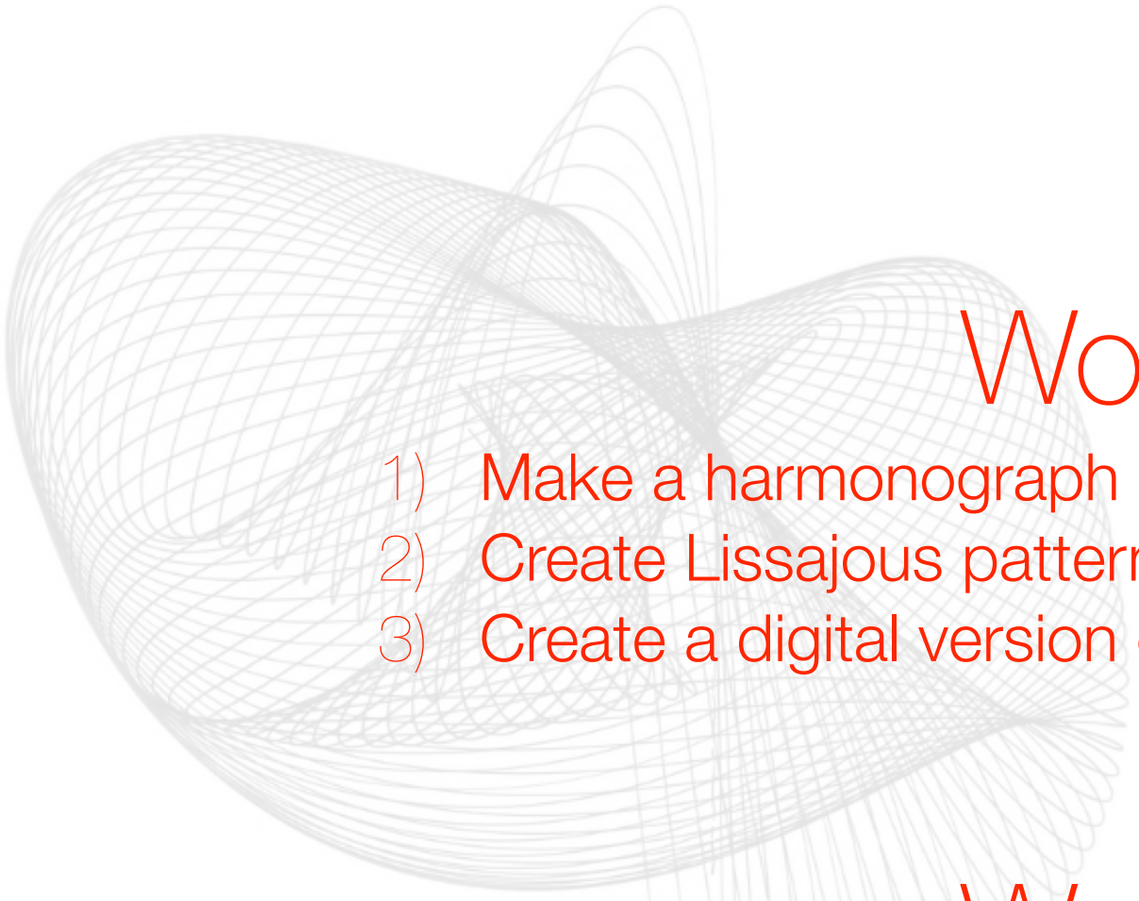
SoundMuse

Creating Sound Patterns

Looking at Sound: **Musical Harmony**

intervals of unison, octave, fourth and fifth



Workshop 1

1) Make a harmonograph
2) Create Lissajous patterns using the harmonograph
3) Create a digital version of the Lissajous patterns

Workshop 2

1) Create patterns using different kinds of harmonographs
2) Create patterns with pendulum painting (also sand and light)
3) Create a digital version of the patterns

Workshops

- Discover that vibrations are **oscillations** (backwards/forwards motion)
- Musical vibrations (**pitches**) are usually consistent, sustained sounds (unlike noise) and are vibrating at a specific rate (**frequency**)
- Understand how musical **intervals** (the distance between 2 pitches played together or) can be expressed as **ratios** (focus on common intervals: unison, octave, 4th and 5th)
- Explore - via **Lissajous** apparatus - what patterns emerge when common intervals (and other intervals) are sounded
- Explore how that intervals relate to **string length** (also **tension** & **mass** of the strings)
- Create **Lissajous patterns** using the **harmonograph** - explore how altering the pendulum length via the weights, changes the frequency of the pendulum and thus the pattern, just like altering the length of the string.
- Create Lissajous patterns with **pendulum painting** (paint/sand/light)
- Create a digital version of the Lissajous patterns

interval *~the distance between* ***two notes (pitches)***

two notes *can be played together or consecutively*

Musical Harmony

intervals of unison, octave, fourth and fifth

~ what do intervals **sound** like?

