

The Nature of Music

Why Music Moves Us



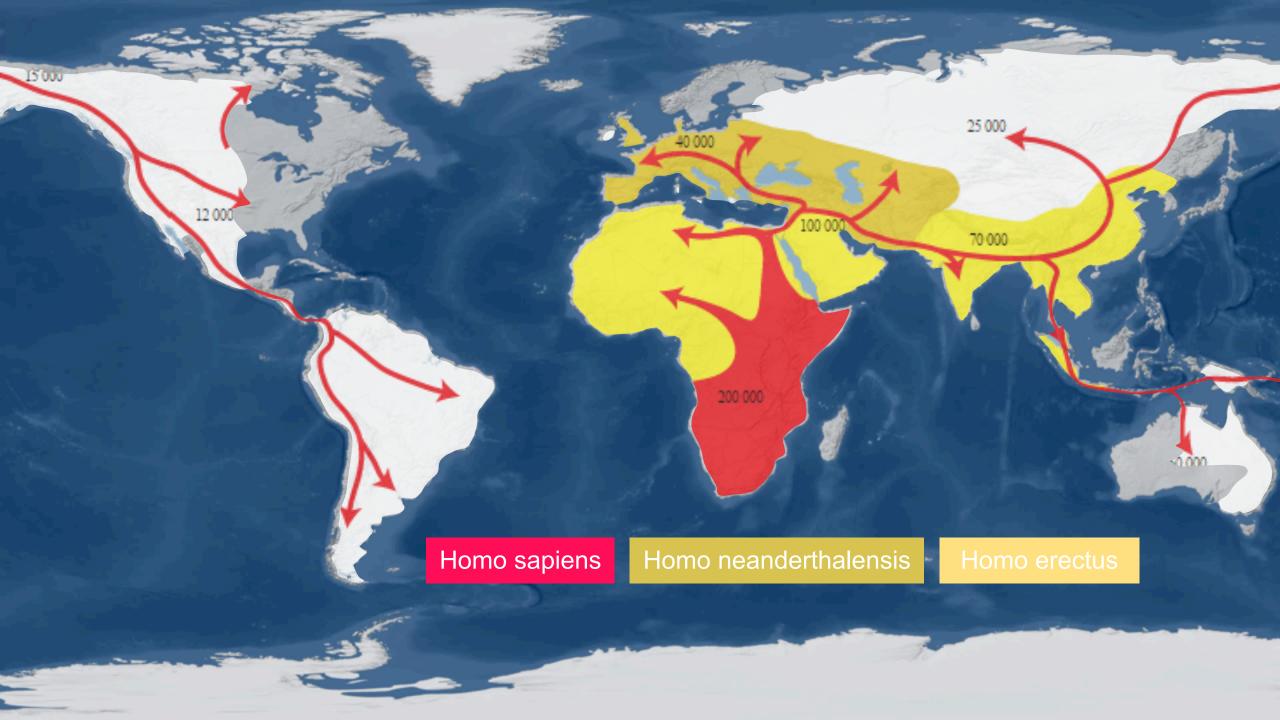
EST. 1597

GRESHAM

An Endless Lullaby



Mammoth ivory flute (≈30,000 BP) discovered in Southern Germany (Nature 2004)



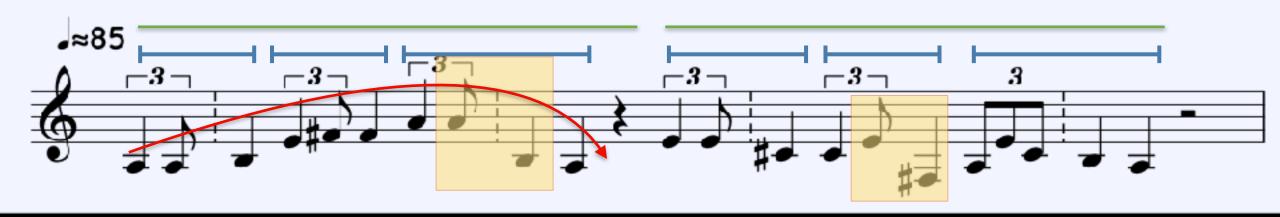
An Endless Lullaby

Recorded 1969 (Hugo Zemp)

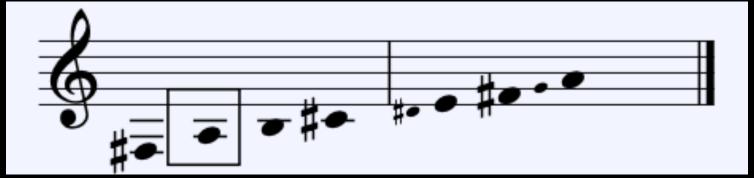




An Endless Lullaby

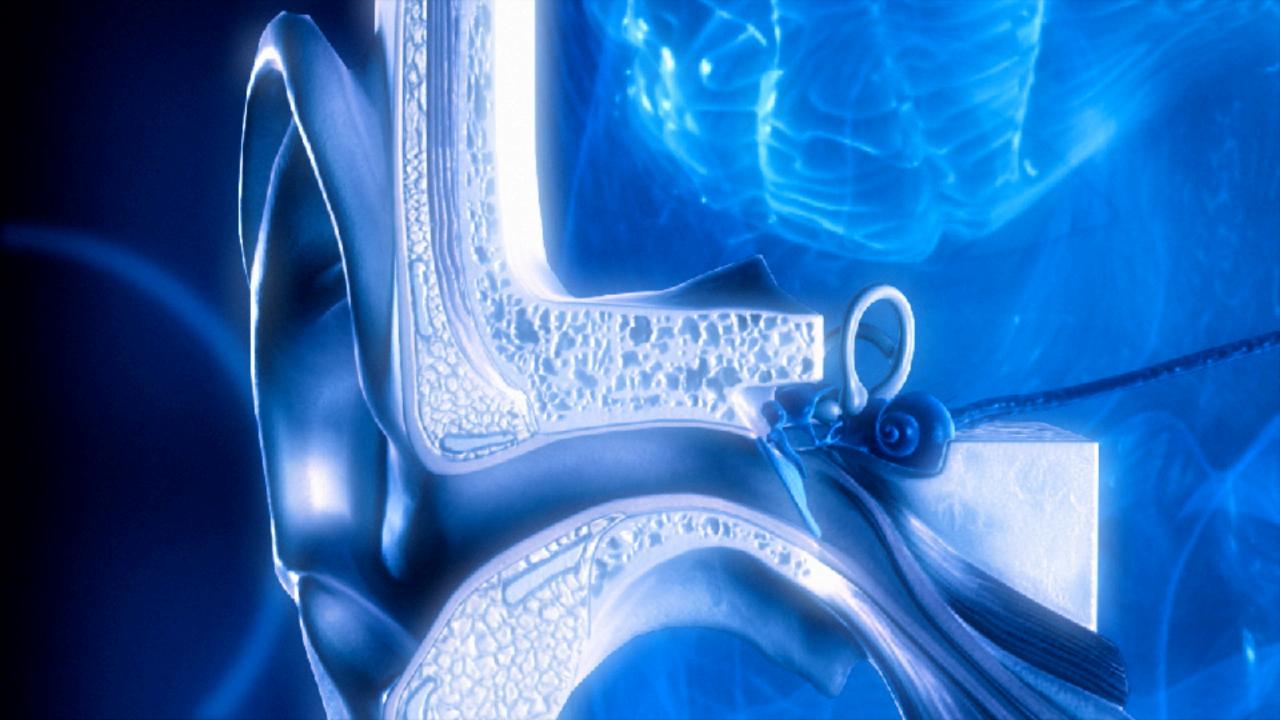


Rorogwela melodic skeleton (all verses)

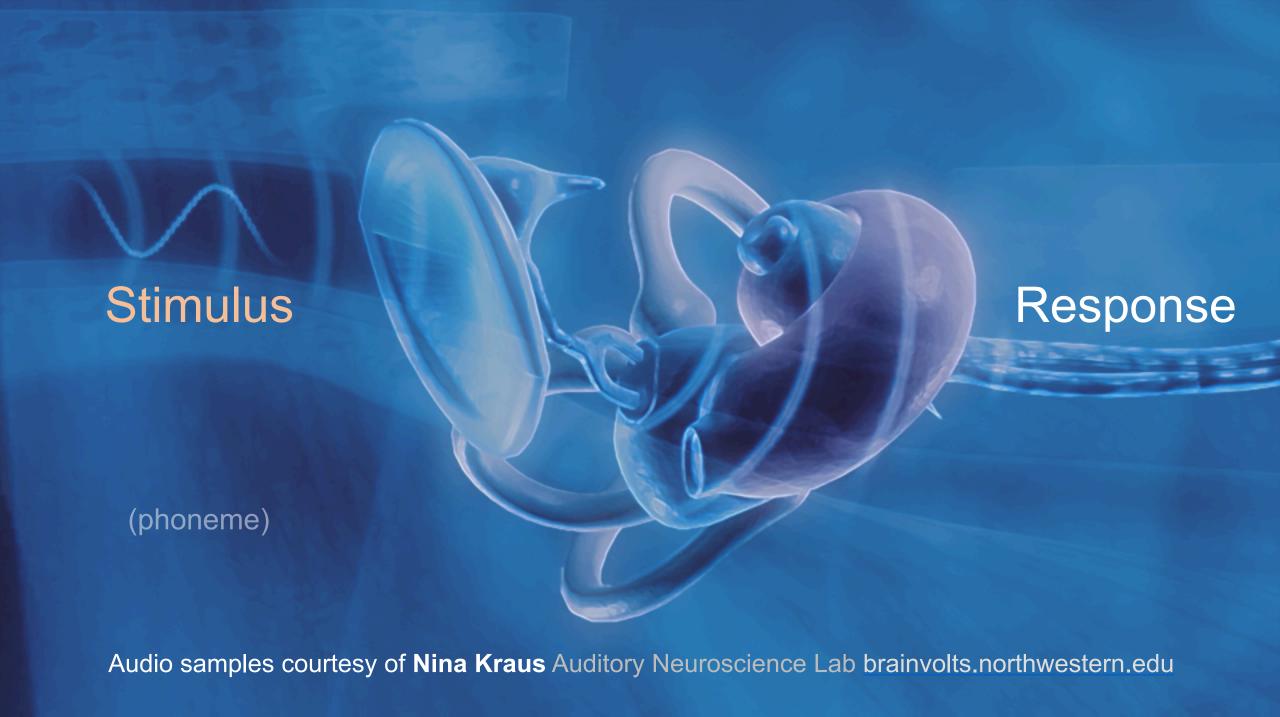


Rorogwela pitch collection
(A major pentatonic with Lydian Dominant ornamentation)

