATURATION: 0.487035

LUMINANCE 0.959056

# ch.3: (Music) {

Performing, Composing & Teaching Music;

# Music

Since I have started learning music, composition and music theory from the age of 12, music has become the most important thing in my life.

My musical education is quite unique, by learning from the best of the best, and self-taught techniques, I have developed a new approach to music and piano, which I have used not only in my performances and original compositions, but also in my research at the Faculty of Architecture.

I have performed my original compositions and arrangements of famous tunes all over the Netherlands, and hope to keep creating and sharing new pieces.



# Teaching

We learn by doing - and by teaching. For many years I have accepted students and shared my personal of piano technique, and interpretation of music theory - something which has been lost in modern ways of teaching music.

Nowadays, music is taught by showing. Think of guitar and piano tutorials on YouTube. However, I think understanding music theory is as much necessary to make good music as it is to find the right keys on the keyboard. I have always strived to show my students the necessity of understanding music theory.





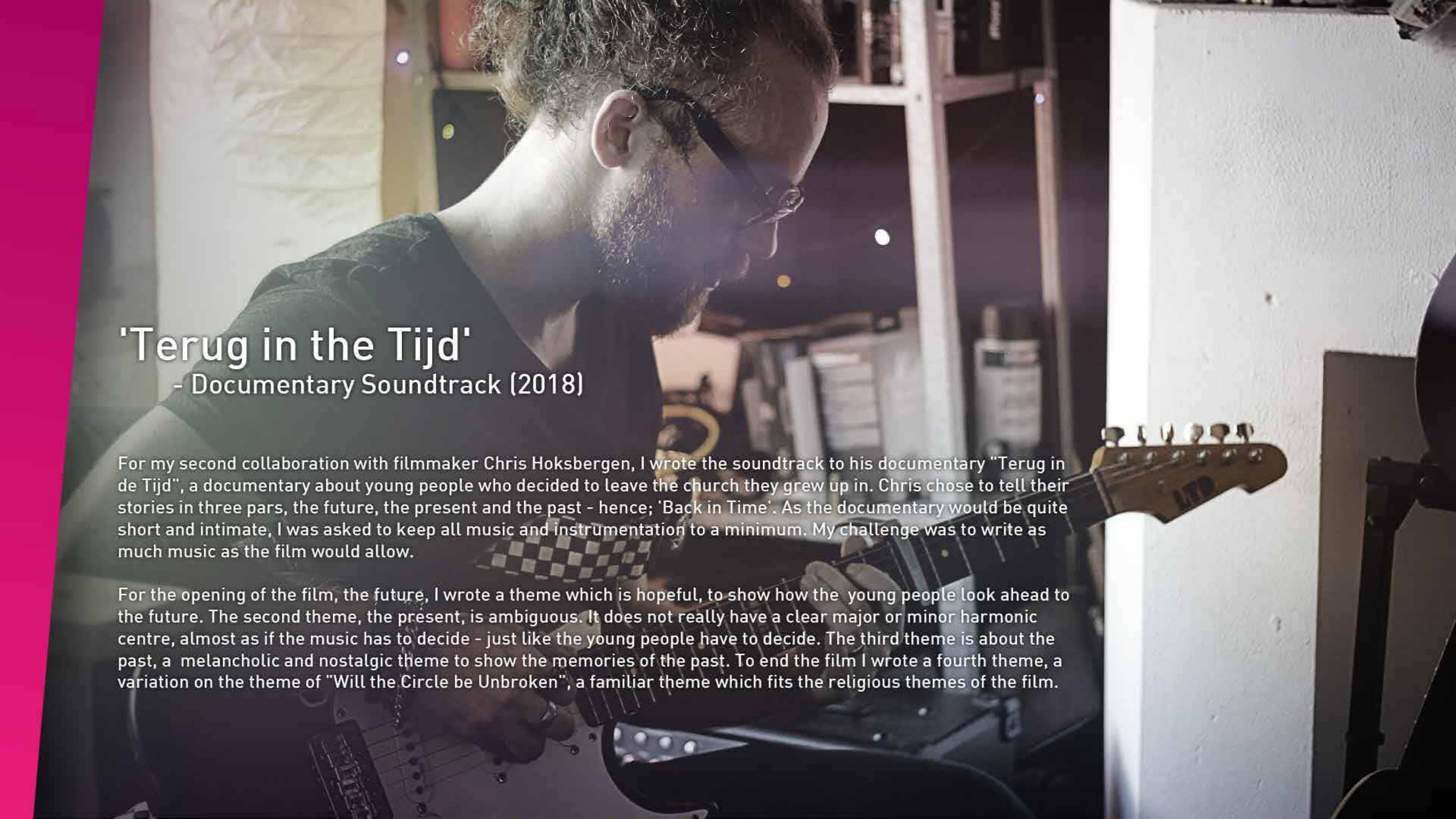
A black and white photograph of a man with glasses and a beard, wearing a dark t-shirt, sitting at a keyboard and looking down at a large sheet of musical notation. He is wearing a watch on his left wrist. The keyboard has the brand name 'Roland' visible on it. The background shows some foliage and a wooden structure.