1:1 unison - oscillating (vibrating) at the same speed

2:1 octave - oscillating at 2 times the speed

3:2 fifth - oscillating at 11/3 times the speed

4:3 fourth - oscillating at 11/4 times the speed

interval~the distance between **two notes (pitches)**

two notes can be played together or consecutively

Musical Harmony

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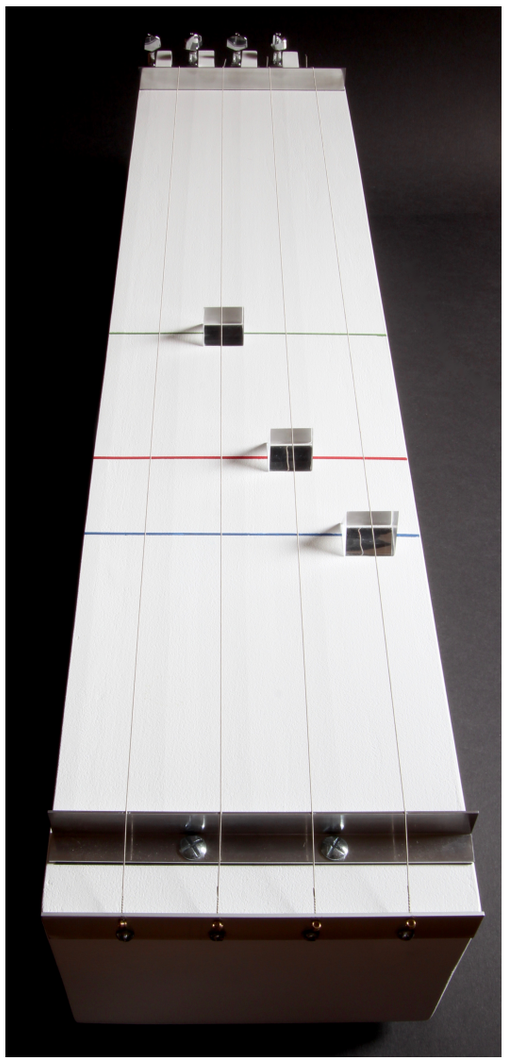
~ the relationship between pitch & string length

monochord demo



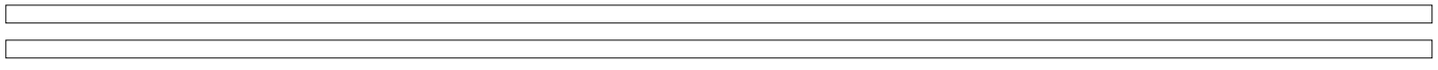
monochord string lengths

2:1 octave (2 times the speed) = 1/2 string length

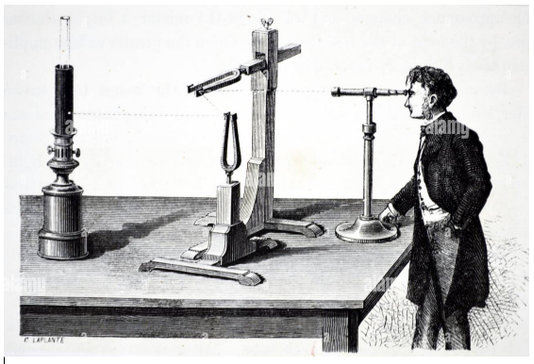
3:2 fifth (11/3 times the speed) = 2/3 string length

4:3 fourth (11/4 times the speed) = 3/4 string length

1:1 unison (same speed) = same string length



To change the interval, change the length of the string
shorter string = higher pitch (frequency)
longer string = lower pitch (frequency)



Musical Harmony

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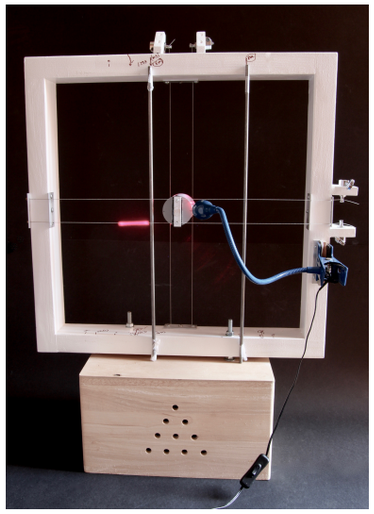
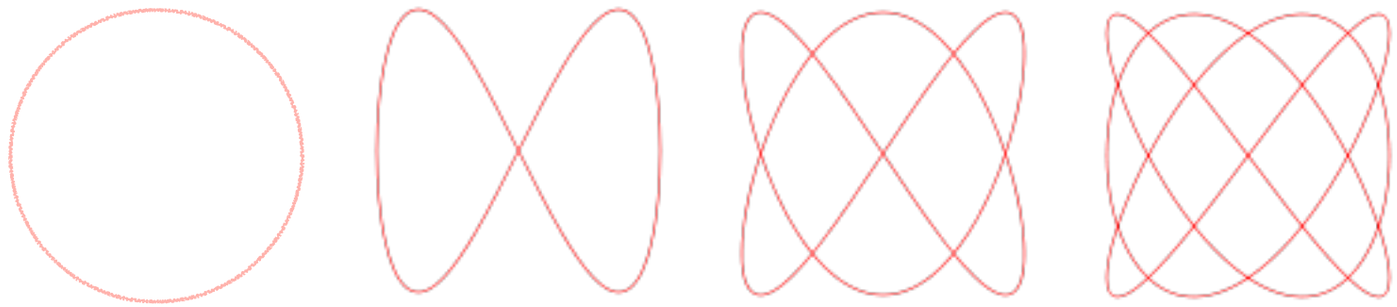
interval~the distance between **two notes**