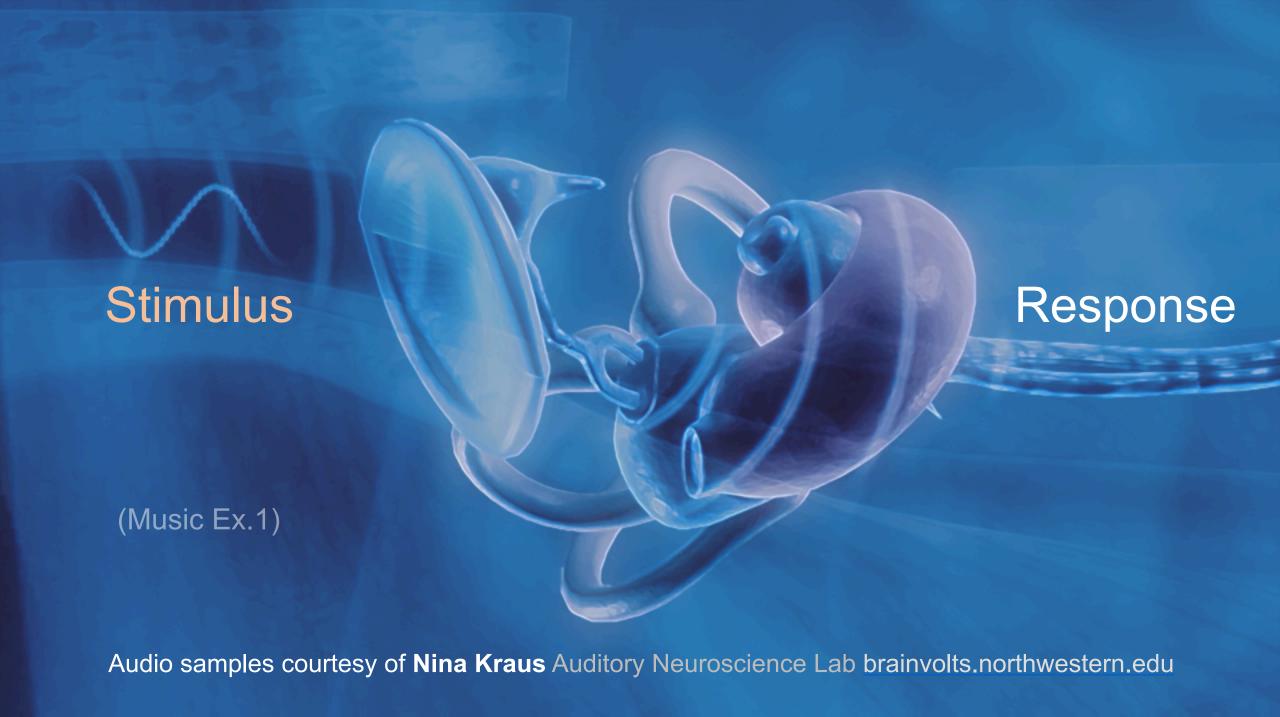
Plucked from Thin Air

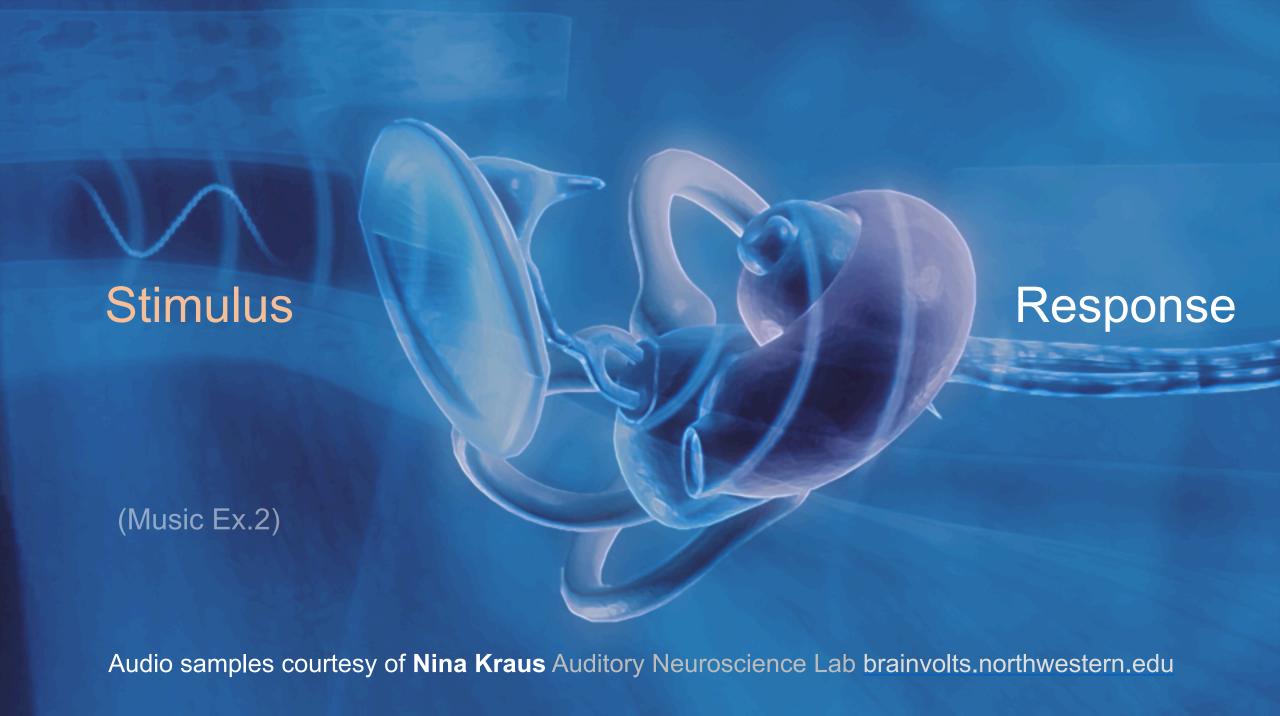






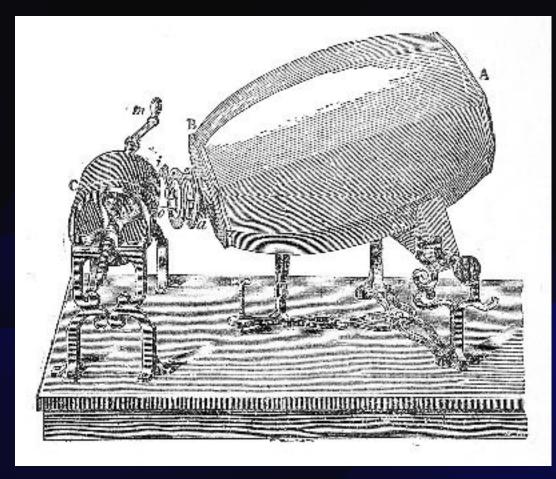






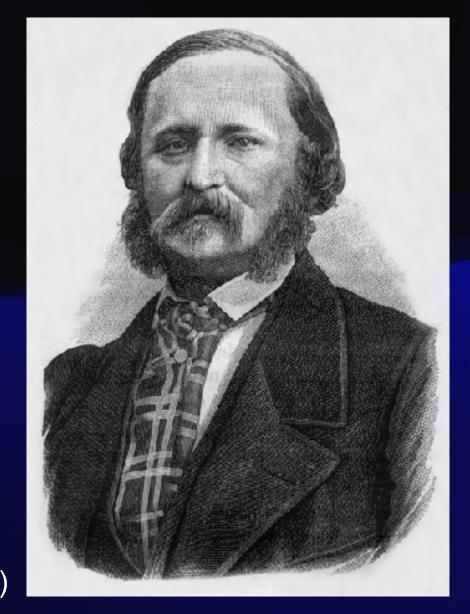
Into Thin Air

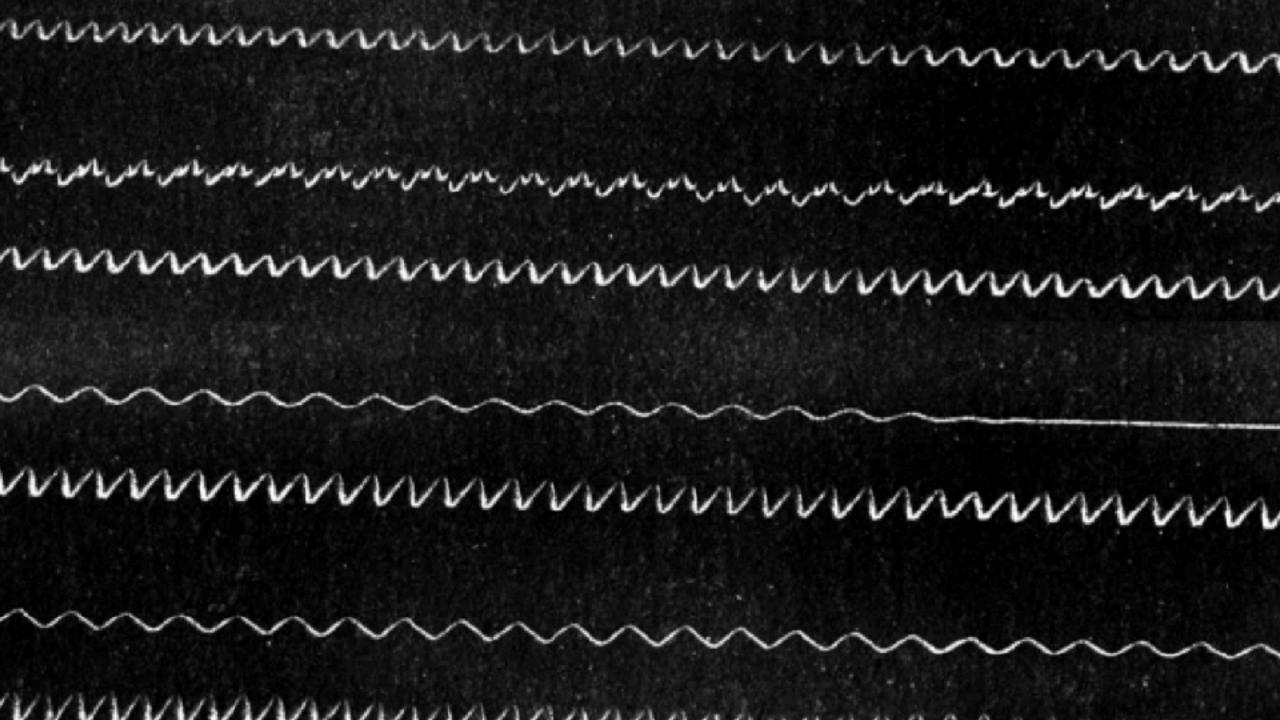
powerful but temporary



Scott's patented phonautograph (1857)

Édouard-Léon Scott de Martinville (1817-1879)

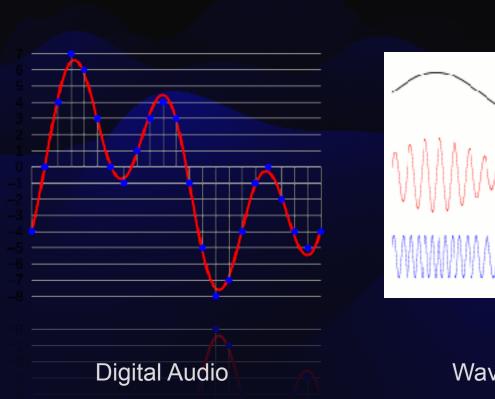


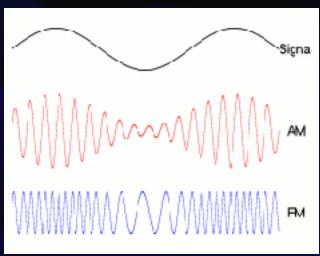


www.www.www.www mmmmmmmmmmmm Au Clair de la Lune - By the Light of the Moon (April 9, 1860) (Earliest recognizable recording of the human voice) WWWWWWWWWWWWWWW

Giovannoni, Feaster et al. firstsounds.org

An Invisible Thread



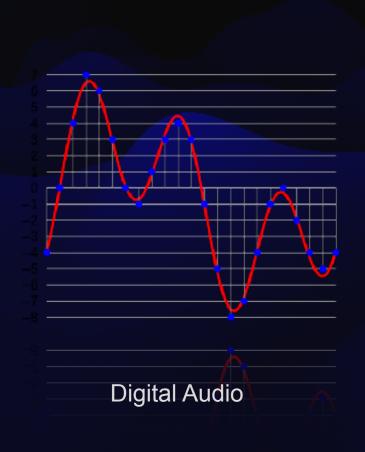


Waves on Aaves



Voyager Golden Record

An Invisible Thread



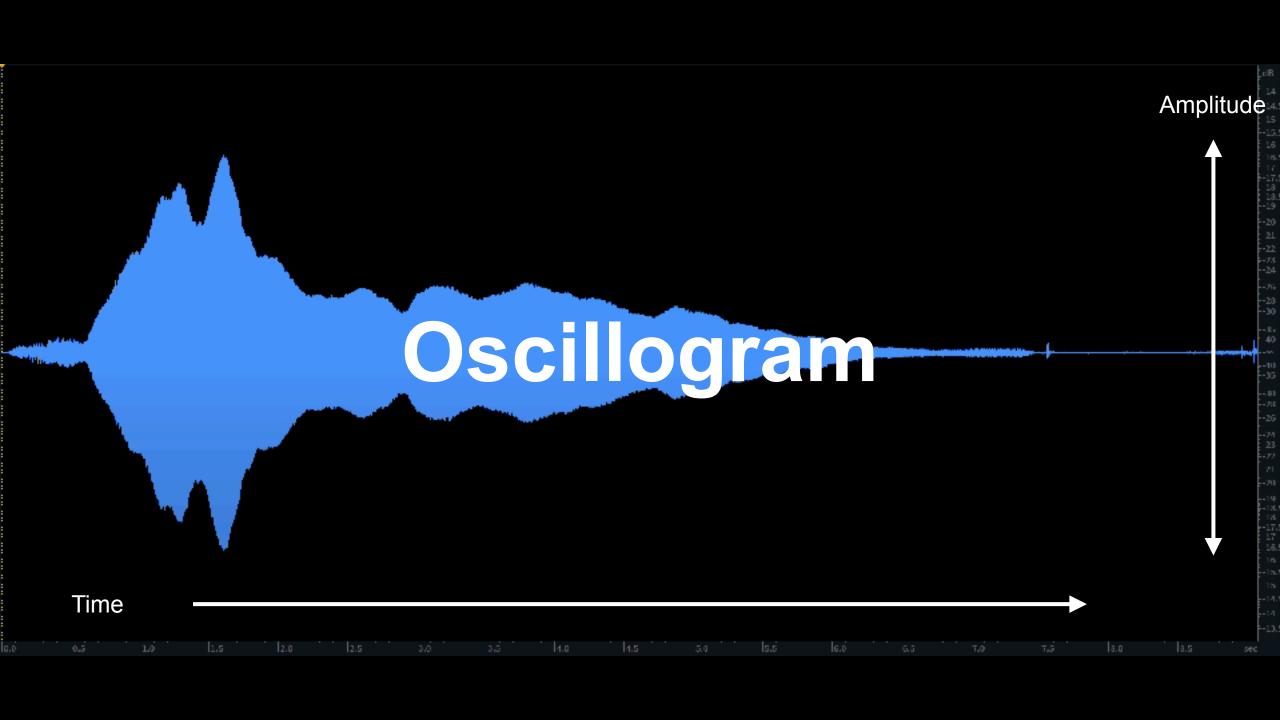
Thanks to Martine-Nicole Rojina sistermoon.space