## 'Een Verzwegen Oorlog' - Documentary Soundtrack (2017)

"Een Verzwegen Oorlog" is a touching documentary by Chris Hoksbergen and colleagues about the consequences of the war in Indonesia. My challenge was to write a compelling soundtrack which would convey on the one hand the intimacy and touching moments shared between a grandfather and grandson, and on the other hand the pride and beauty of the country.

I wrote a single theme, built upon the oriental, yet familiar sounding D minor pentatonic scale, which grows and morphs throughout the duration of the documentary. My goal was to write a main theme which would almost behave modular, so that I could write simple variations which would each fit to the emotion of the scene. The result was a theme which would repeat throughout the 20 minute documentary in different forms, so that it wouldn't get repetitive. During a short exposition of the nature of the country, I wrote a variation on a traditional theme of the 'Gamalan'.





## 'Terug in de Tijd'

- Documentary Soundtrack (2018)

For my second collaboration with filmmaker Chris Hoksbergen, I wrote the soundtrack to his documentary "Terug in de Tijd", a documentary about young people who decided to leave the church they grew up in. Chris chose to tell their stories in three parts, the future, the present and the past - hence; 'Back in Time'. As the documentary would be quite short and intimate, I was asked to keep all music and instrumentation to a minimum. My challenge was to write as much music as the film would allow.

For the opening of the film, the future, I wrote a theme which is hopeful, to show how the young people look ahead to the future. The second theme, the present, is ambiguous. It does not really have a clear major or minor harmonic centre, almost as if the music has to decide - just like the young people have to decide. The third theme is about the past, a melancholic and nostalgic theme to show the memories of the past. To end the film I wrote a fourth theme, a variation on the theme of "Will the Circle be Unbroken", a familiar theme which fits the religious themes of the film.









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MSc. Architecture, TU Delft

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# Education, experience & skills



## Architecture:

### EDUCATION:

- 2012-2015 Bachelor Architecture, TU Delft
- 2014 Minor Retail Design, TU Delft
- 2016 Masterclass Retail Design, UHasselt
- 2016-2019 Master Architecture TU Delft

- 2015-2016
- 2015-2017
- 2017-2018

### WORK EXPERIENCE:

- Internship @ studiojosvandijk, Amsterdam
- Student Mentor @ TU Delft, Delft
- Student Assistant @ Hyperbody, Delft



## Programming & 3D Modelling:

### EDUCATION:

- 2016 Course Beyond 3D Computer Visualisation, TU Delft
- 2016
- 2016
- 2017

### WORK EXPERIENCE:

- Dudok Symposium, Ankara
- GSM Symposium, TU Delft
- Project Pixies, Light Festival Delft



## Music:

### EDUCATION:

- 2011-2019 Participant Masterclass Wibi Soerjadi
- 2013-2019
- 2017
- 2018

### WORK EXPERIENCE:

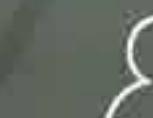
- Teaching piano/guitar/composition
- Soundtrack to 'Een Verzwegen Oorlog', movie by Chris Hoksbergen
- Soundtrack to 'Terug in de Tijd', movie by Chris Hoksbergen



## Skills

- Adobe Photoshop
- Adobe InDesign
- Adobe Illustrator
- Adobe Premiere
- Autodesk Maya
- Autodesk AutoCAD
- Autodesk Revit
- Google Sketchup