What do intervals **look** like? ~ **Lissajous** curves

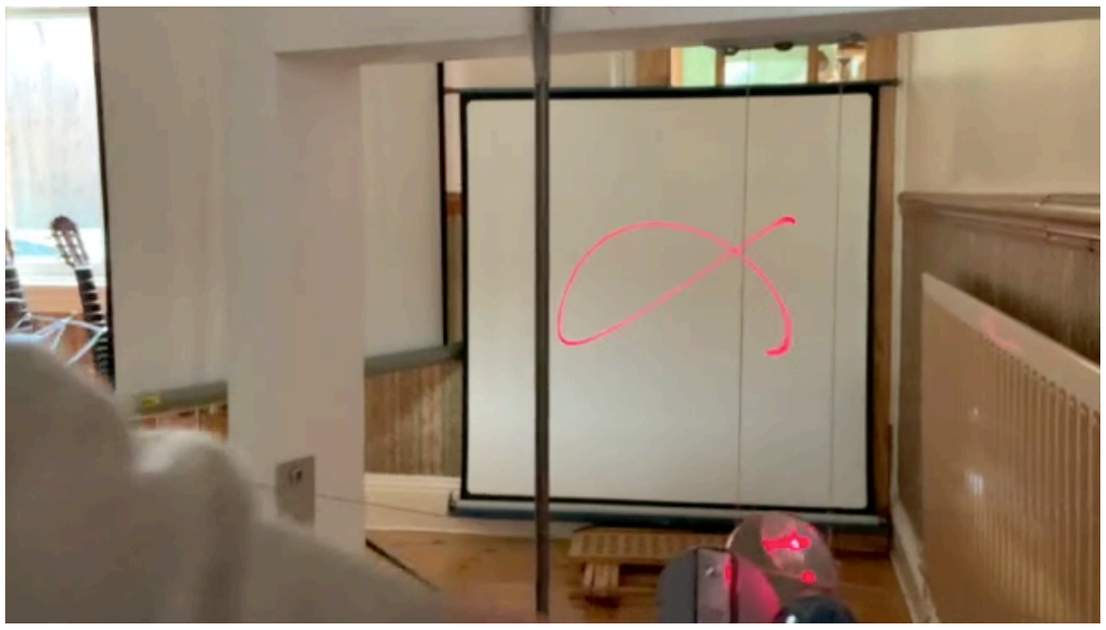
Lissajous apparatus

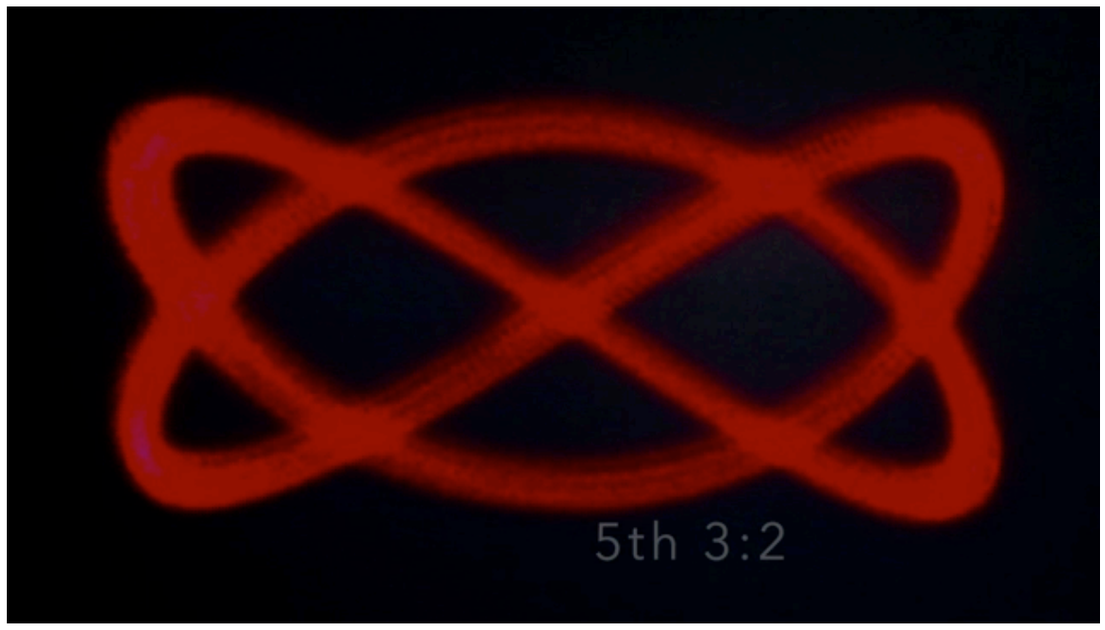




1:1 2:1 3:2 4:3

Jules Antoine Lissajous





interval~the distance between **two notes**

Musical Harmony

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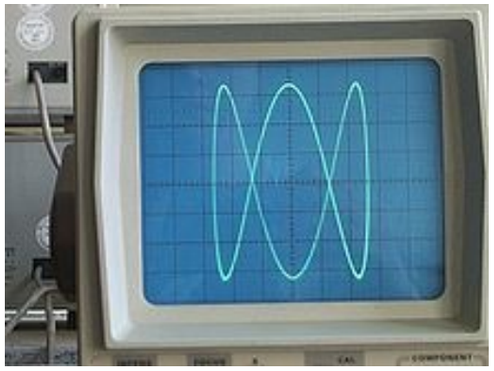
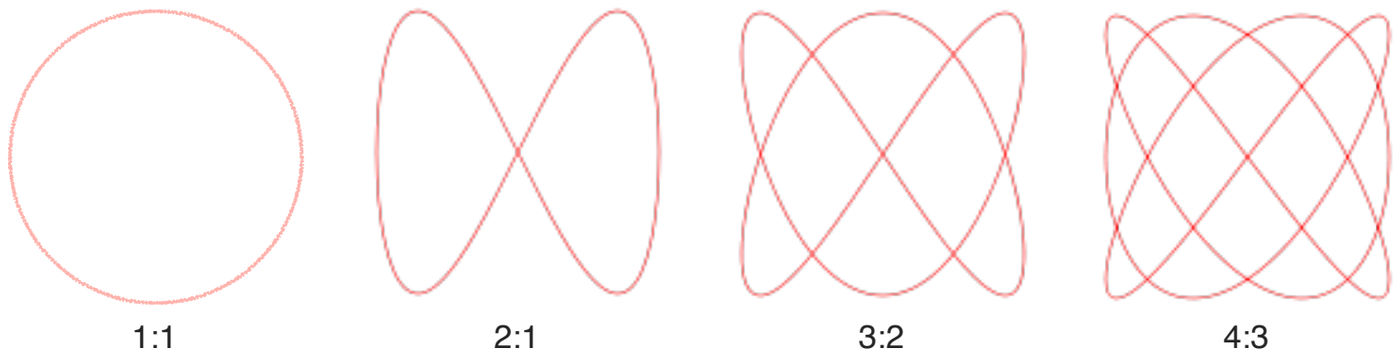
What do intervals **look** like? ~ **Lissajous** curves



Example of an analog oscilloscope Lissajous figure, showing a harmonic relationship of 1 horizontal oscillation cycle to 3 vertical oscillation cycles.