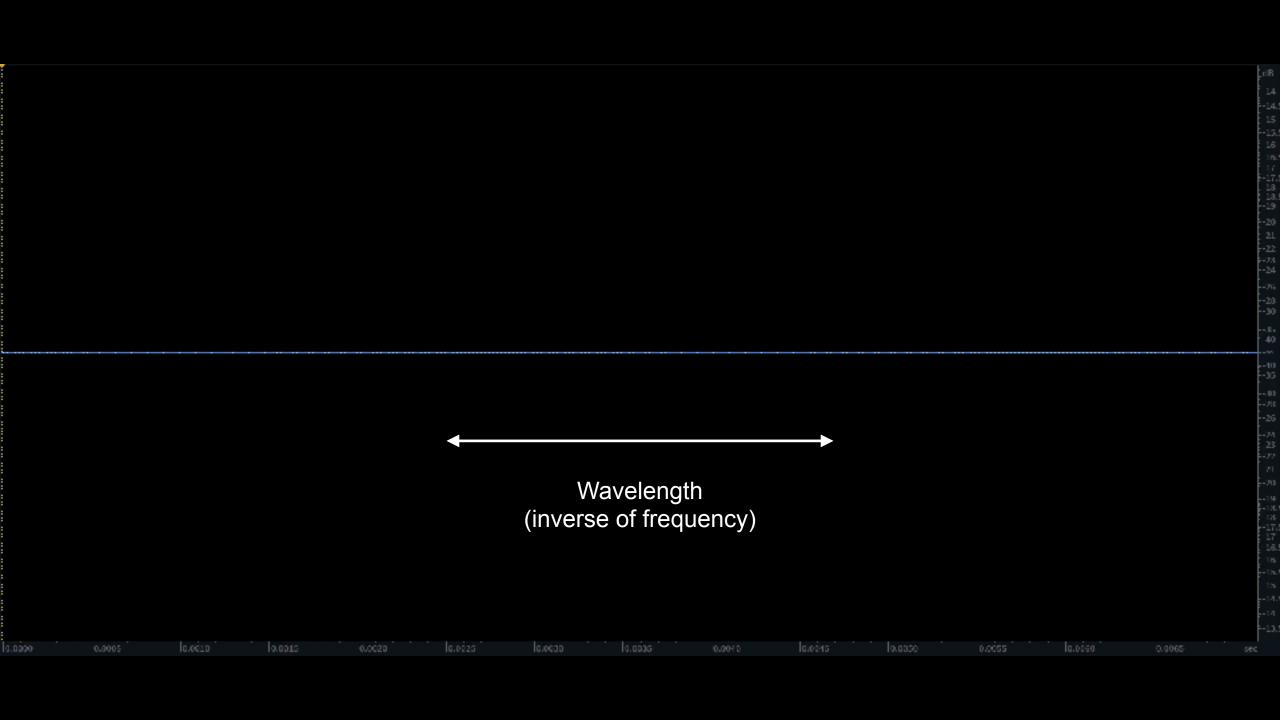


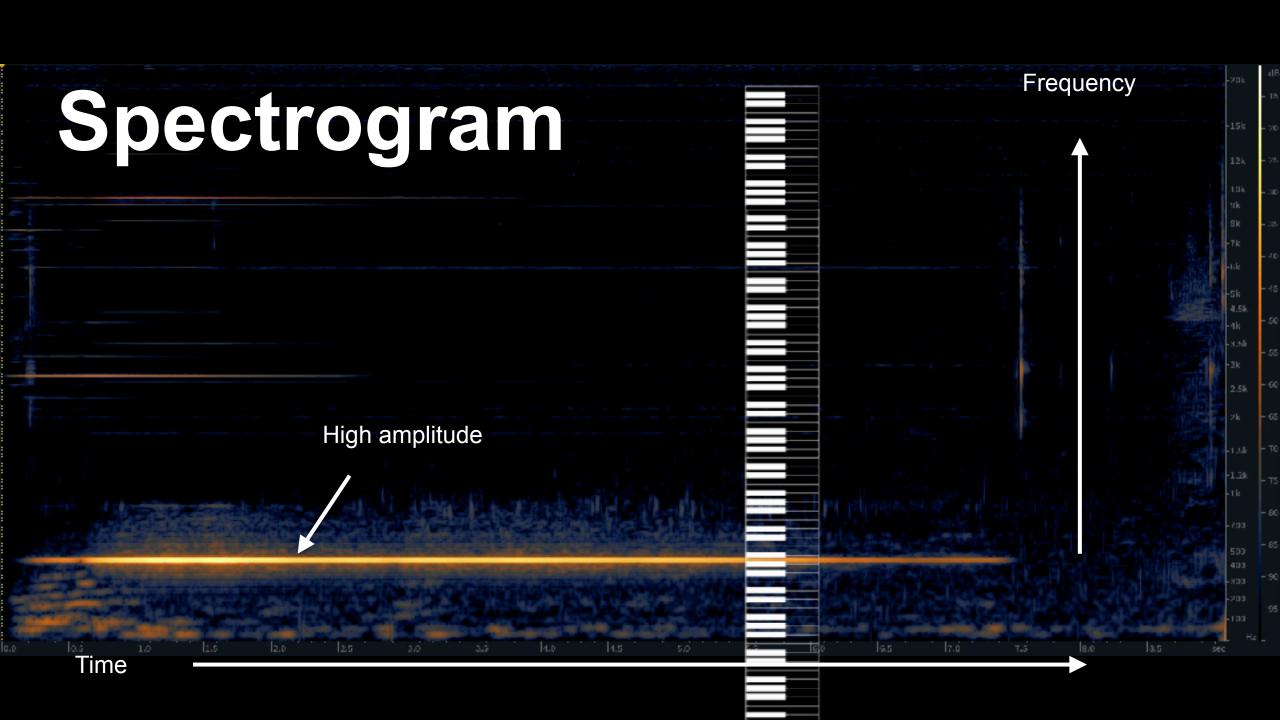
Voyager Golden Record

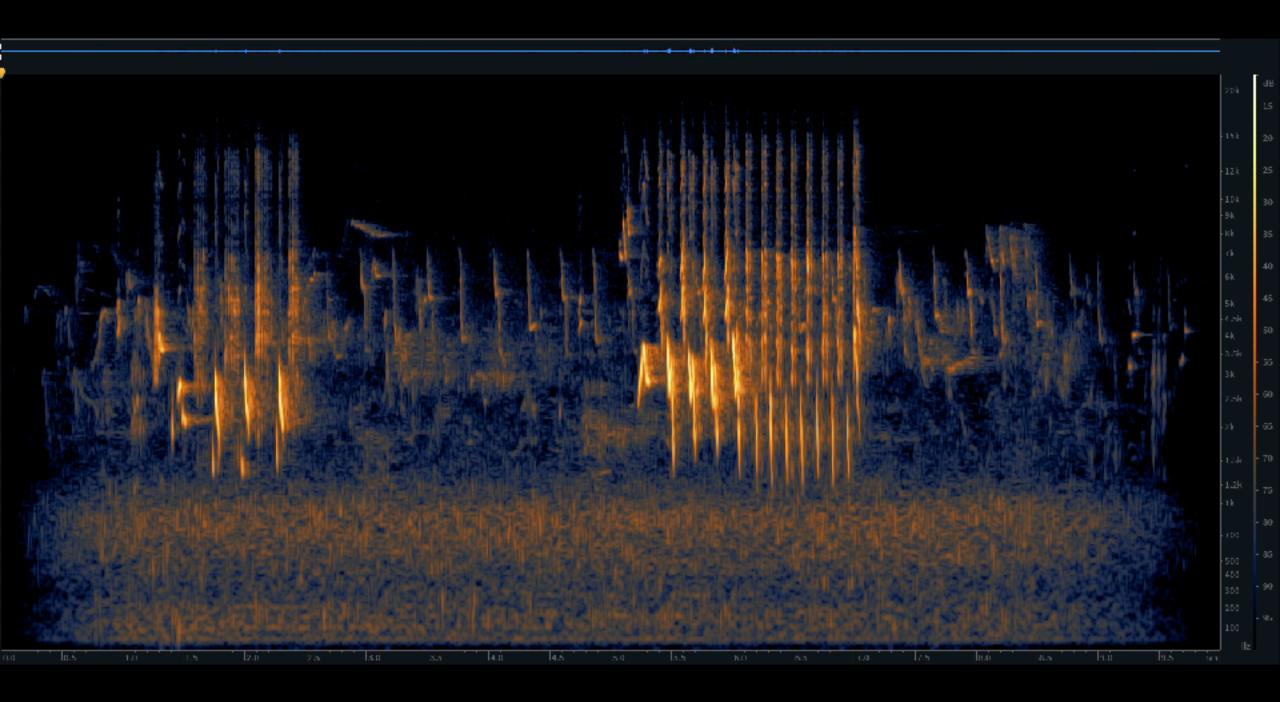
The Sonic Canvas

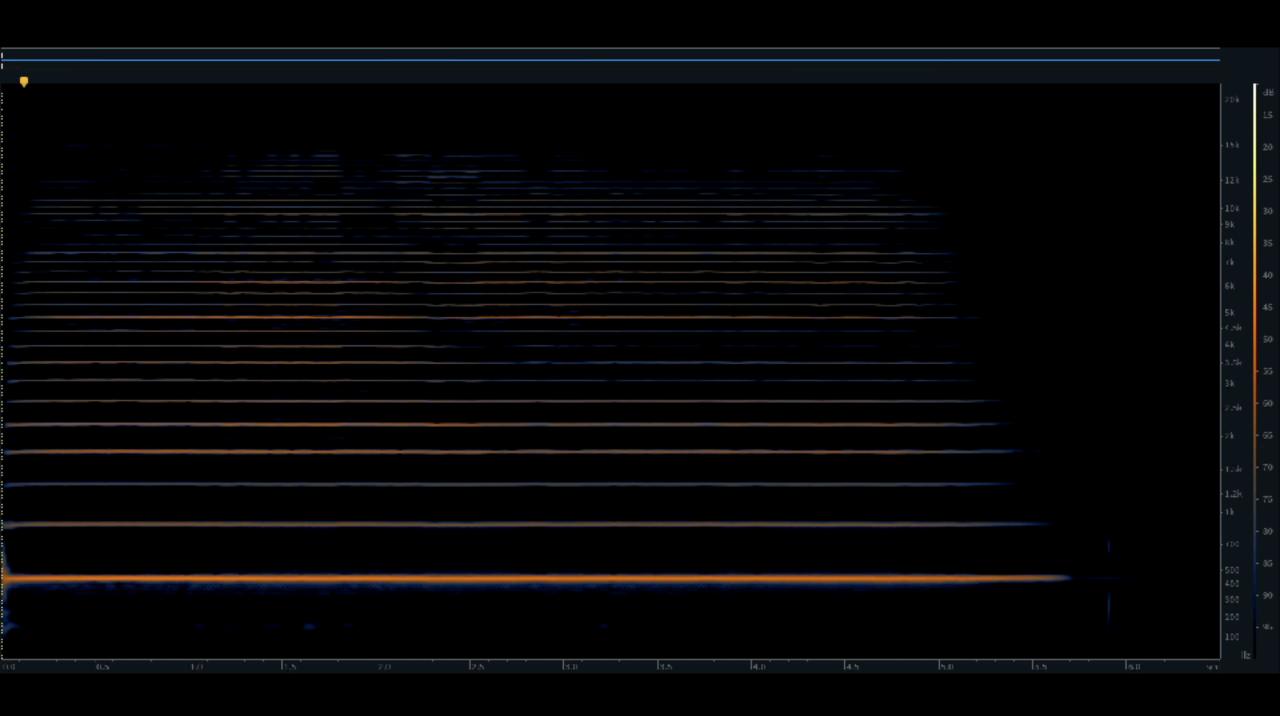
Making sense of sound

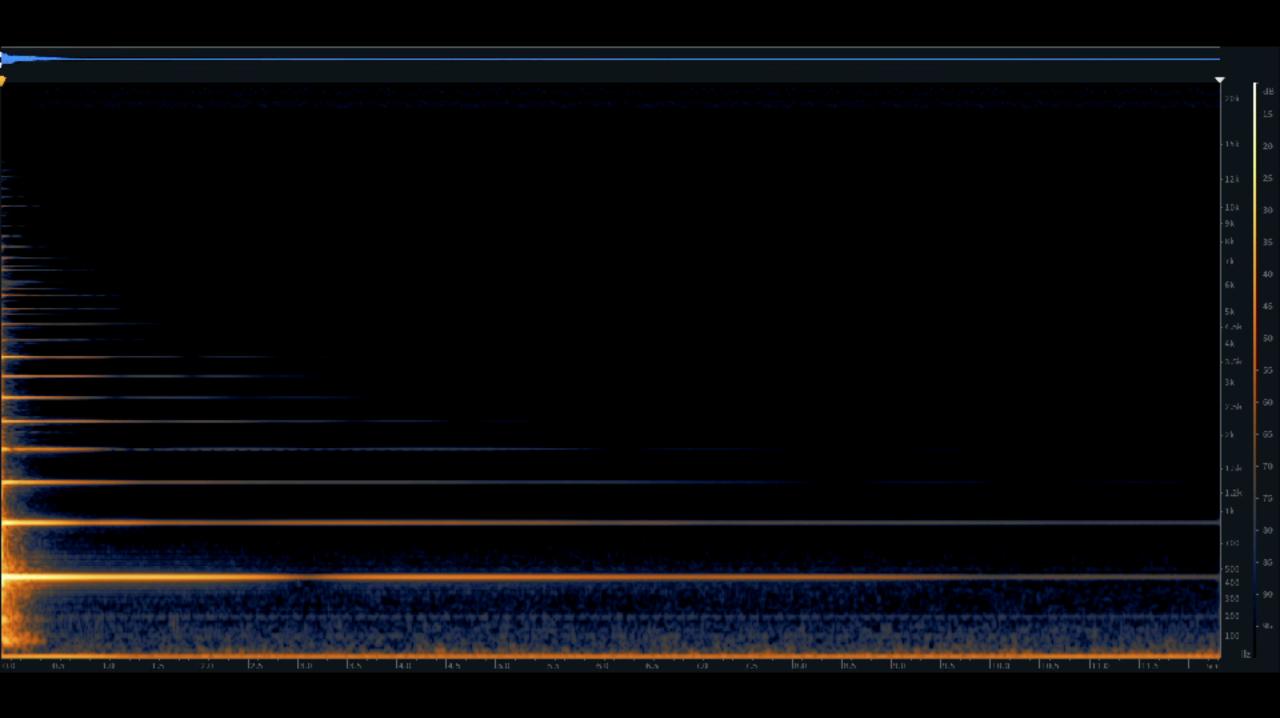


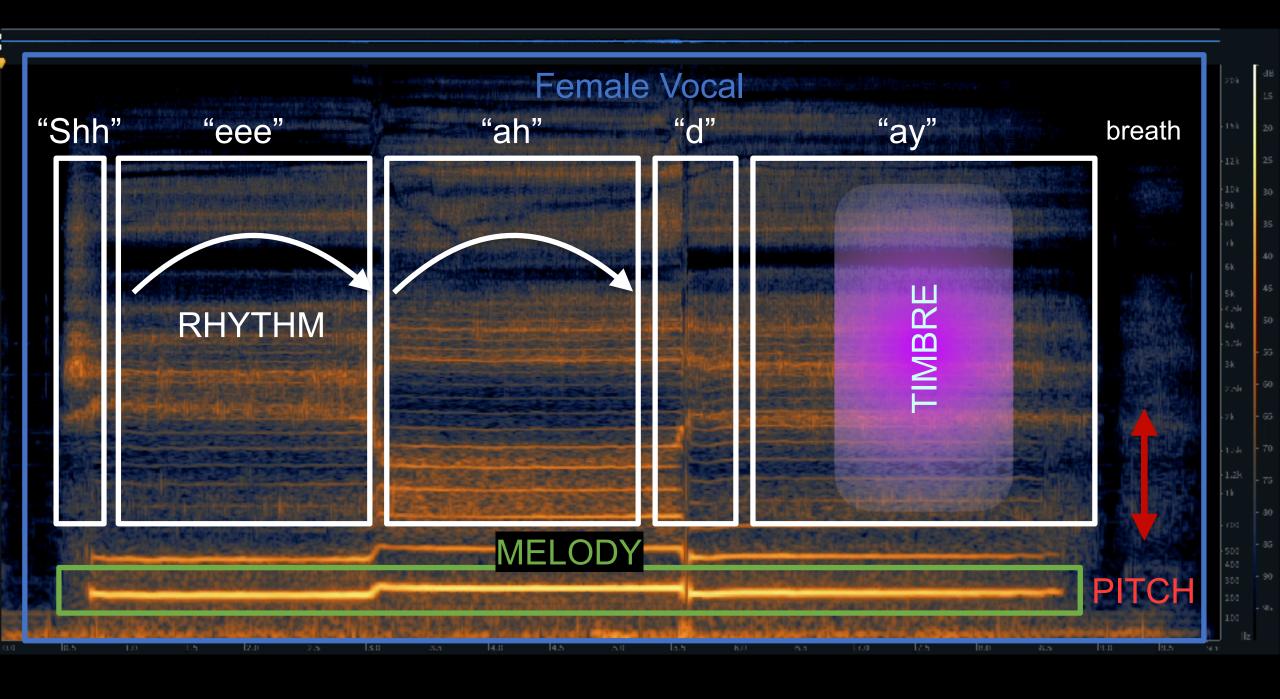


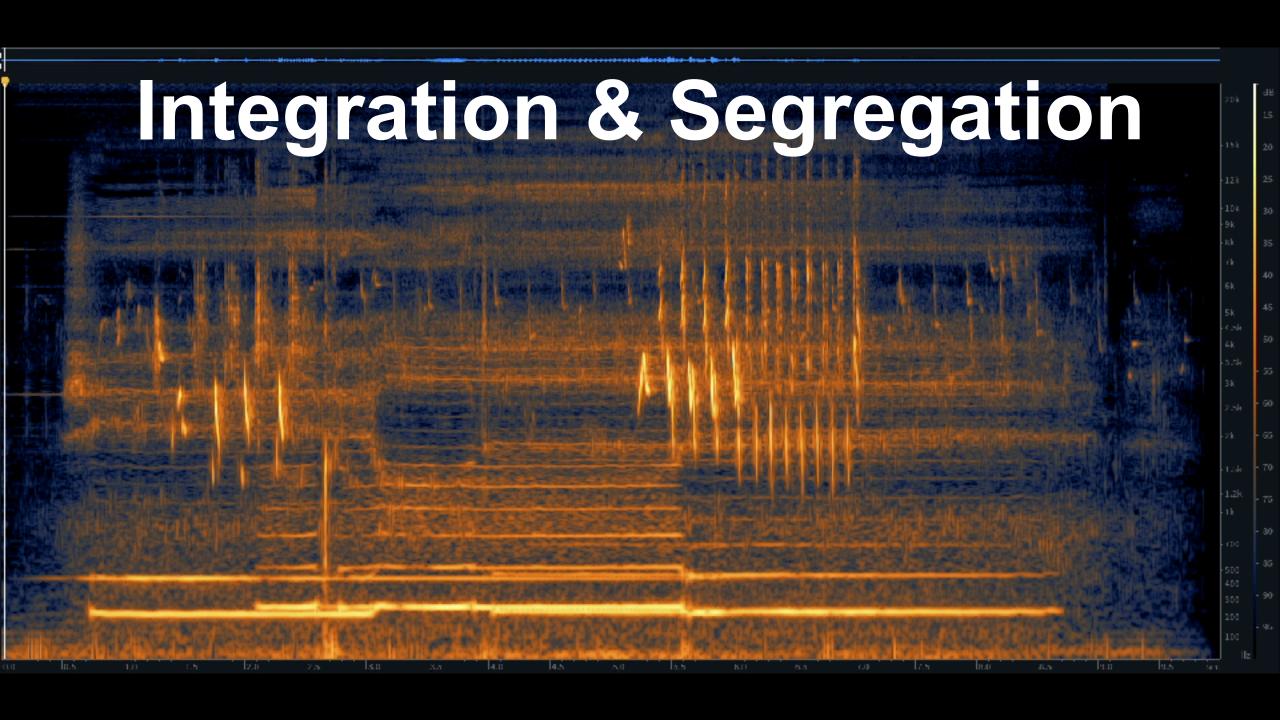












Green Needle

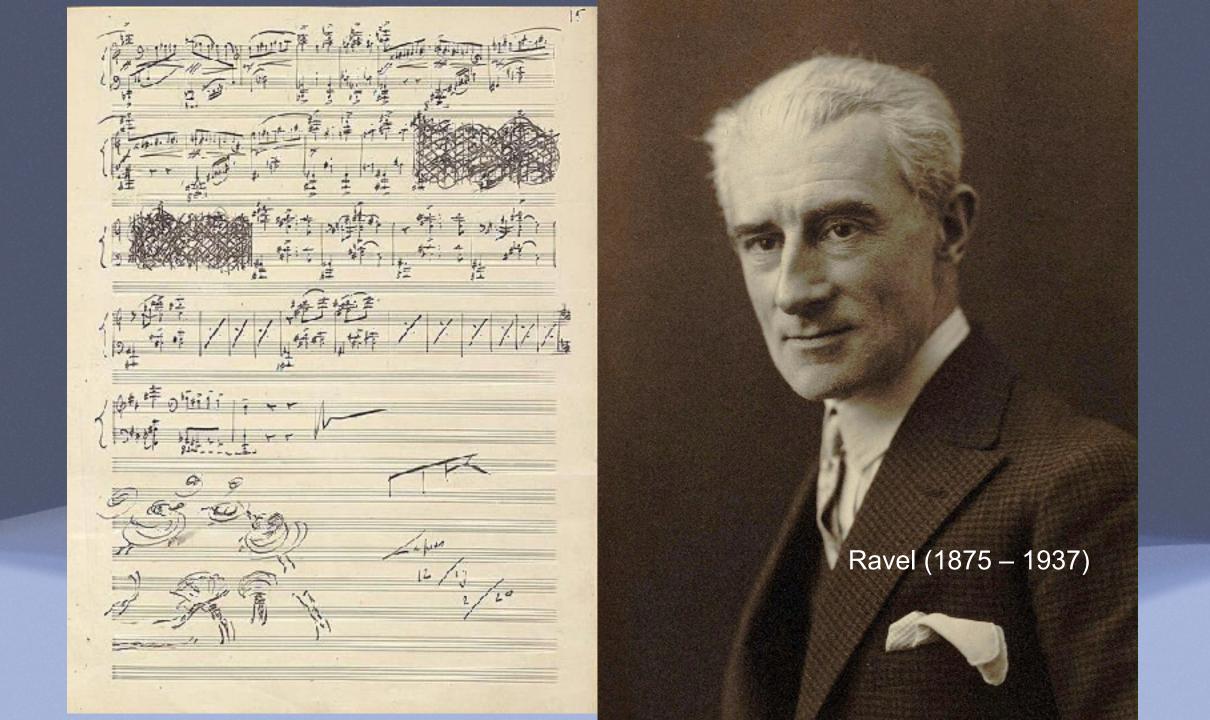
BrainStorm

Green Needle

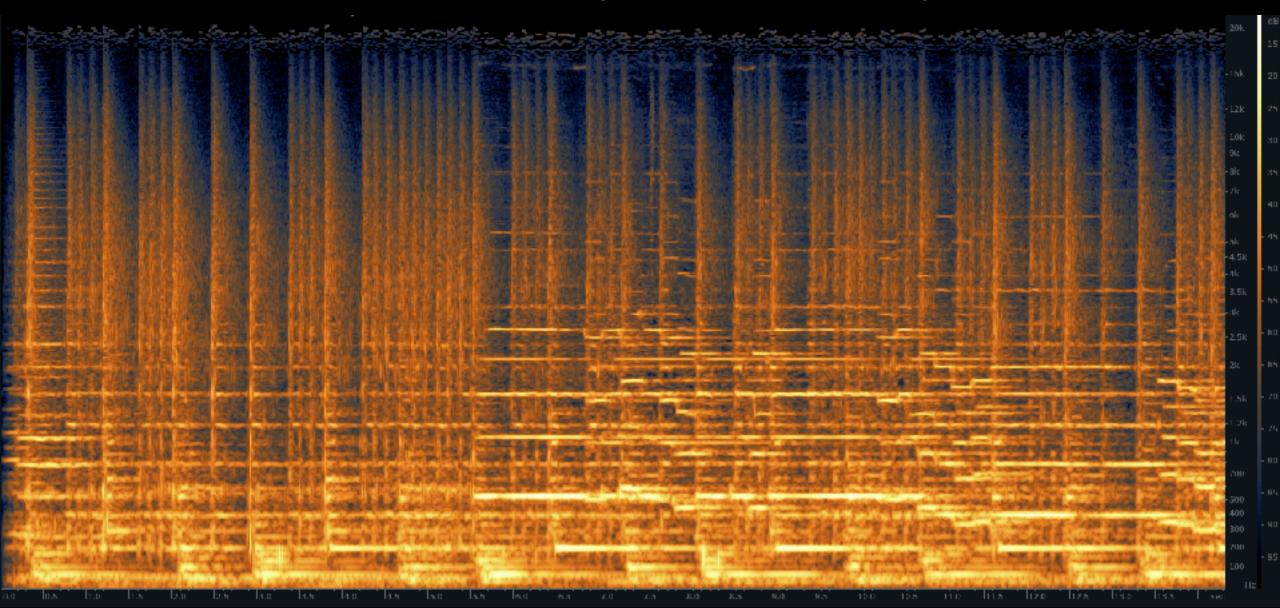
Brain Storm

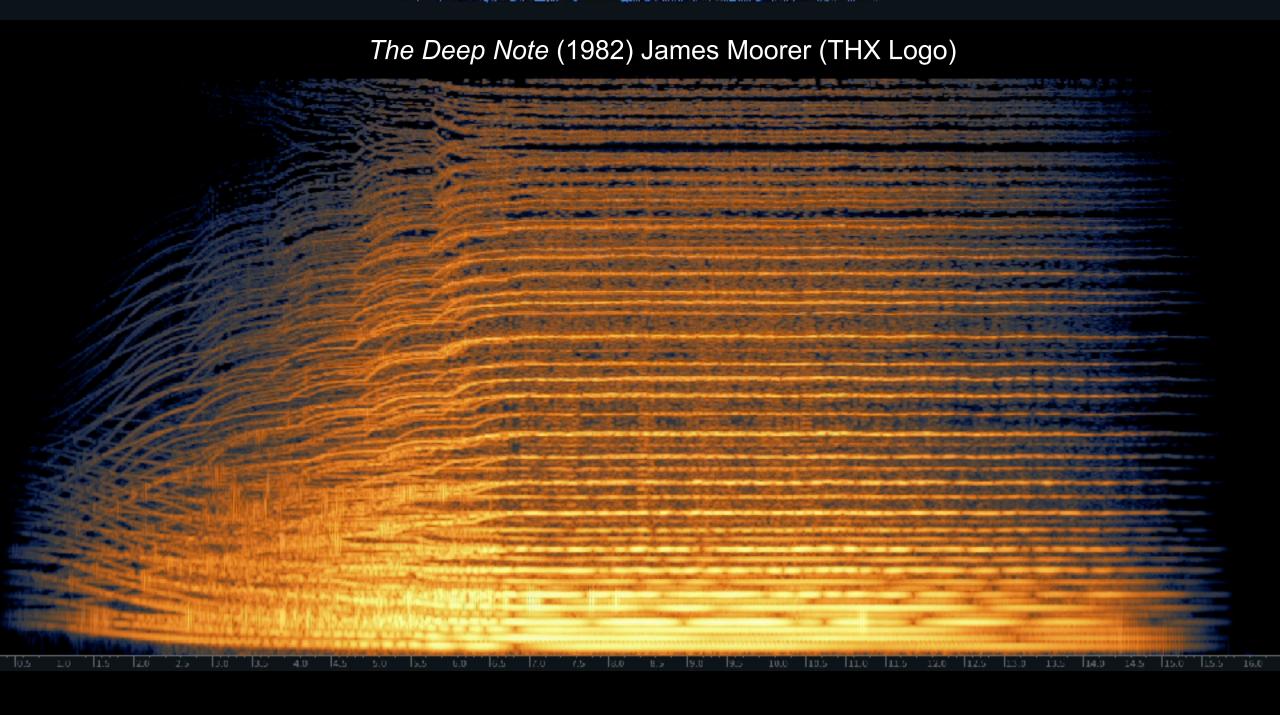
Listening is both

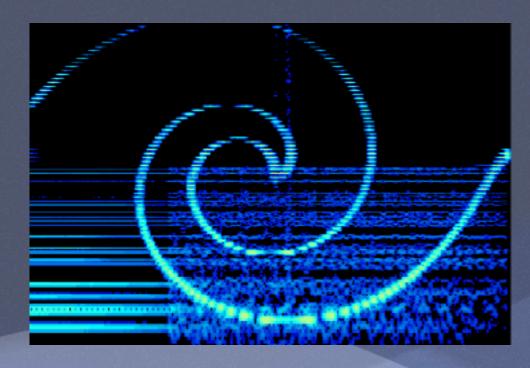
Bottom-up (afferent) and
Top-down (efferent)



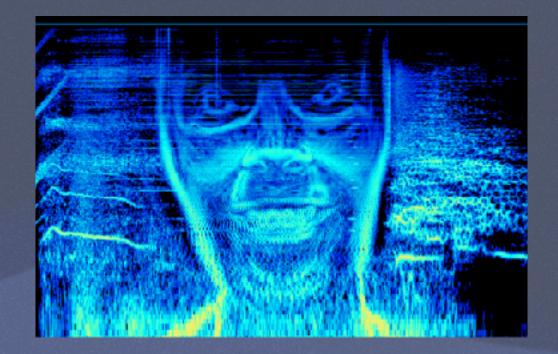
Boléro - Ravel (Section 9 - bar 165)







Aphex Twin Windowlicker



Aphex Twin ' $M\Delta_i^{-1} = -\alpha \sum D_i[\eta][\sum F_i[\eta-1] + Fext_i[\eta^{-1}]]$ '

The Gresham Spectrogram

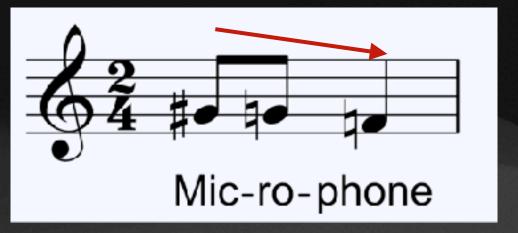
The Music of Language

Silver

Microphone