- Rhinoceros
- Grasshopper
- Unreal Engine/VR
- Processing
- P5.js
- Arduino



## Misc.

### Languages:

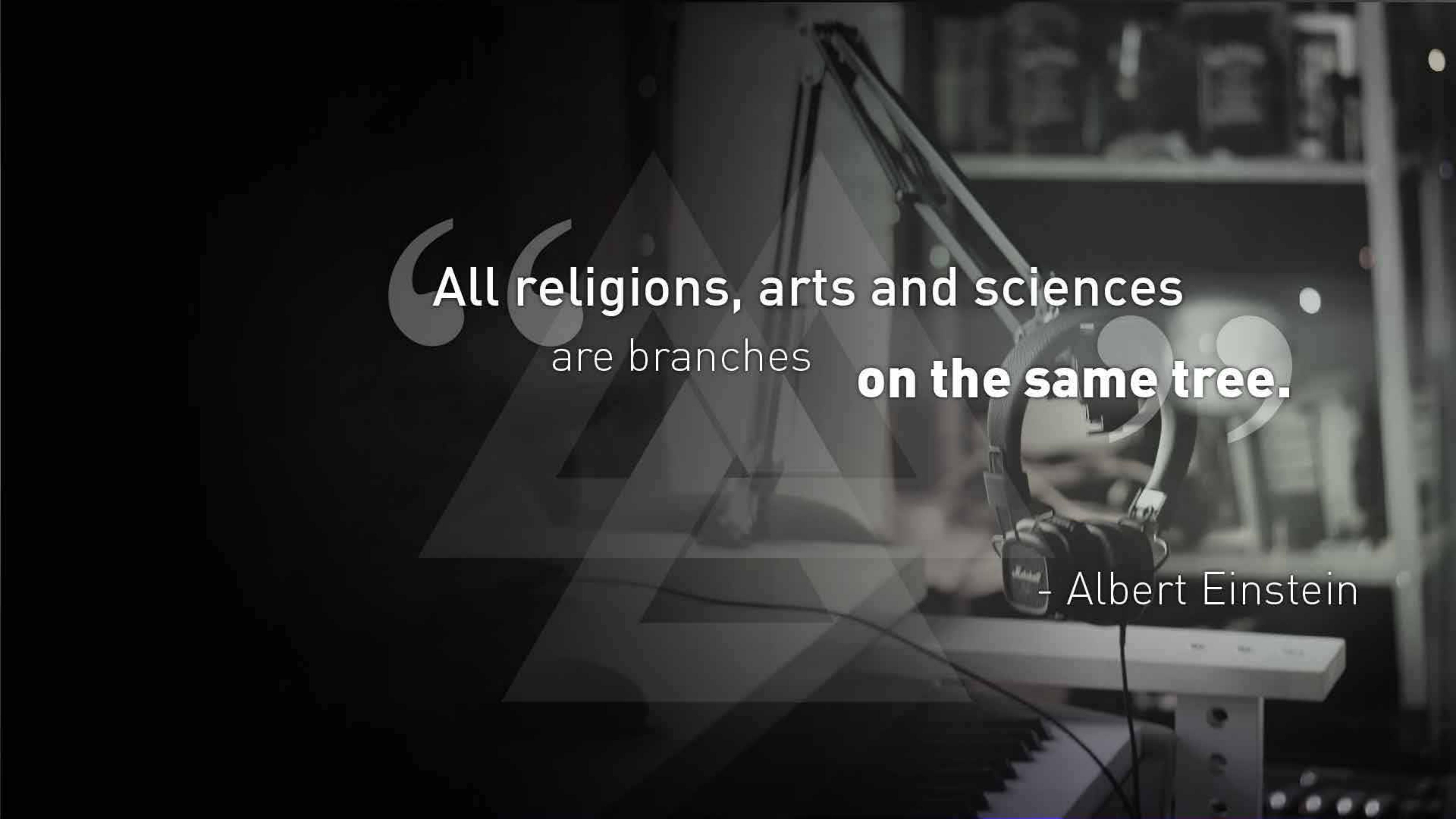
- Dutch (Native)
- English (Fluent)
- German, French, Latin (Elementary)

### Driver's Licences:

- AM, A1, A2, B, T

### Interests:

- Classical music, rock&roll, weightlifting, graphic design, vintage motorcycles, vintage guitars, coffee, cinema

A black and white photograph showing a person's hands holding a violin bow over a piano keyboard. The hands are positioned as if playing both instruments simultaneously. The background is dark and out of focus.

All religions, arts and sciences  
are branches  
**on the same tree.**

- Albert Einstein