1:1 unison - oscillating (vibrating) at the same speed

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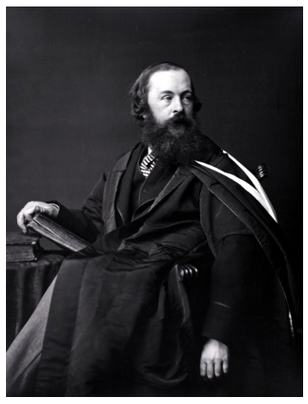
Harmonograph means **'harmony drawing'**

interval~the distance between **two notes**

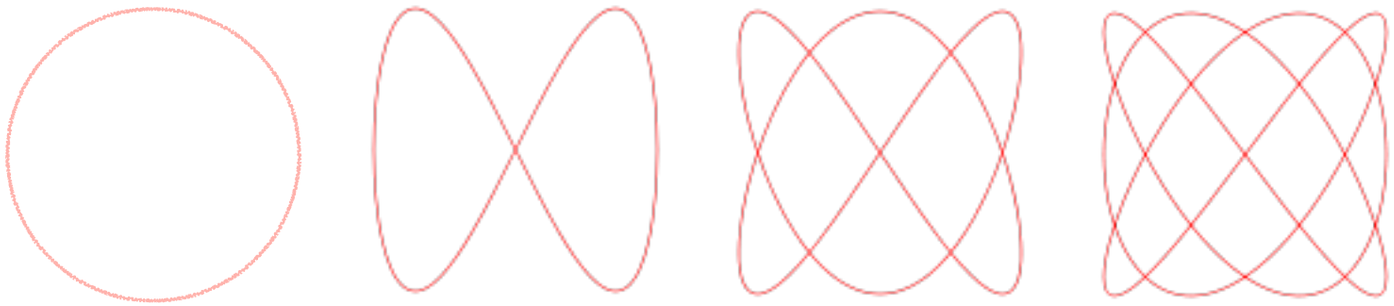
Musical Harmony

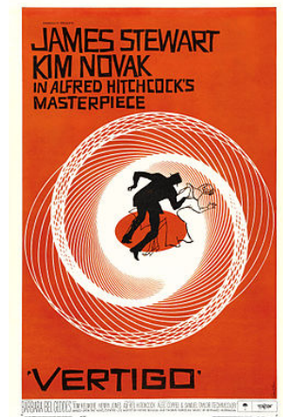
intervals of unison, octave, fourth and fifth