The silver microphone







Adapted from Chow & Brown (2018) A Musical Approach to Speech Melody

Is that my microphone?

Whose microphone is that?





Adapted from Chow & Brown (2018) A Musical Approach to Speech Melody

Speech Melody Acquisition

Infant Directed Speech (IDS)

That's a mic-ro-phone

That's microphone



Debussy – Quartet in G minor, Mvt. 1, 2nd theme





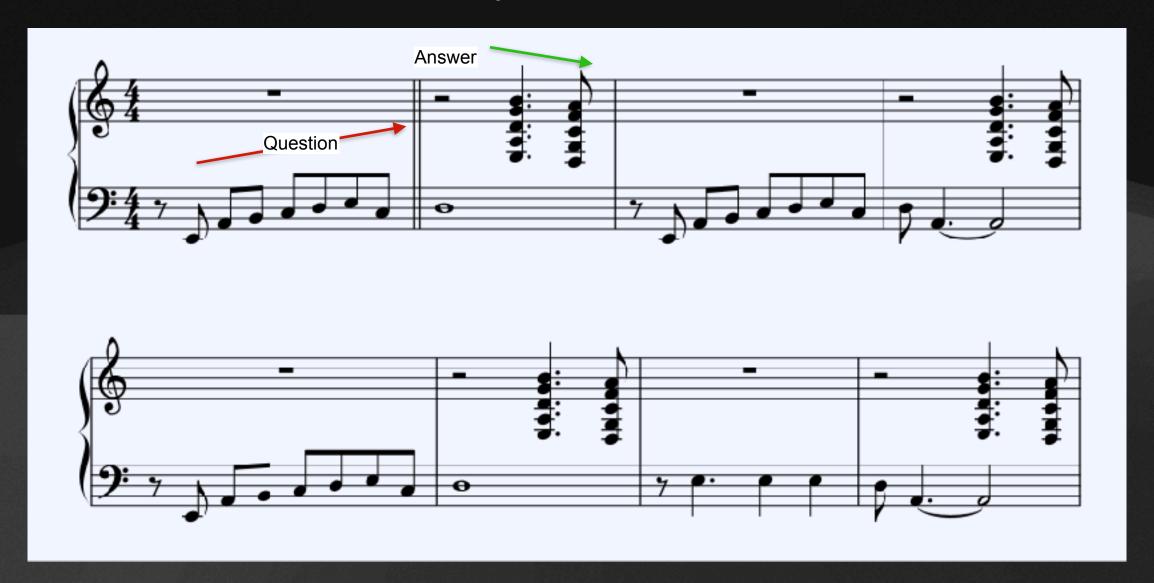


Elgar – Enigma Variations, X 'Dorabella'

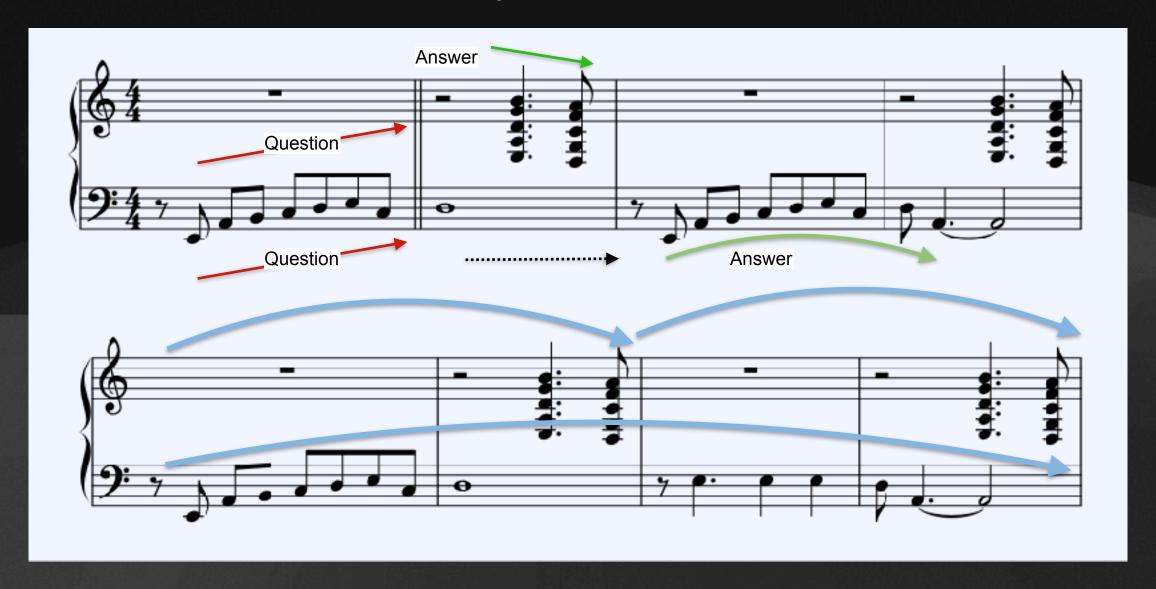


Elgar – Symphony No.1, Mvt. 4, 2nd theme

Recursive Call & Response in So What - Miles Davis



Recursive Call & Response in So What - Miles Davis



Sentence Structure

3

C

IDEA

REPETITION/ VARIATION

NEW IDEA

RESOLUTION

Mozart, K.331 mvt.1

The Language of Music 1

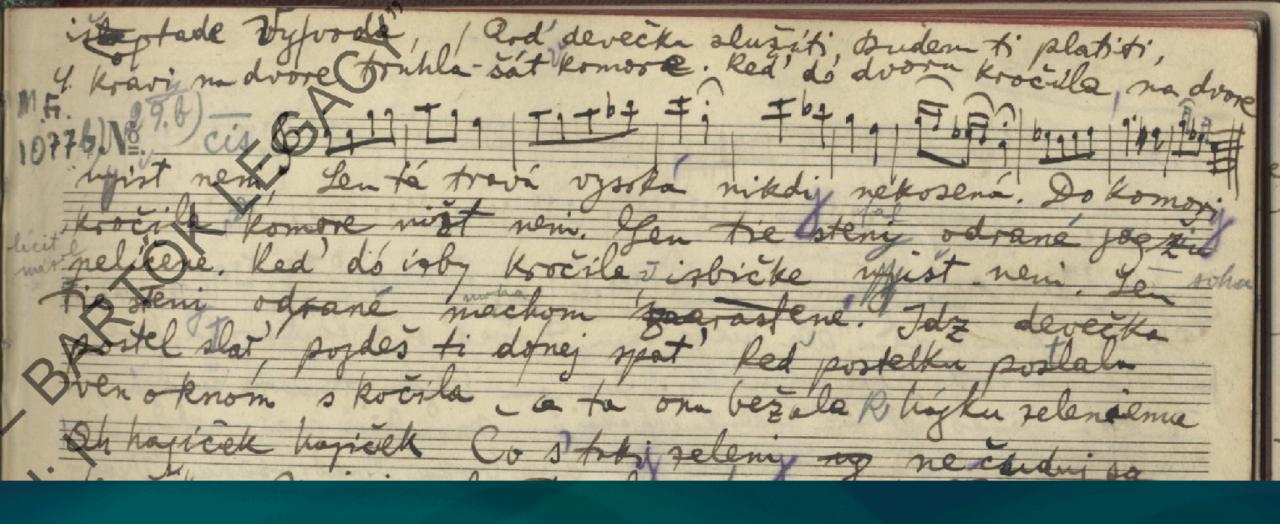






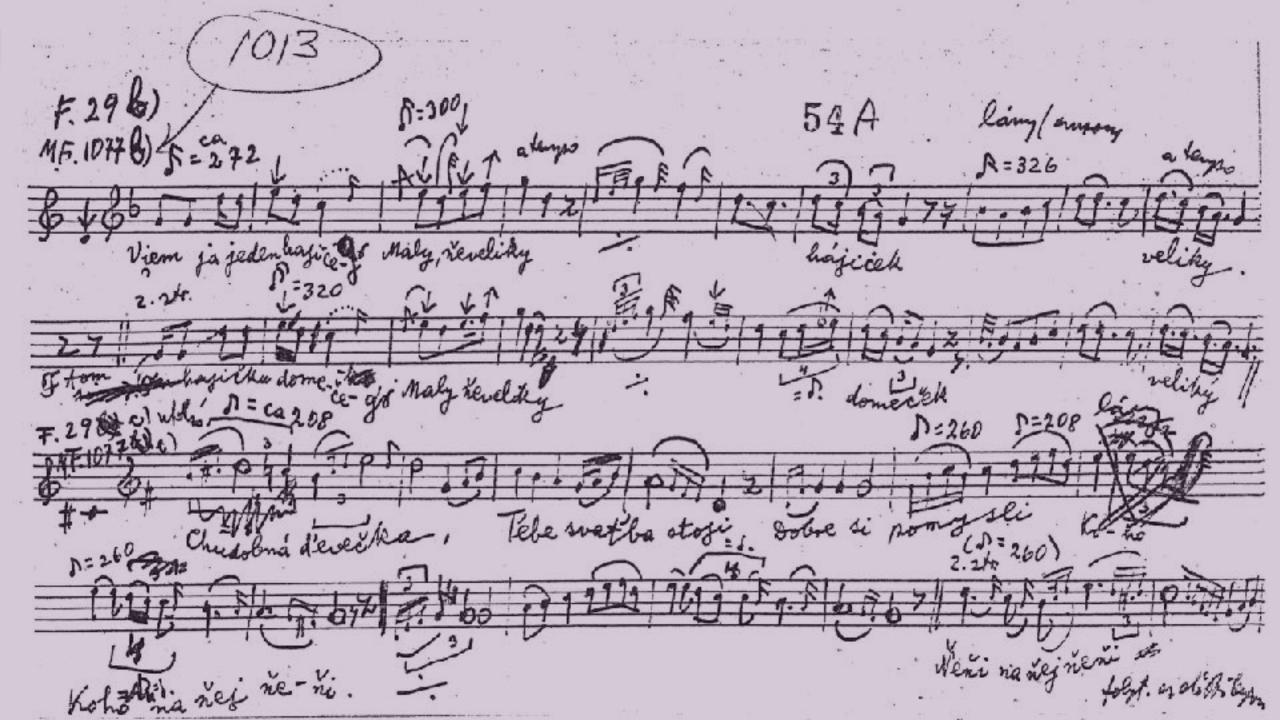


Béla Bartók recording Slovak folk songs in Zobordarázs with a phonograph in 1908 (Public domain)

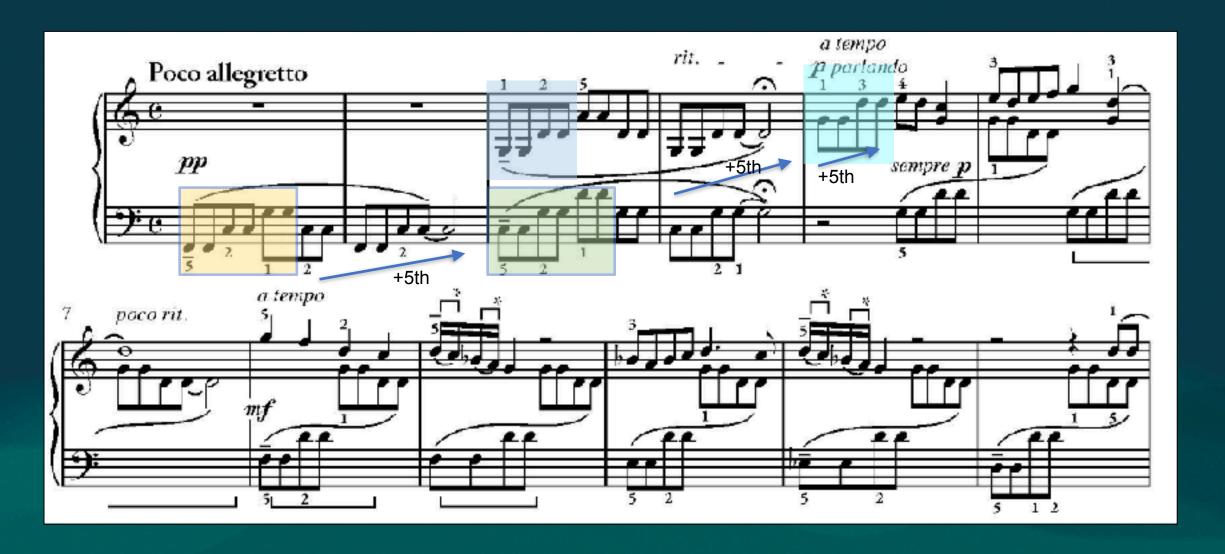


'I Know a Little Forest'

Performed by Matilda Kolárová (November 1907) in Nyitra county (now Western Slovakia)



For Children no.34 Románc BB53 (1908-11)



The Language of Music

Simple, likeable, robust, memorable, pluripotent geometries that survive retelling.

Tu, manu seserėlė "Oh My Sister"

A traditional wedding song from Anton Juszkiewicz's *Melodje ludowe litewskie an* anthology of Lithuanian melodies (Number 157)



Tu, manu seserėlė "Oh My Sister"

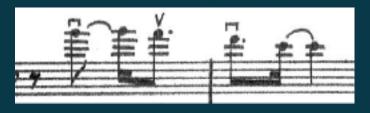


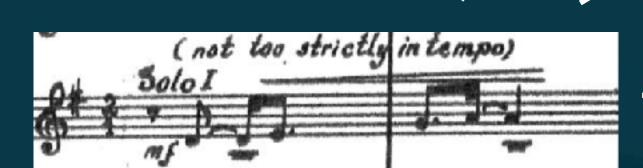


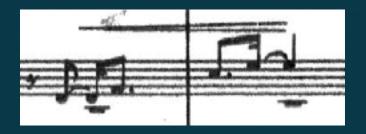
The opening bassoon melody of Stravinsky's The Rite of Spring

Motivic flexibility in Gershwin's I Got Rhythm Variations











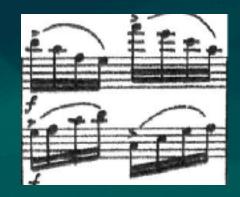






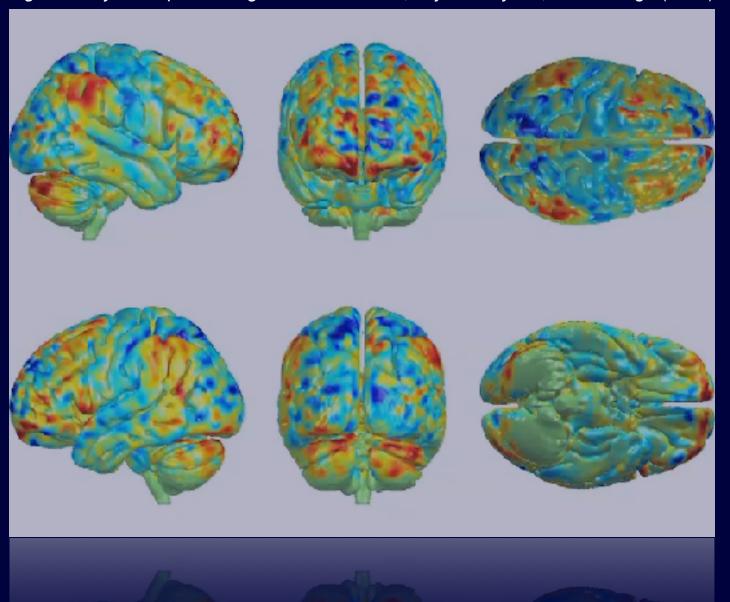


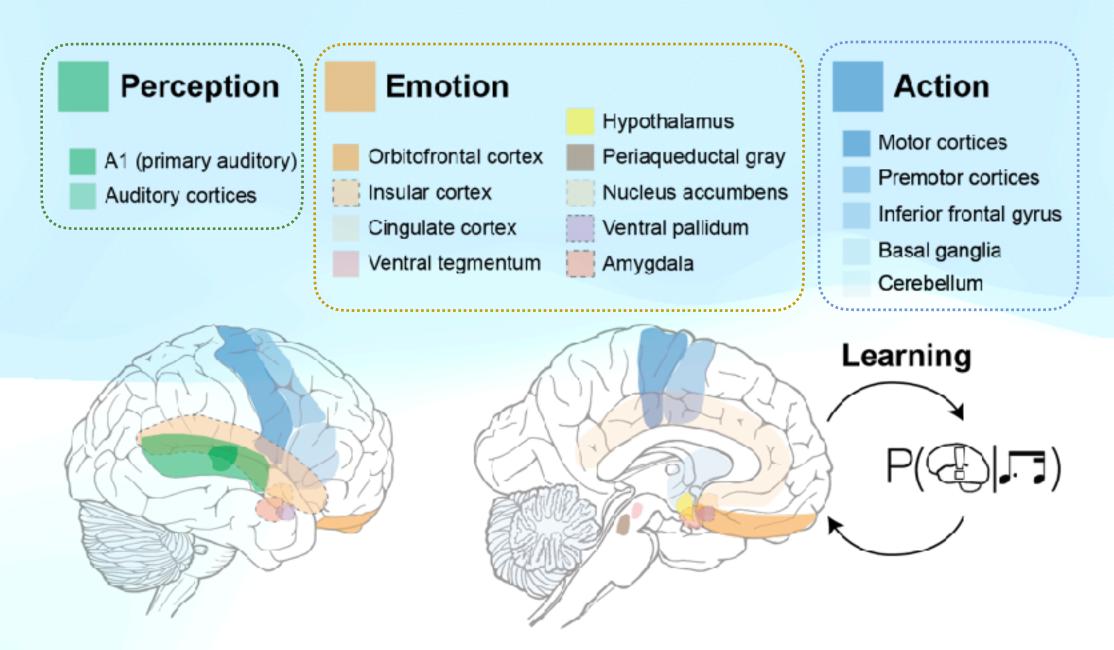




The Language of Emotions

Alluri V, Toiviainen P, Jääskeläinen IP, Glerean E, Sams M & Brattico E, *Large-scale brain networks emerge from dynamic processing of musical timbre, key and rhythm,* Neurolmage (2012)





Vuust, P., Heggli, O.A., Friston, K.J. & Kringelbach, M.L. (2022) Music in the brain. Nat Rev Neurosci 23, 287–305. https://doi.org/10.1038/s41583-022-00578-5

BRECVEMA theoretical framework

Patrik Juslin & Daniel Västfjall (2008)

Juslin, Liljeström, Västfjäll, & Lundqvist. (2010)

Brain Stem Reflex

Rhythmic Entrainment

Evaluative Conditioning

Emotional Contagion

Visual Imagery

Episodic memory

Musical expectancy

Aesthetic Judgement

BRECVEMA theoretical framework

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Brain Stem Reflex

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sual Imagery

Episodic memory

Musical expectancy

Aesthetic Judgement

EVERBEAM

*acronym discovered by Tate ≈2017

- Episodic memory
- Visual Imagery
- Emotional Contagion
- Rhythmic Entrainment
- **Brain Stem Reflex**
- Evaluative Conditioning
- Aesthetic Judgement
- **M**usical expectancy

Episodic memory Recollection, narrative of self 3-4 yrs

Visual Imagery

Emotional Contagion

survive

genelobuer.

Rhythmic Entrainment

Brain Stem Reflex

Evaluative Conditioning

Aesthetic Judgement

Musical expectancy

Episodic memory Recollection, narrative of self 3-4 yrs

Visual Imagery Internal simulation of reality Pre-school

Emotional Contagion

Rhythmic Entrainment

Brain Stem Reflex

Evaluative Conditioning

Aesthetic Judgement

Musical expectancy

- Episodic memory Recollection, narrative of self 3-4 yrs
- Visual Imagery Internal simulation of reality Pre-school
- Emotional Contagion Social cohesion & bonding Yr.1
- Rhythmic Entrainment
- **Brain Stem Reflex**
- **Evaluative Conditioning**
- Aesthetic Judgement
- Musical expectancy

- Episodic memory Recollection, narrative of self 3-4 yrs
- Visual Imagery Internal simulation of reality Pre-school
- Emotional Contagion Social cohesion & bonding Yr.1
- Rhythmic Entrainment Coordination, communion Pre-birth
- **Brain Stem Reflex**
- **Evaluative Conditioning**
- Aesthetic Judgement
- Musical expectancy

- Episodic memory Recollection, narrative of self 3-4 yrs
- Visual Imagery Internal simulation of reality Pre-school
- Emotional Contagion Social cohesion & bonding Yr.1
- Rhythmic Entrainment Coordination, communion Pre-birth
- Brain Stem Reflex Alertness to nearby important events Pre-birth
- **Evaluative Conditioning**
- Aesthetic Judgement
- Musical expectancy

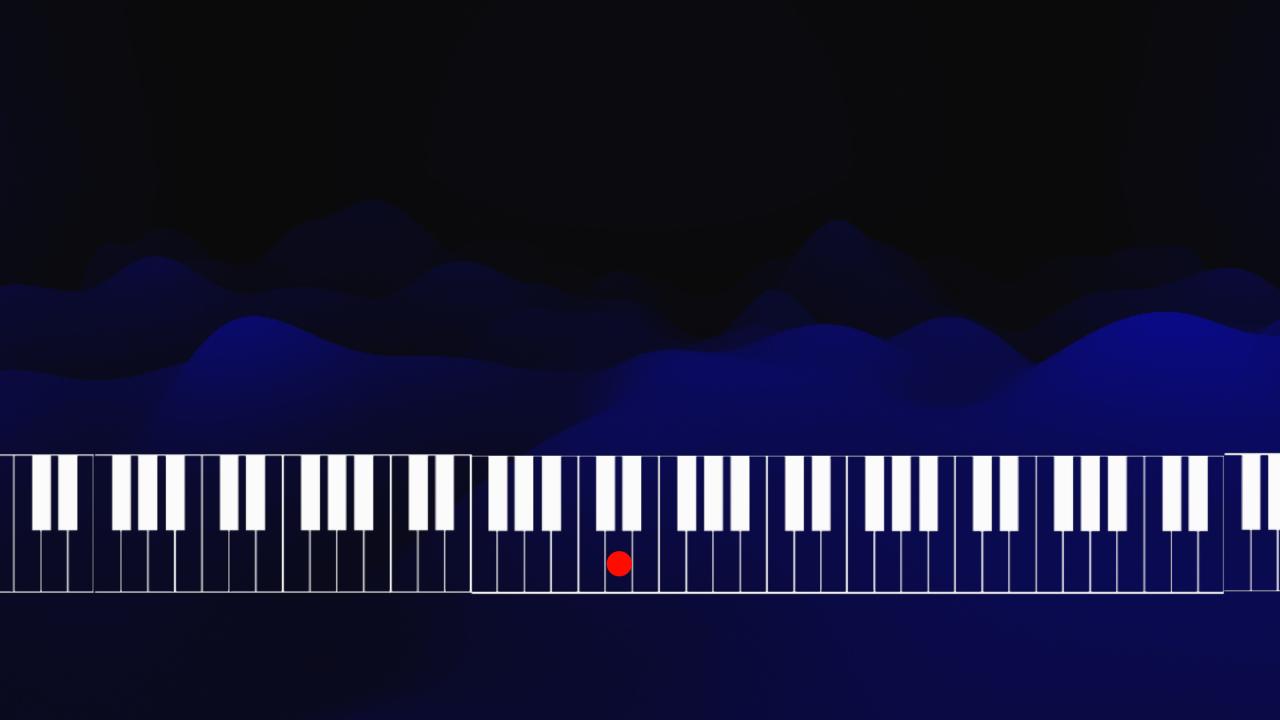
- Episodic memory Recollection, narrative of self 3-4 yrs
- Visual Imagery Internal simulation of reality Pre-school
- Emotional Contagion Social cohesion & bonding Yr.1
- Rhythmic Entrainment Coordination, communion Pre-birth
- Brain Stem Reflex Alertness to nearby important events Pre-birth
- Evaluative Conditioning ± associations of events/objects Pre-birth
- Aesthetic Judgement
- Musical expectancy