What do intervals **look** like? ~ **Harmonograph** drawings



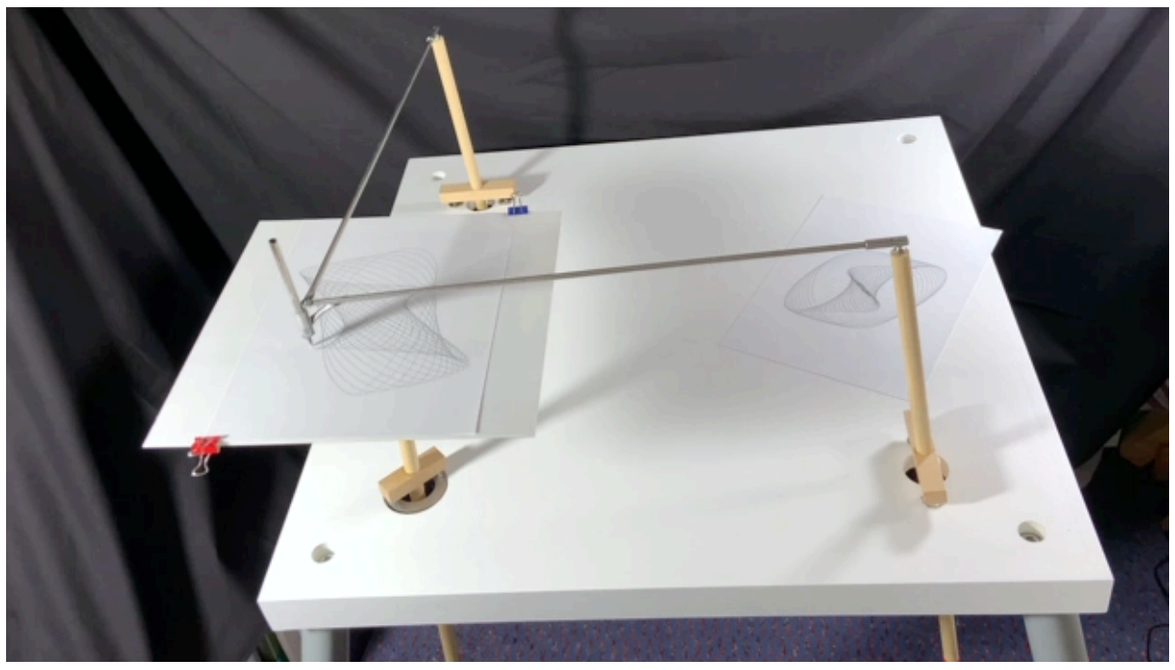
Hugh Blackburn



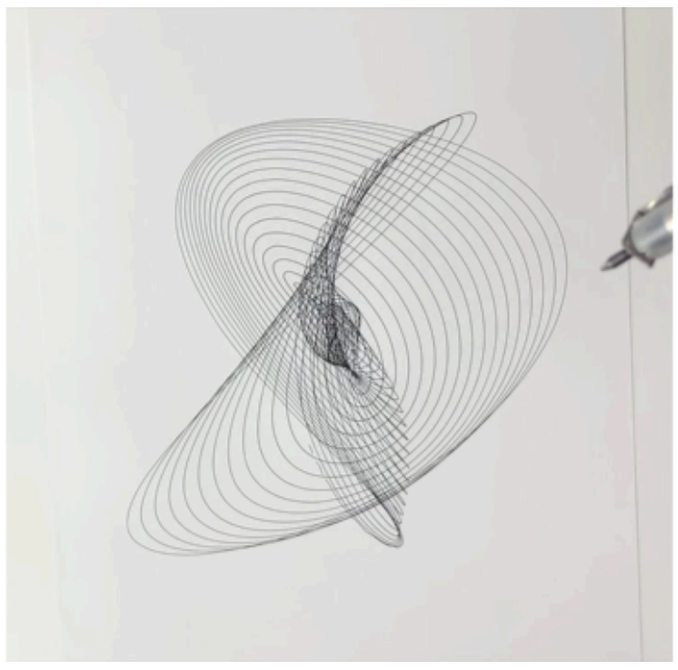


Vertigo Poster

3 pendulum rotary harmonograph



interval of a perfect 5th
lateral & rotary clockwise & rotary anticlockwise

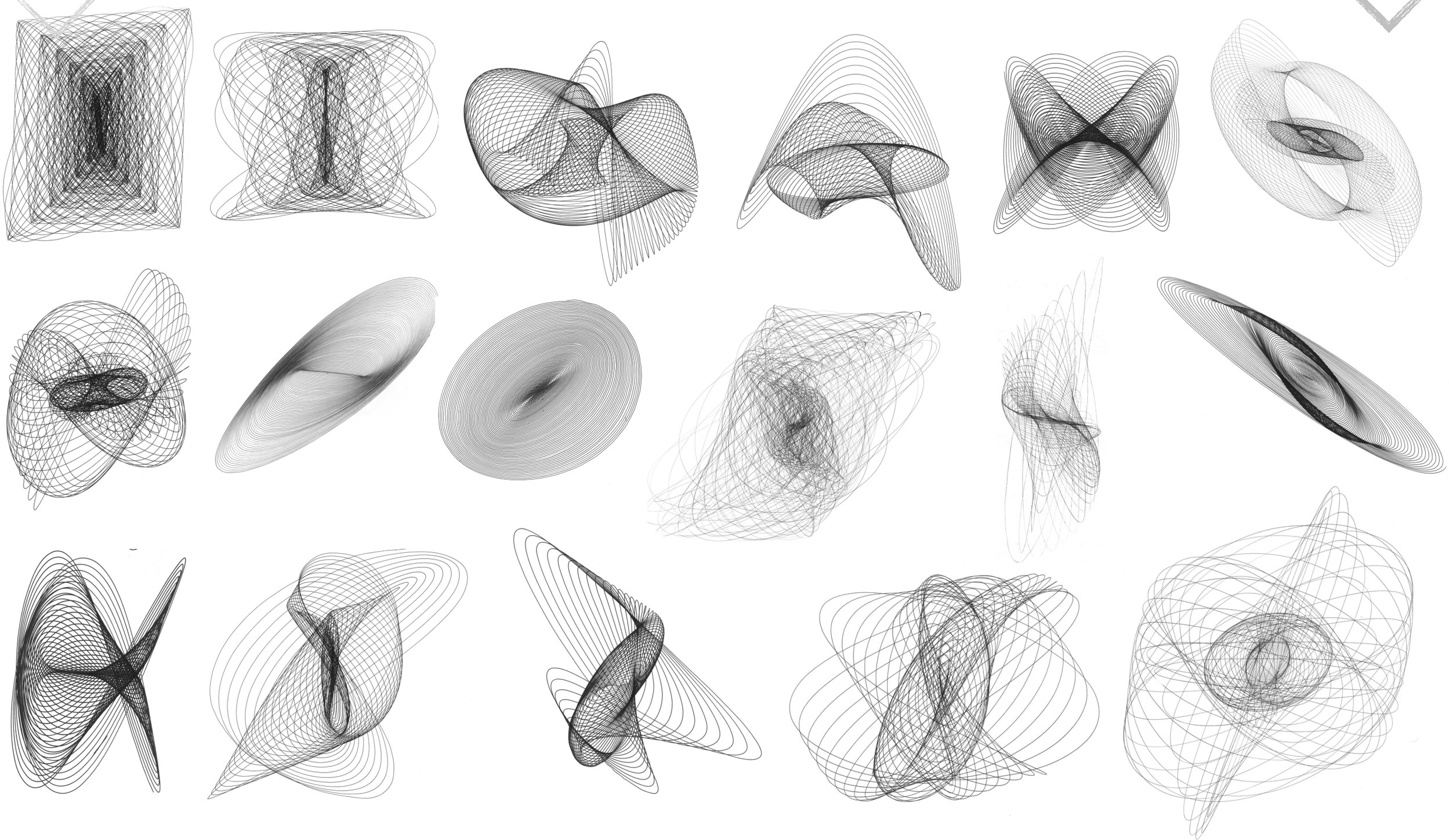


Harmonograph means
'harmony drawing'

interval~the distance
between **two notes**

Musical Harmony

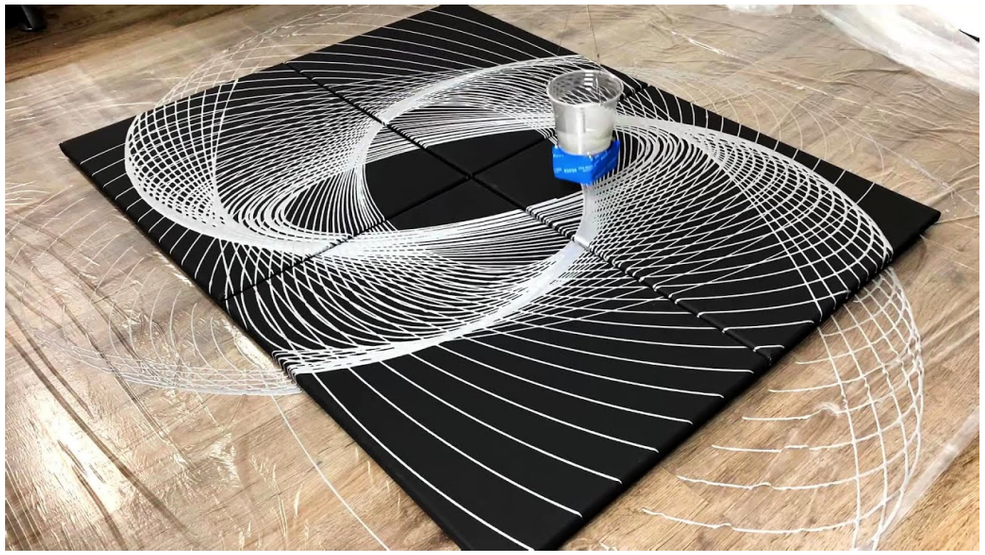
What do intervals **look** like? ~ various intervals drawings created on lateral & rotary harmonographs