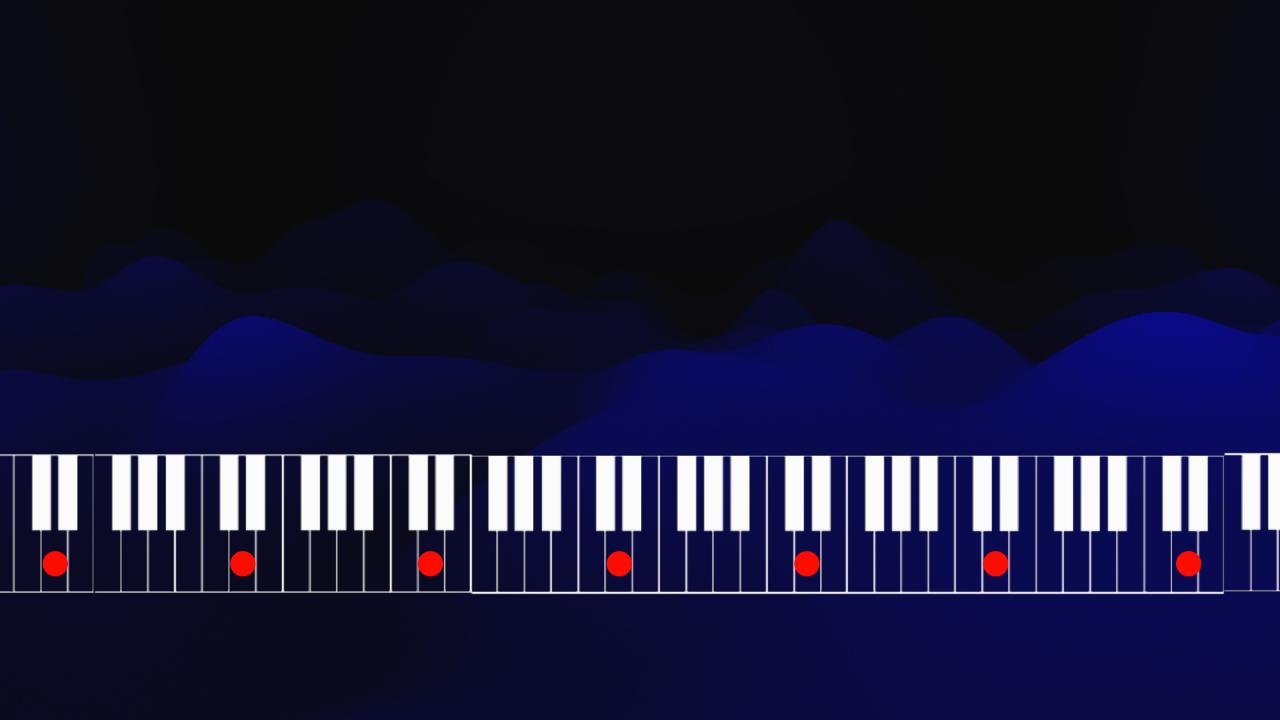
- Episodic memory Recollection, narrative of self 3-4 yrs
- Visual Imagery Internal simulation of reality Pre-school
- Emotional Contagion Social cohesion & bonding Yr.1
- Rhythmic Entrainment Coordination, communion Pre-birth
- Brain Stem Reflex Alertness to nearby important events Pre-birth
- Evaluative Conditioning ± associations of events/objects Pre-birth
- Aesthetic Judgement Recognition of beauty & value 3-4 yrs
- Musical expectancy

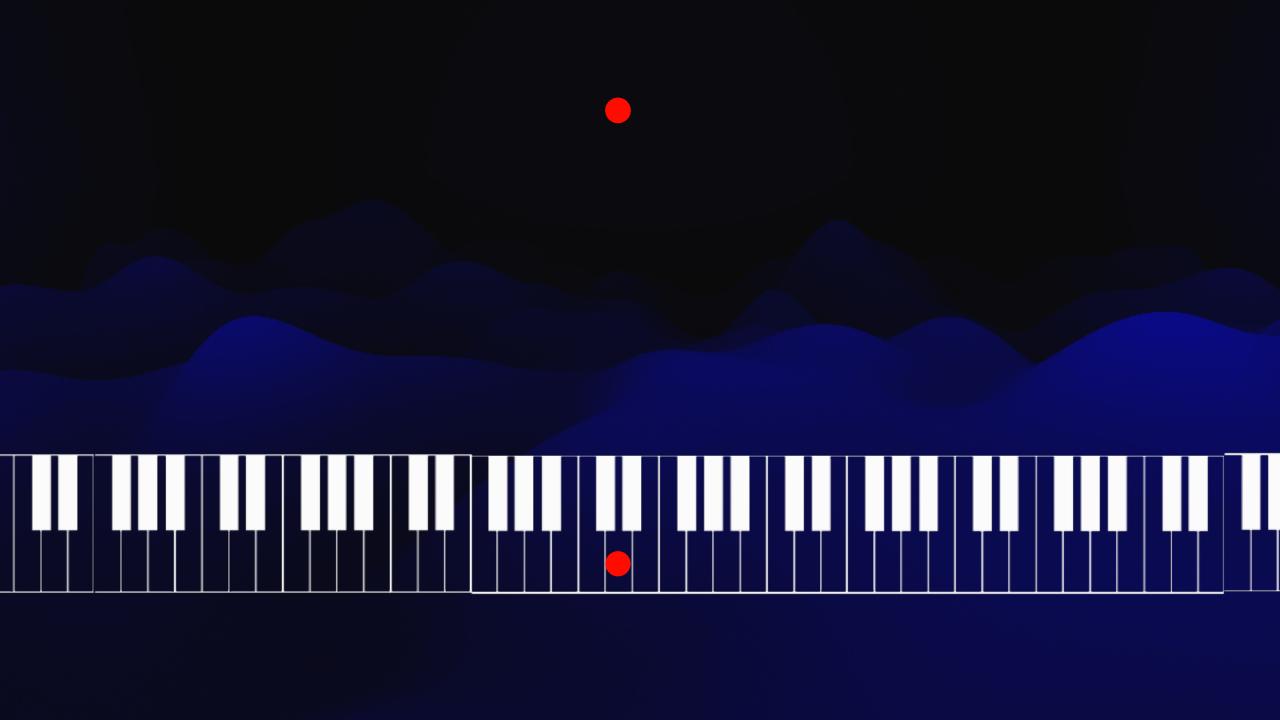
- Episodic memory Recollection, narrative of self 3-4 yrs
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- Rhythmic Entrainment Coordination, communion Pre-birth
- Brain Stem Reflex Alertness to nearby important events Pre-birth
- Evaluative Conditioning ± associations of events/objects Pre-birth
- Aesthetic Judgement recognition of beauty & value 3-4 yrs
- Musical expectancy Predicting events and complex semantics 5-11yrs