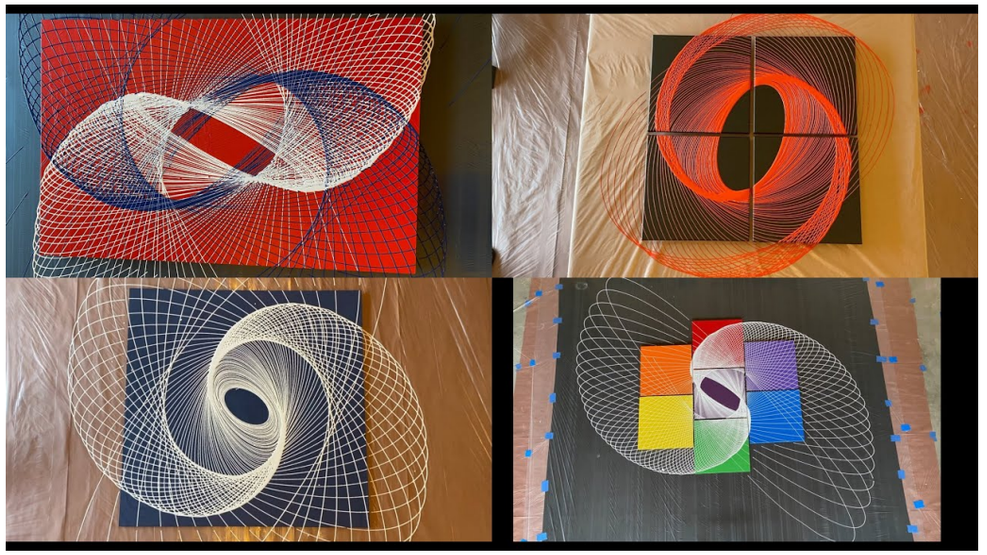


Musical Harmony

intervals of unison, octave, fourth and fifth

What do intervals look like? ~ Pendulum Painting (paint)