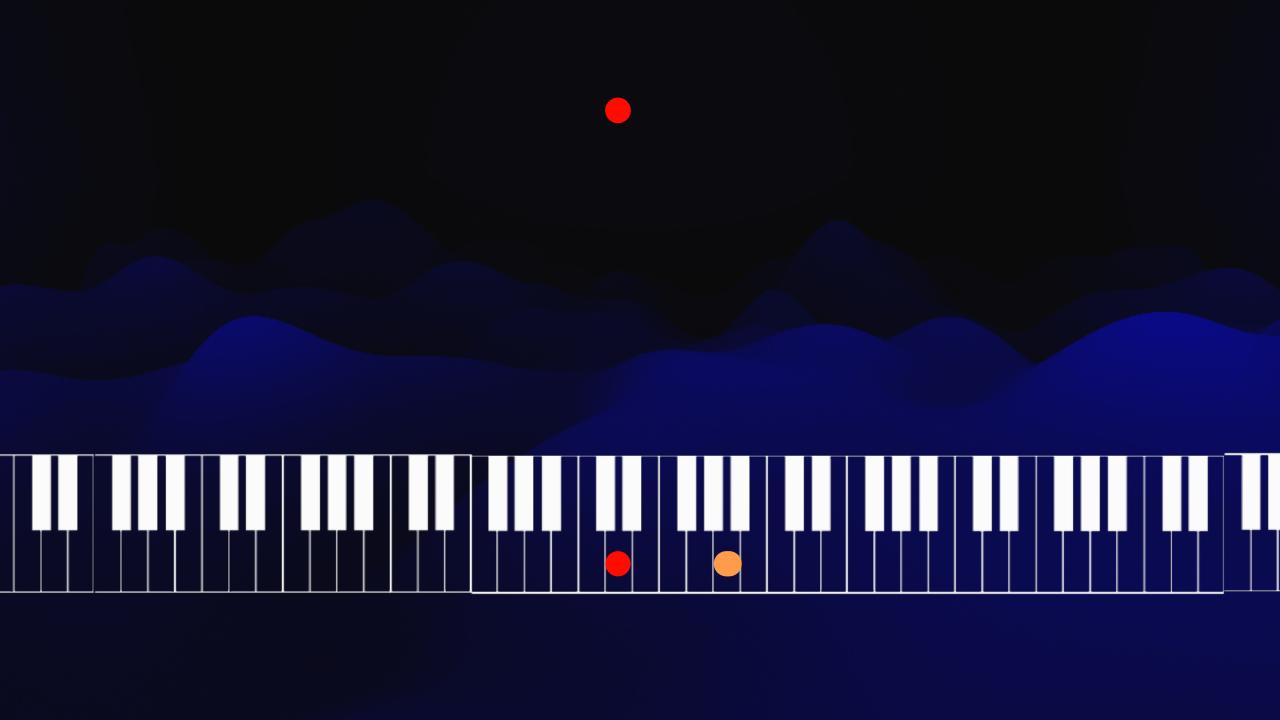
Musical expectancy

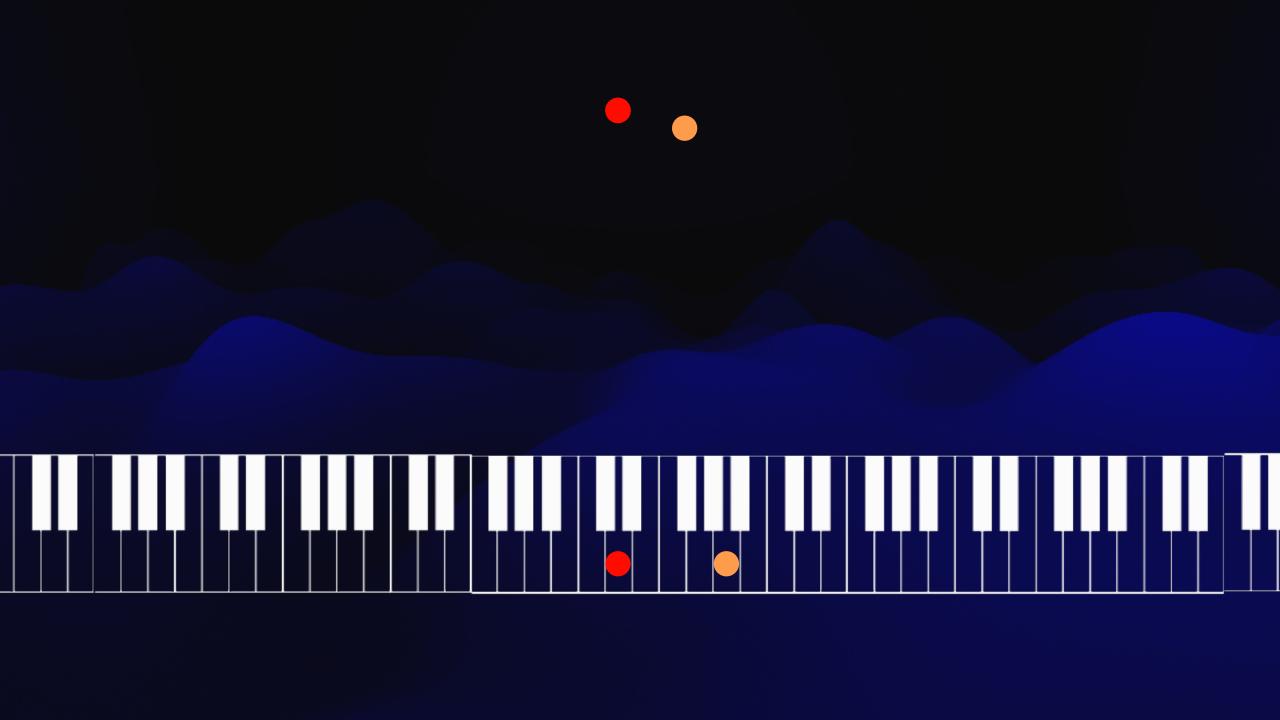


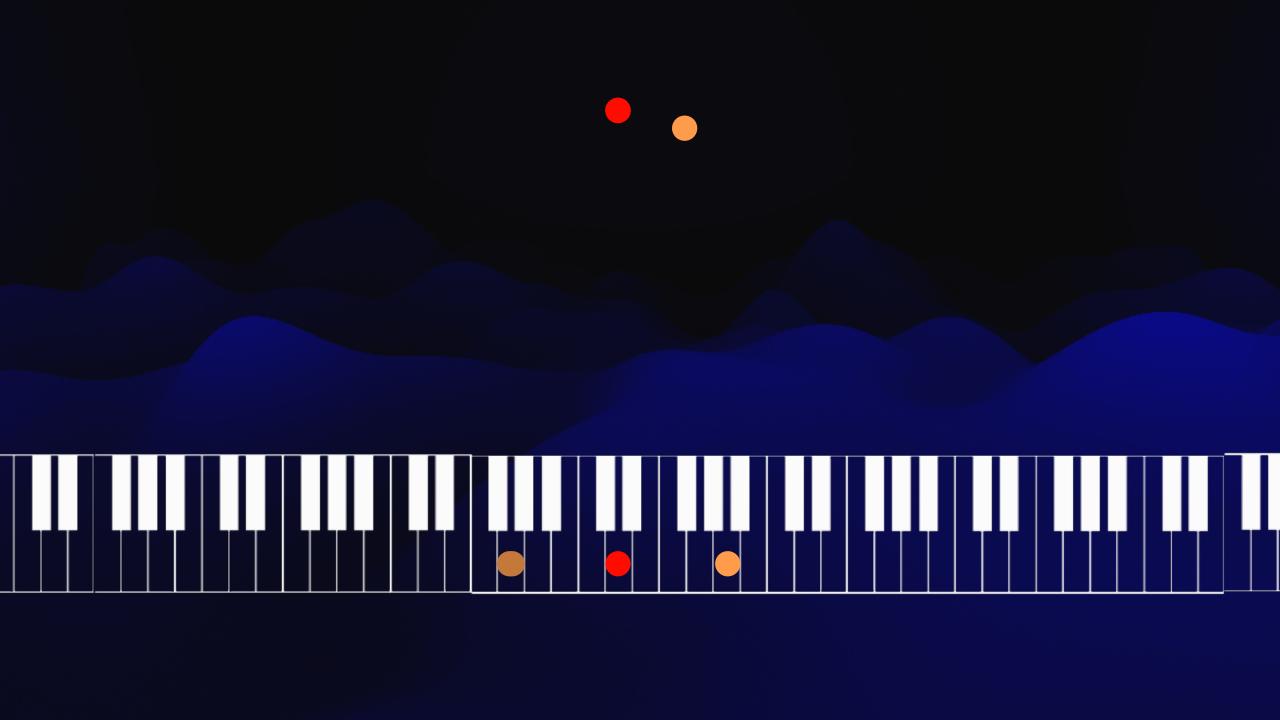




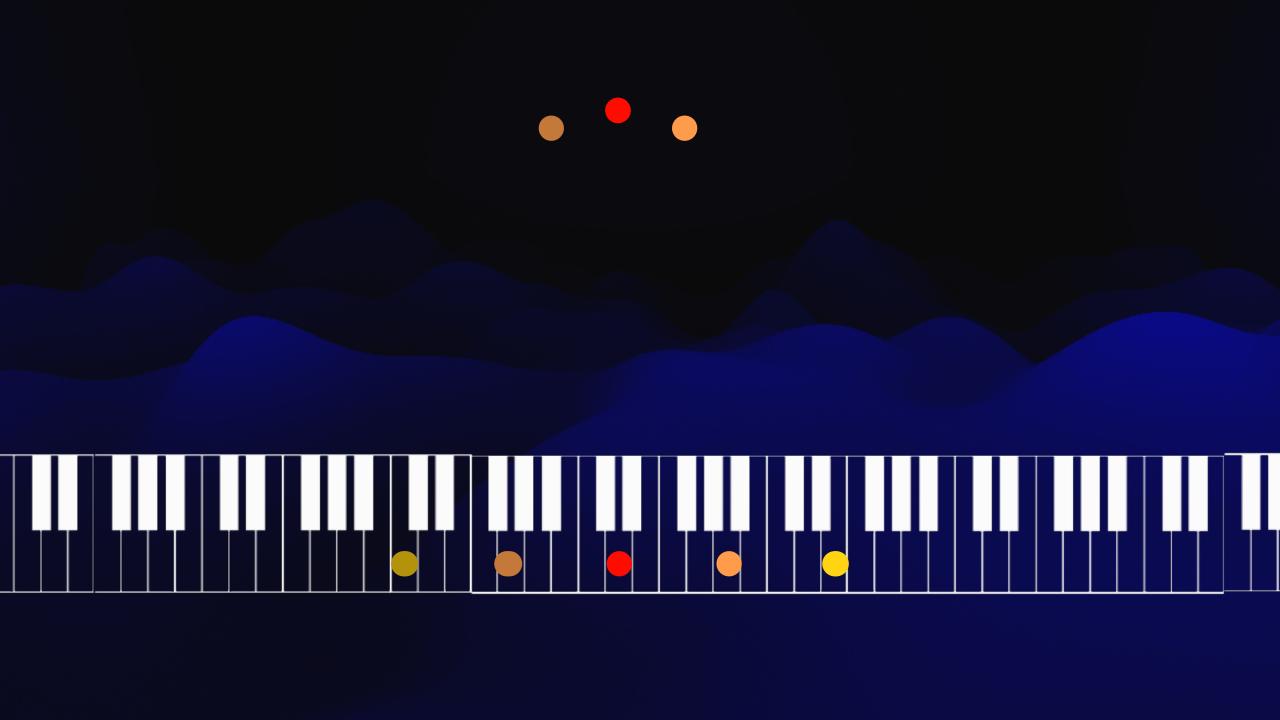


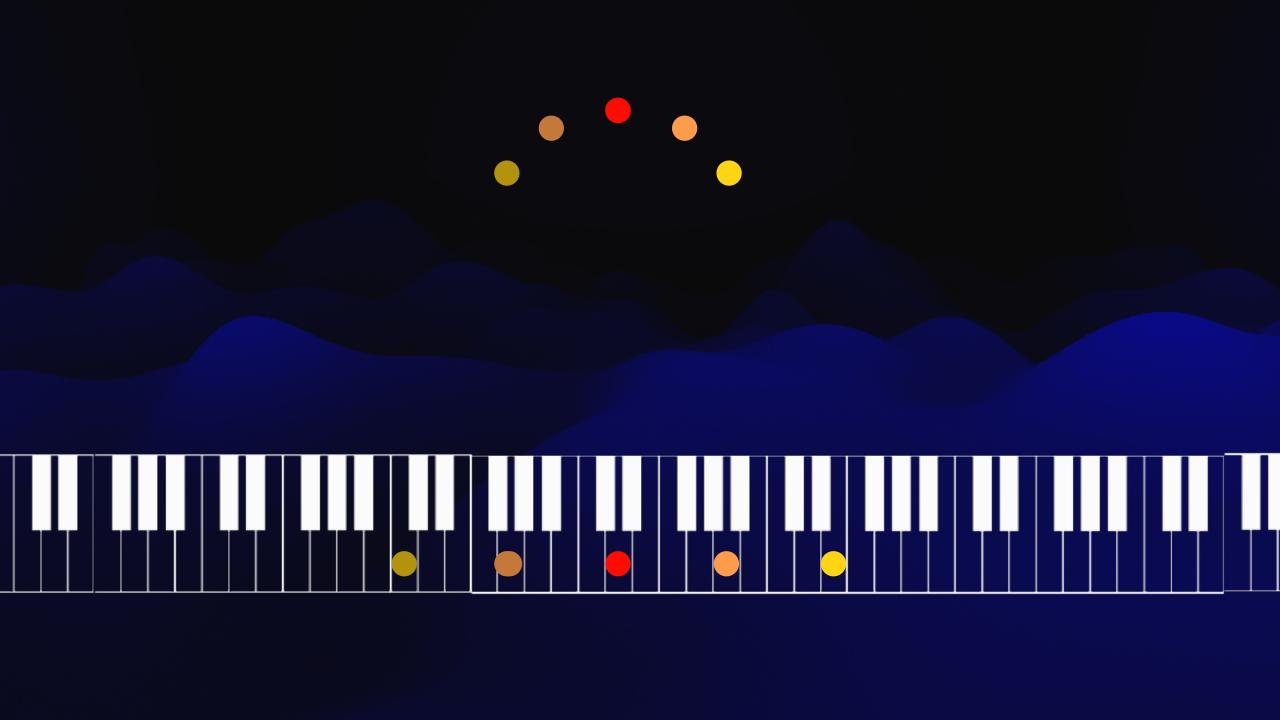


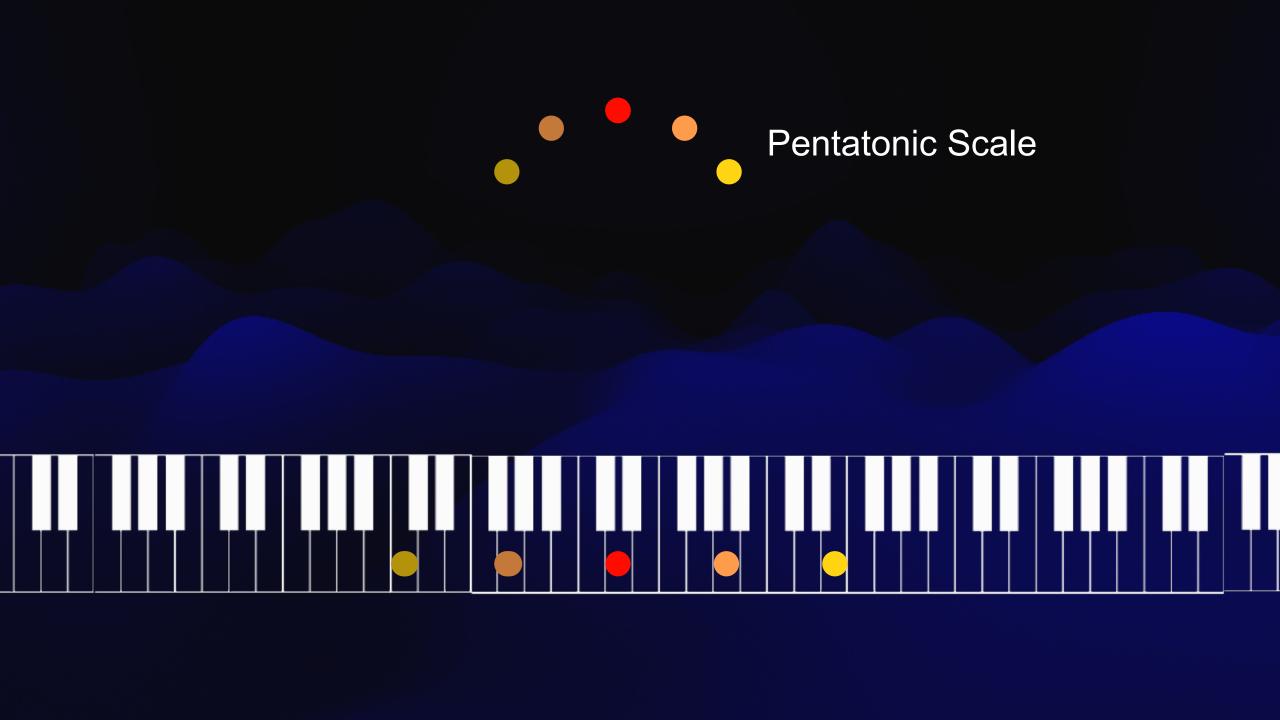


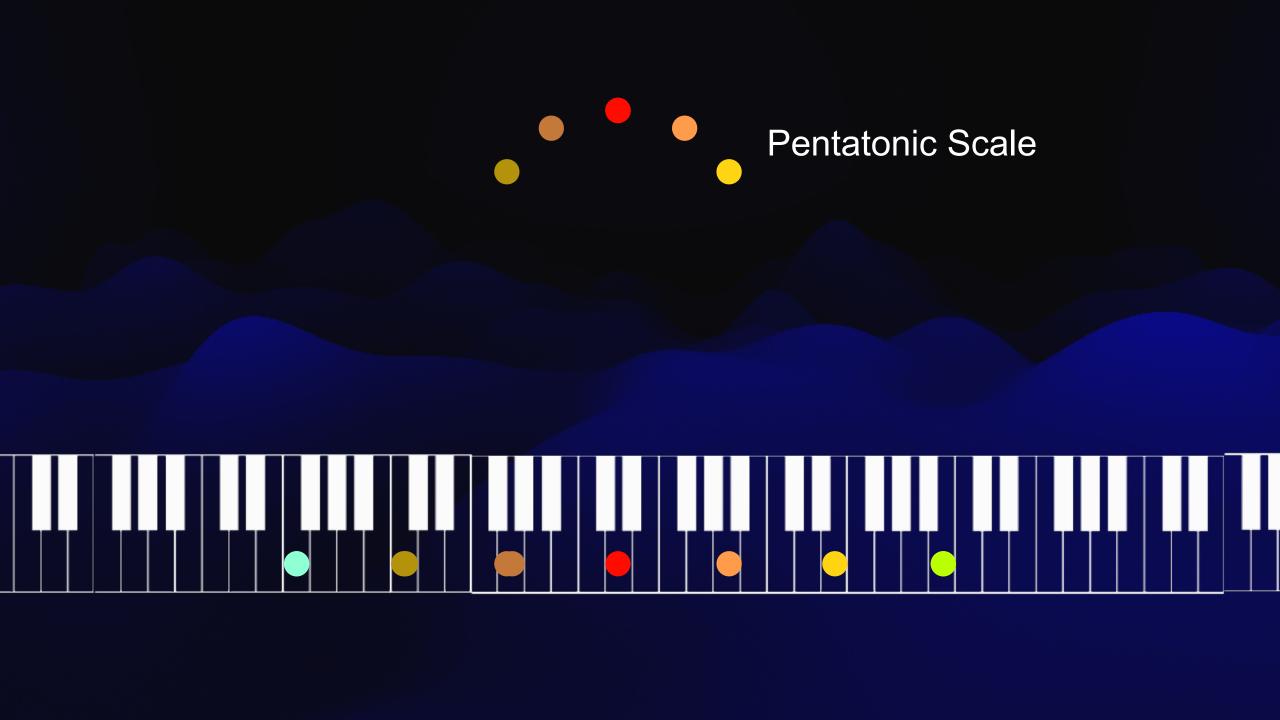


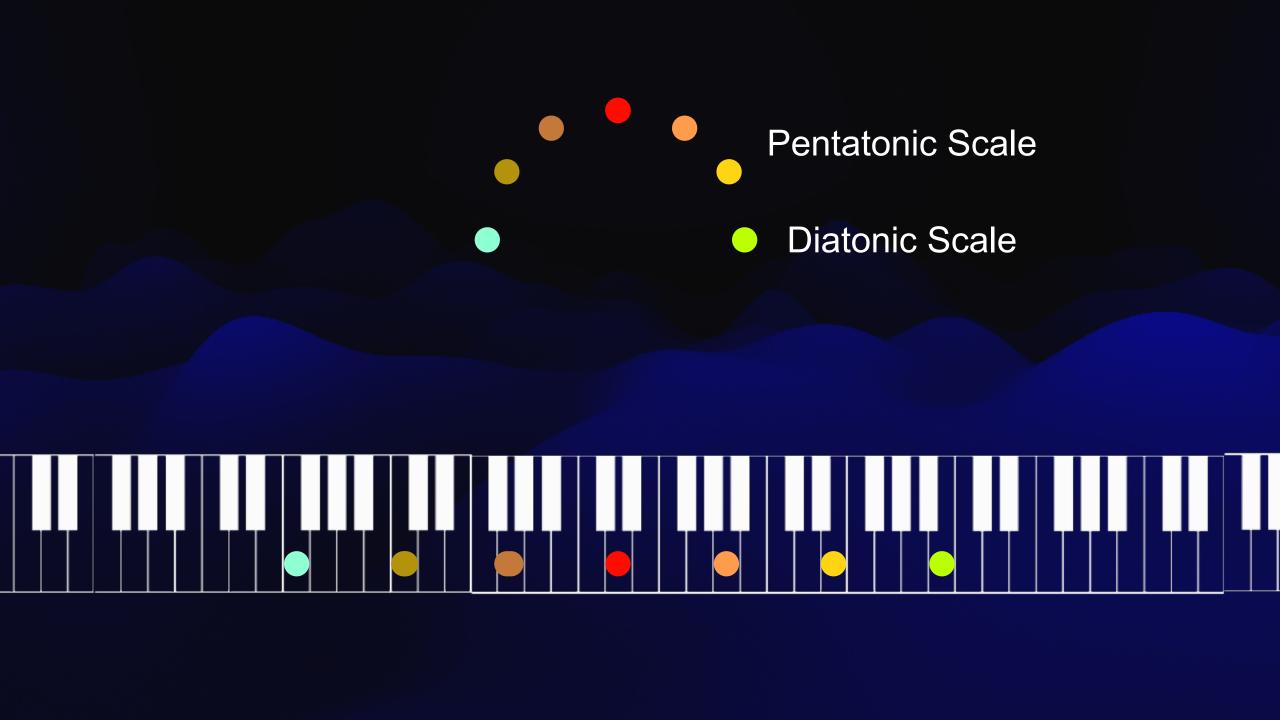


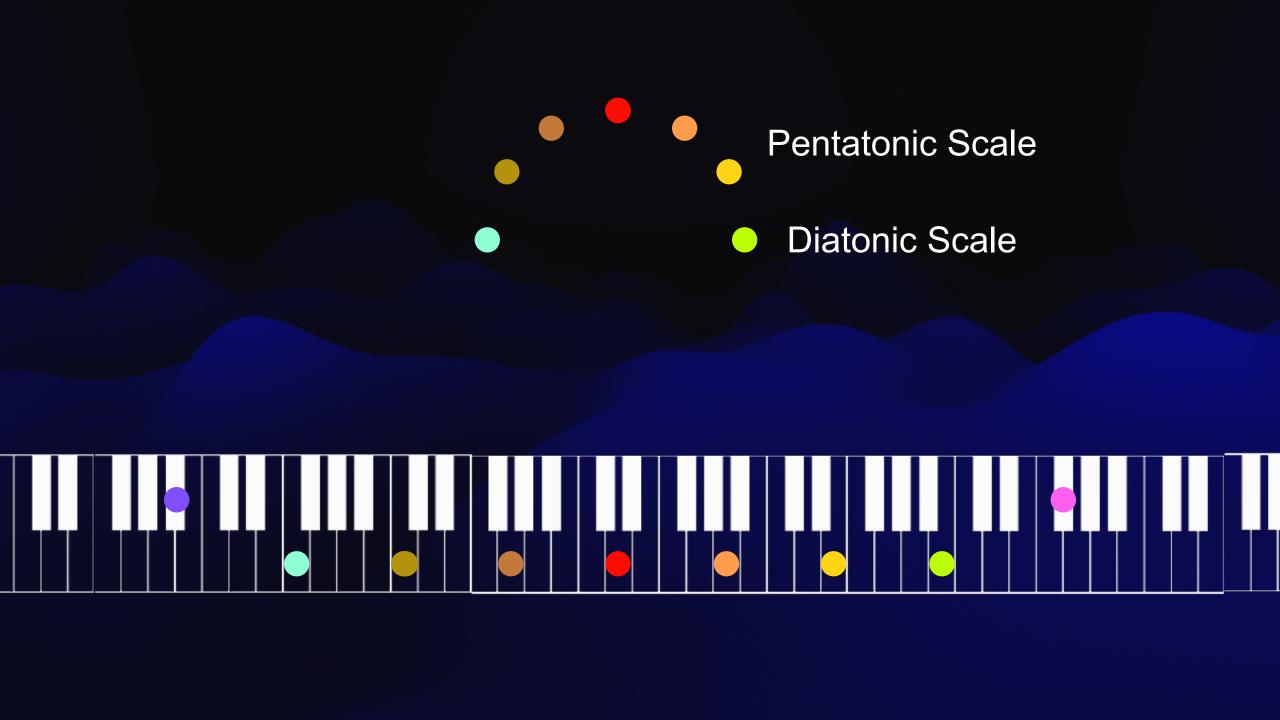


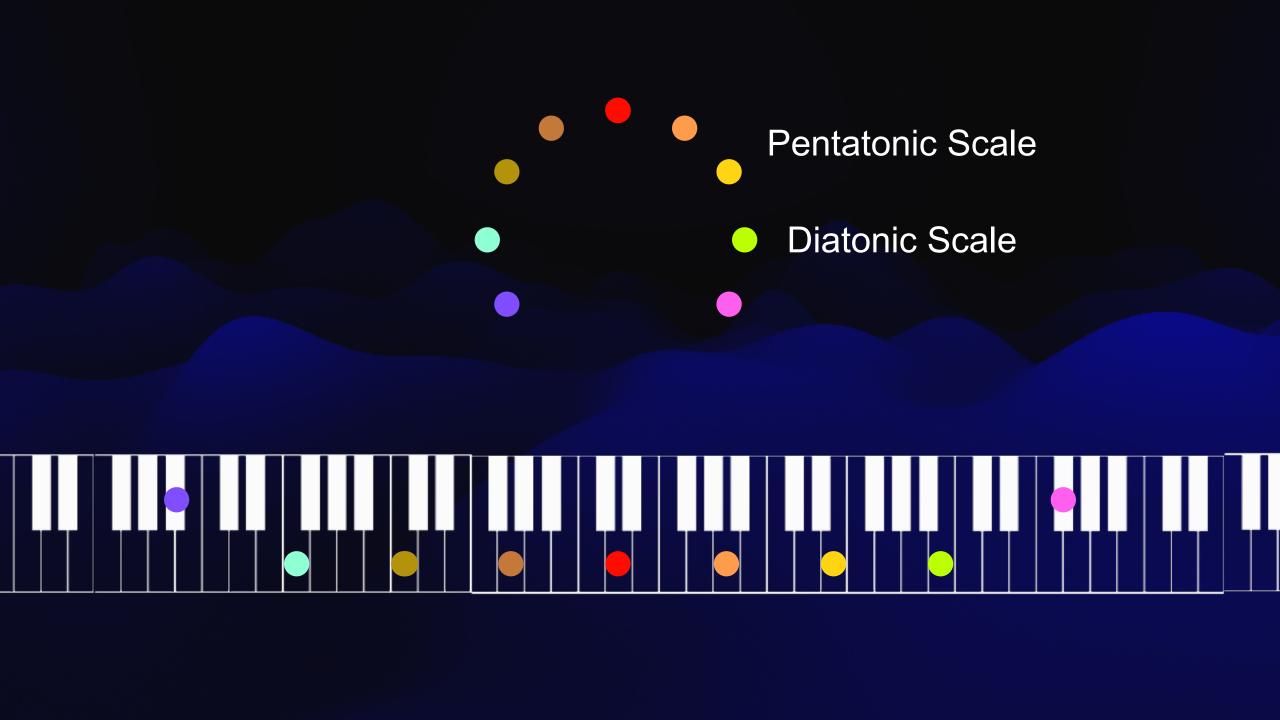


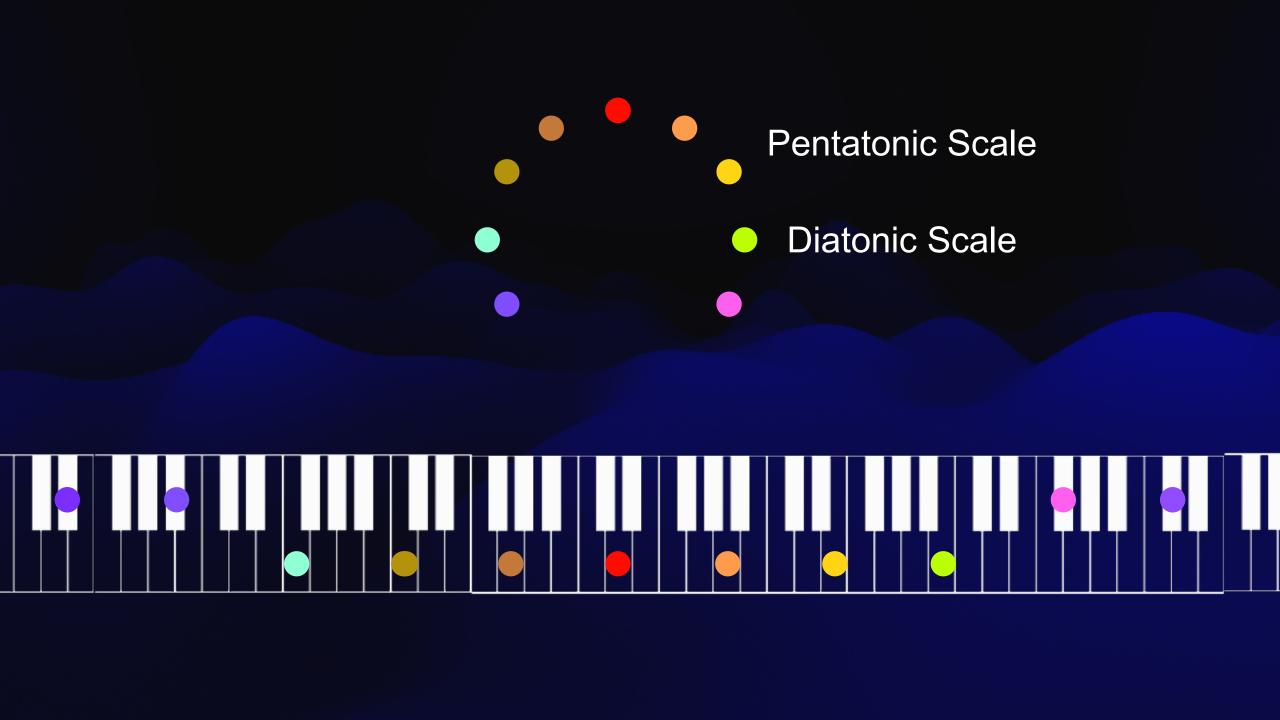


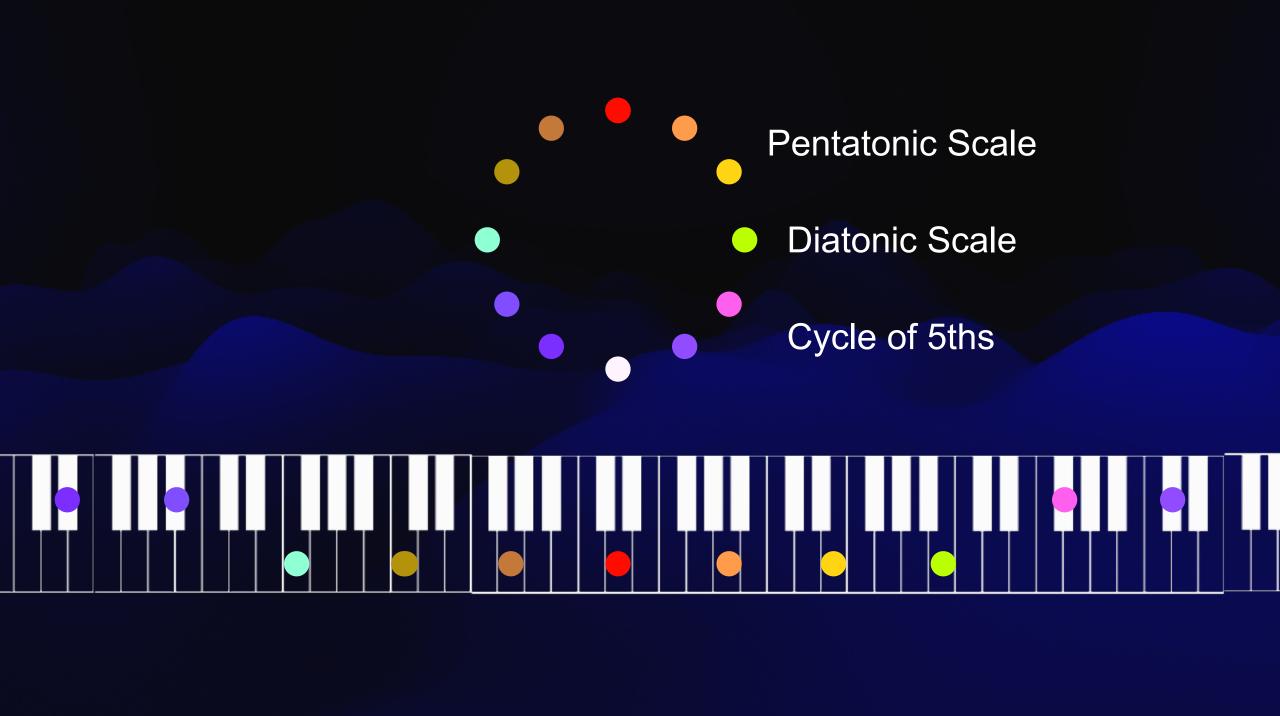














Pentatonic Scale



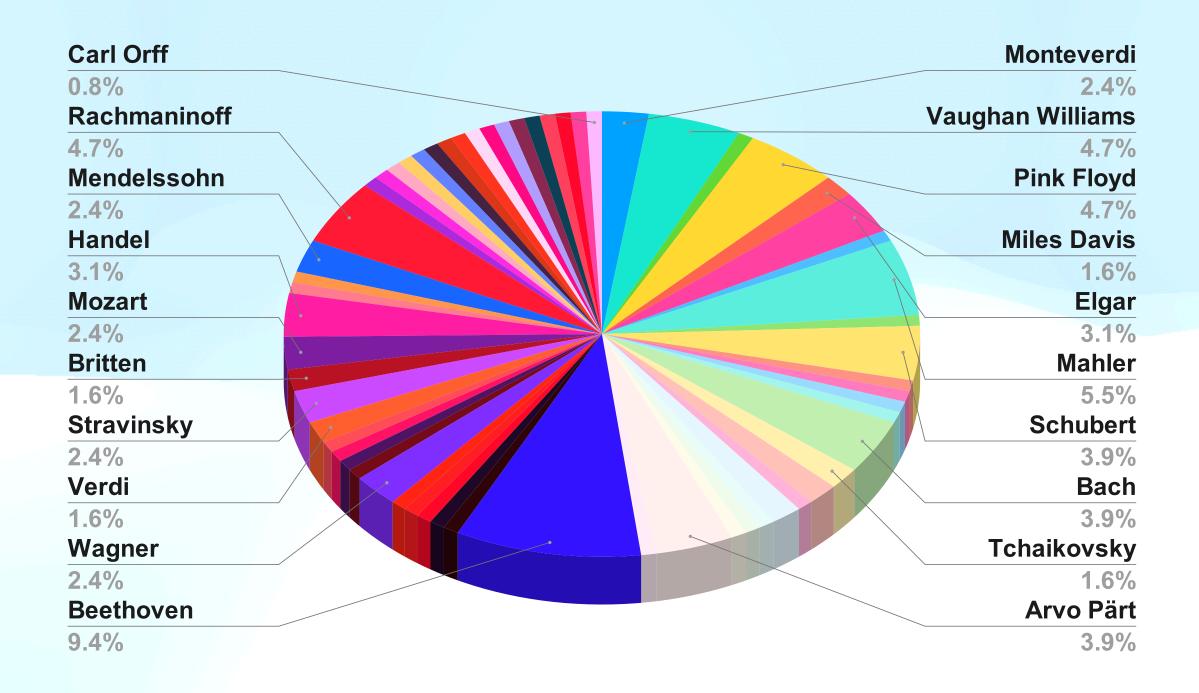
Diatonic



Pentatonic Scale



The Musical Chills



```
"even from the beginning..."
  "so satisfying"
                                              "from restrained to unrestrained"
       "spiritual upliftment"
                           "starts to build... I feel"
                                                           "breathtaking"
     "and just when"
                                 "suggesting urgency"
"modulating down a 3rd...
                                                         "complex rhythm"
                           "and then the strings join"
        "when it builds"
                            "simple yet complex"
                                                       "shrill slides"
 "there's that one chord"
  "harmonic clash"
                           "uplifting sadness"
                                                      "reminds me of..."
                             "haunting"
                                                         "...my childhood"
   "painful"
                      "ominous"
                                  "foreboding"
 "more and more.
                                                 "and when they sing [ ]"
                                                       "it evokes"
         "impossible"
                              "unbelievable"
```

"so satisfying"