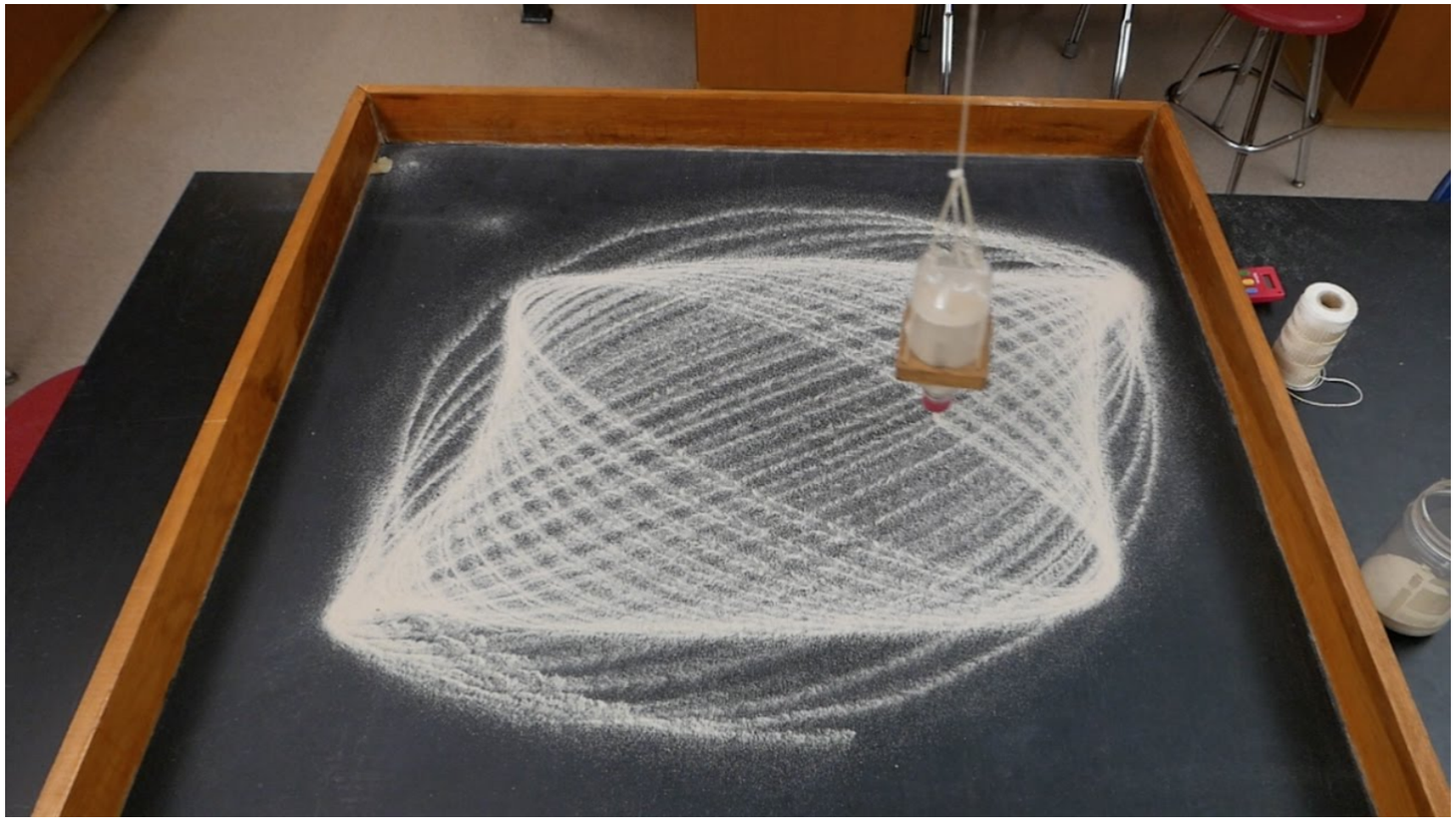


Vertigo film opening credits

Musical Harmony

intervals of unison, octave, fourth and fifth

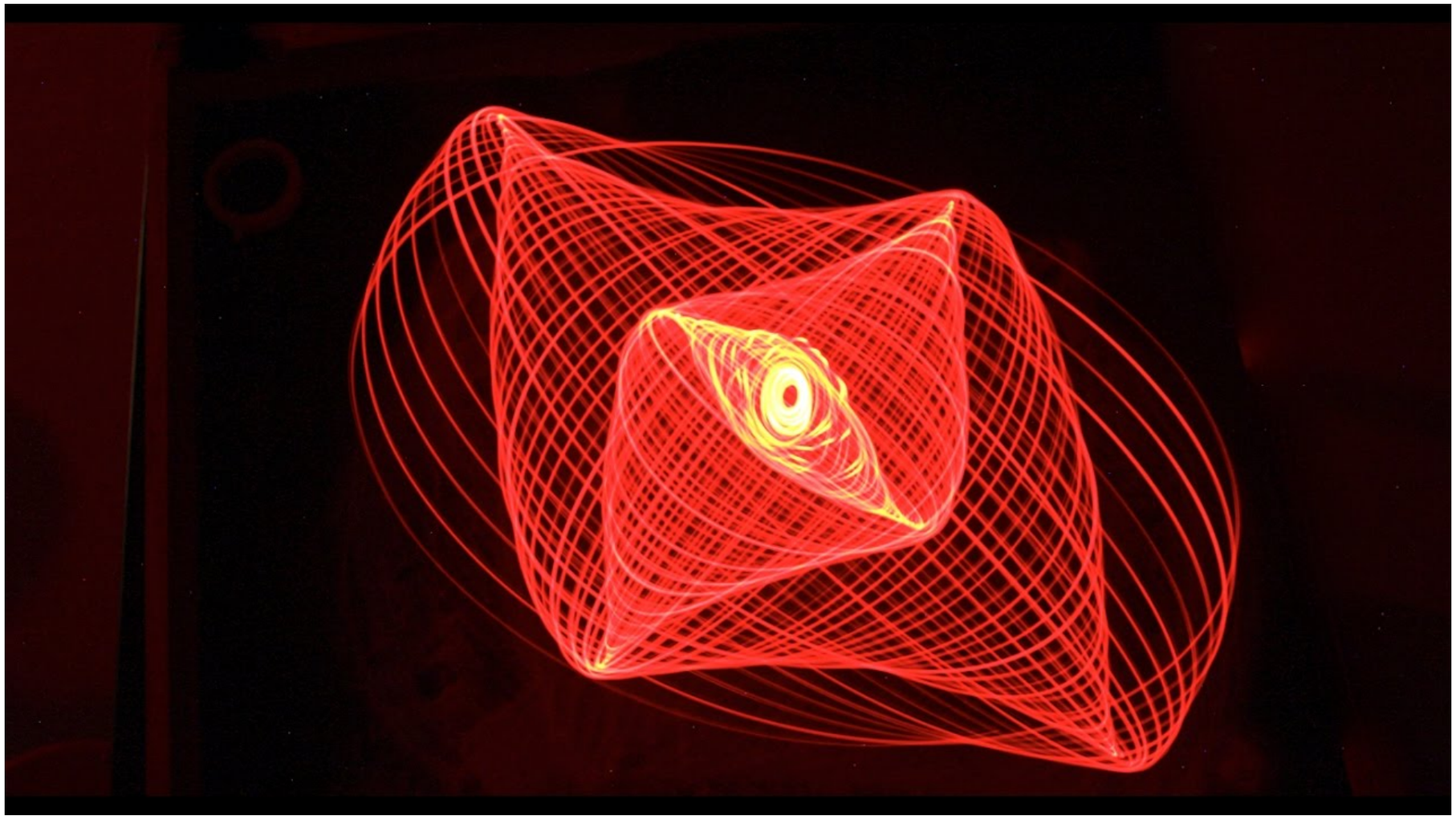
What do intervals look like? ~ Pendulum Painting (sand)



Musical Harmony

intervals of unison, octave, fourth and fifth

What do intervals look like? ~ Pendulum Painting (light)



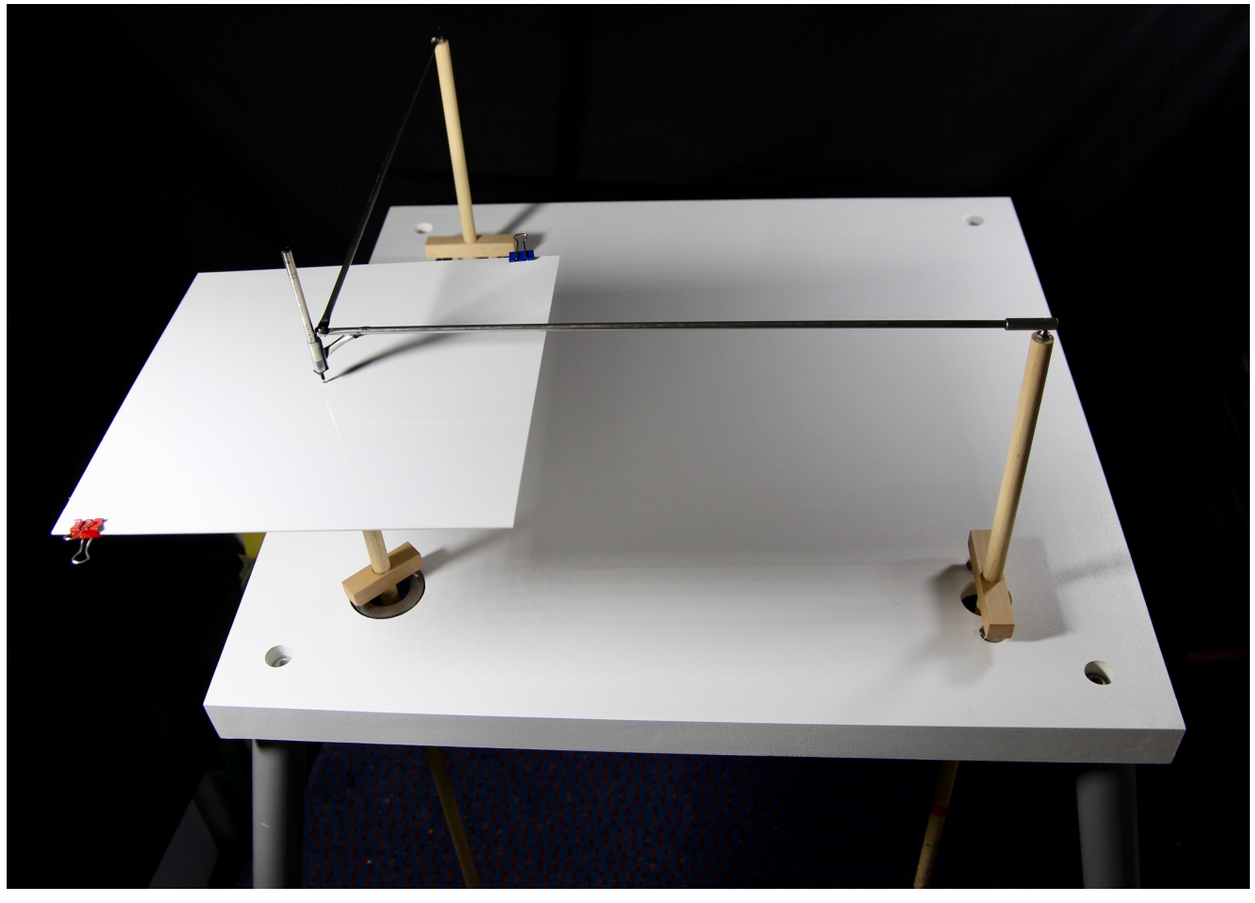
Musical Harmony

intervals of unison, octave, fourth and fifth

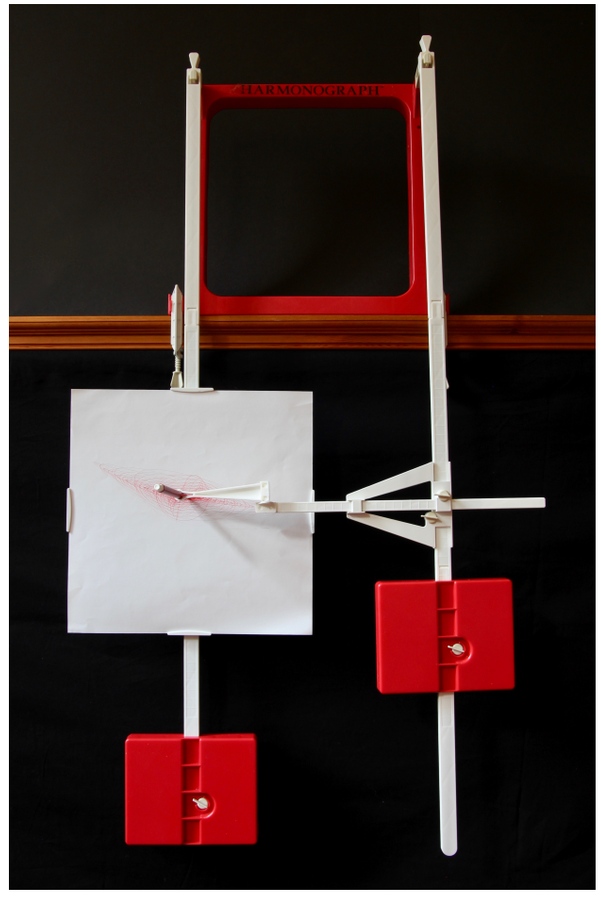
What do intervals look like? ~ harmonograph making

http://www.1920-30.com/toys/things-to-make/harmonographs.html

rotary harmonograph (3 pendulum)



1980s harmonograph



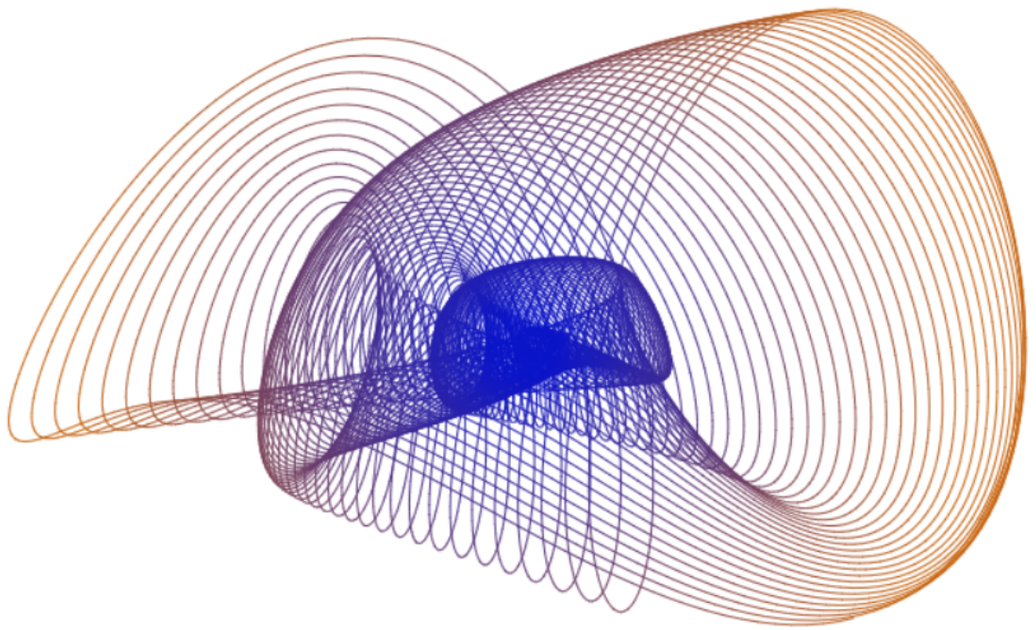
Musical Harmony

intervals of unison, octave, fourth and fifth

What do intervals look like? ~ coding Lissajous curves

Digital Harmonograph
coding

https://javascript.plainenglish.io/the-digital-harmonograph-b932fd3e6c2e



expanded view

https://gje7g.csb.app