Catharsis

"spiritual upliftment"

"and just when"

(Twisted) resolution

"modulating down a 3rd..."

"there's that one chord"

Dissonance

"harmonic clash"
"complex rhythm"
"painful"

"more and more..."

Gathering

"even from the beginning..."

Anticipation

"suggesting urgency"

"when it builds" "starts to build... I feel"

Build

"and then the strings join"

"simple yet complex"

Contrast & Combination

"uplifting sadness"

"haunting"
"ominous"

Awe
"foreboding"

"impossible" "breathtaking"

"unbelievable"

"from restrained to unrestrained"

Sudden (usually low to high, soft to loud) Change

"shrill slides"

choir, vocals, high strings, cymbal, harmonics

Intense High Frequencies

"reminds me of..." "...my childhood"

Personal

"it evokes"

Meaning &

Associations

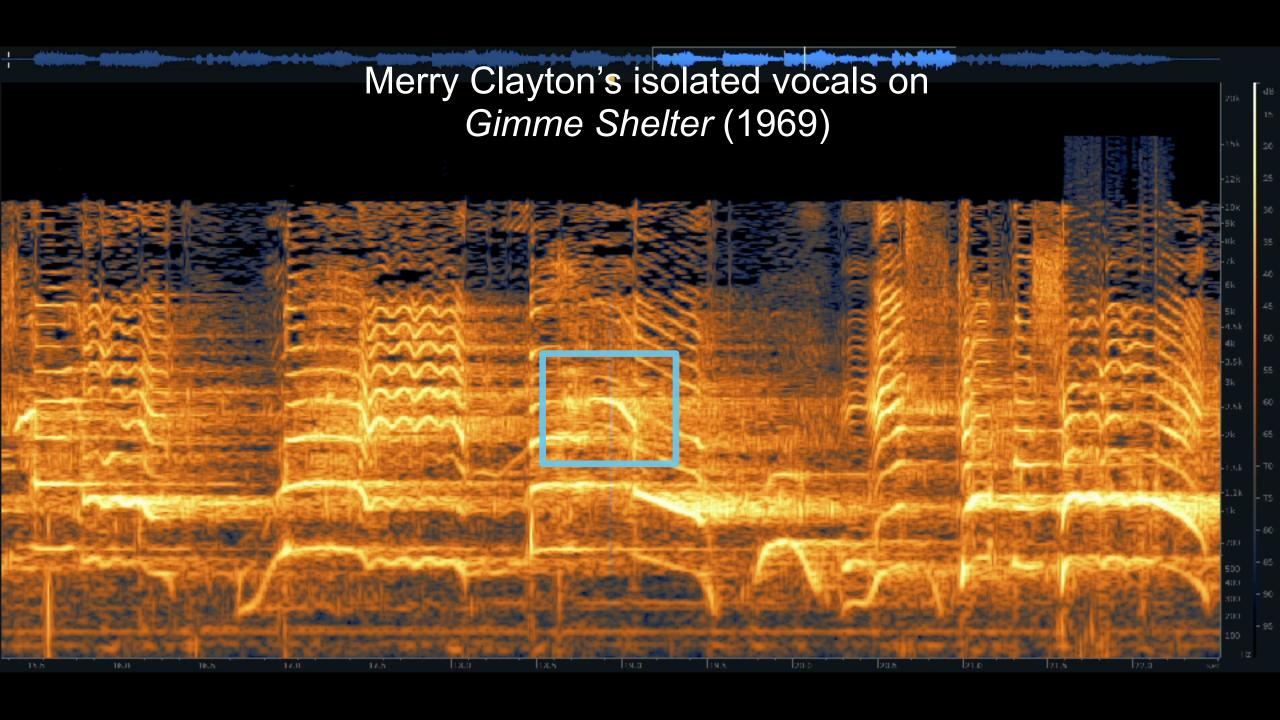
"and when they sing []"

Huron's Contrastive Valence Theory

Juslin, P. N., & Sloboda, J. A. (Eds.). (2011). Handbook of music and emotion: Theory, research, applications. Oxford University Press.

Panksepp's Separation Distress Theory

Juslin, P. N., & Sloboda, J. A. (Eds.). (2011). Handbook of music and emotion: Theory, research, applications. Oxford University Press.



Chills case study Pink Floyd *Eclipse*

Associations
(Preaching the truth with organ, lyrical repetition and soul vocals)

A Gathering (Reunion of instruments)

Rhythmic Entrainment (in 6/8 circles, but binary landing points)

Twisted Resolution
("Sun" is elided into

next sentence, and
(Staggetthe cycle shortened)

Layering

Build (Staggered Layering, And, and, and, and...)

Awe
(Life flashing by,
the return to

endless cycle)

Impending
Fate
(time running
out
"All that you)"

Catharsis
(Arrival of D
& end of a
story)

The Shrill (Hammond & Vocals)

'Dark Side'
chords
(D, <u>D/C</u>
Bb∆7b5 A7)





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EST. 1597

GRESHAM



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