# Wilsonic

- **MTS-ESP + Simple Synth**

# WilsonicController

- **MTS-ESP + MIDI Effect**

## wilsonic.co

Public Beta Downloads

- MacOS  0.38 Beta
- Windows 10 64-bit 0.38 Beta

Support in Wilsonic Discord

Updated 2024-04-22

# Overview



# Scale Designs

- Wilson's Garden
- Moments of Symmetry
- Persian-17 North Indian Raga Scales
- Combination Product Sets
- Euler Genus 6 and subsets
- Recurrence Relations
- Equal Temperament
- Tritriadic
- Scala
- CoPrime Grid
- Diamonds
- Morph

# What is MTS-ESP?

- MTS-ESP is a protocol for automatically and invisibly sharing tuning data between plug-ins in a DAW in real-time, without any routing or other setup required. ODDSound Github link

- MTS-ESP does not use MIDI data and is not routed through MIDI connections in a DAW.
  - Wilsonic is an MTS-ESP Source and has a simple synth for reference tones
  - WilsonicController is both an MTS-ESP Source and a MIDI Source, but has no simple synth

- Sharing of tuning data happens directly between plug-ins. It does not involve the DAW at all and therefore it will work in any DAW.

- Developers must explicitly add support for MTS-ESP to their plug-ins for this to work. A list of supported plug-ins can be found here

- Most synths that support MTS-ESP will automatically retune to Wilsonic when loaded, however some have a UX preference to enable MTS-ESP (like SurgeXT).

- Synths that don't natively support MTS-ESP can usually be retuned using MIDI pitch bend messages. This can even work polyphonically for synths that support MPE.

# What is MTS-ESP?

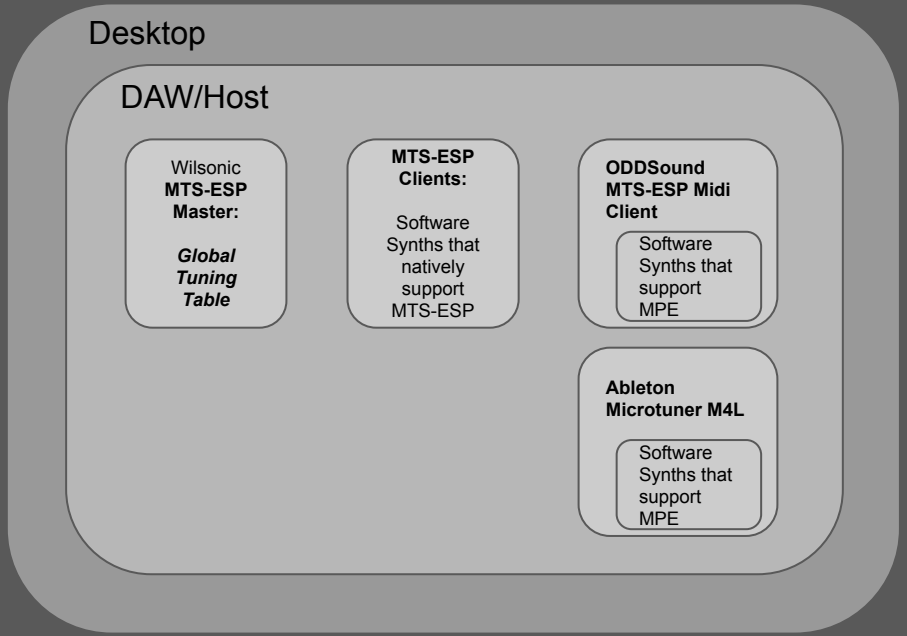
- Synths that don't natively support MTS-ESP can usually be retuned using MIDI pitch bend messages.  This works best for synths that support MPE.

- Re-tuning via MIDI pitch bend requires a plug-in that can receive tuning data via MTS-ESP and generate MIDI pitch bend messages in response.  Available options are:
  - Paid:
    - ODDSound MTS-ESP MIDI Client (part of the MTS-ESP Suite)
  - Free:
    - Ableton Microtuner M4L device (in MTS-ESP client mode) and
    - Xen MIDI Retuner

- The Wilsonic installer includes everything required for MTS-ESP to work on your computer, however if you have problems you can do a clean install of the MT-ESP components here
  - Mac-specific MTS-ESP installer
  - Windows-specific MTS-ESP installer

# Architecture

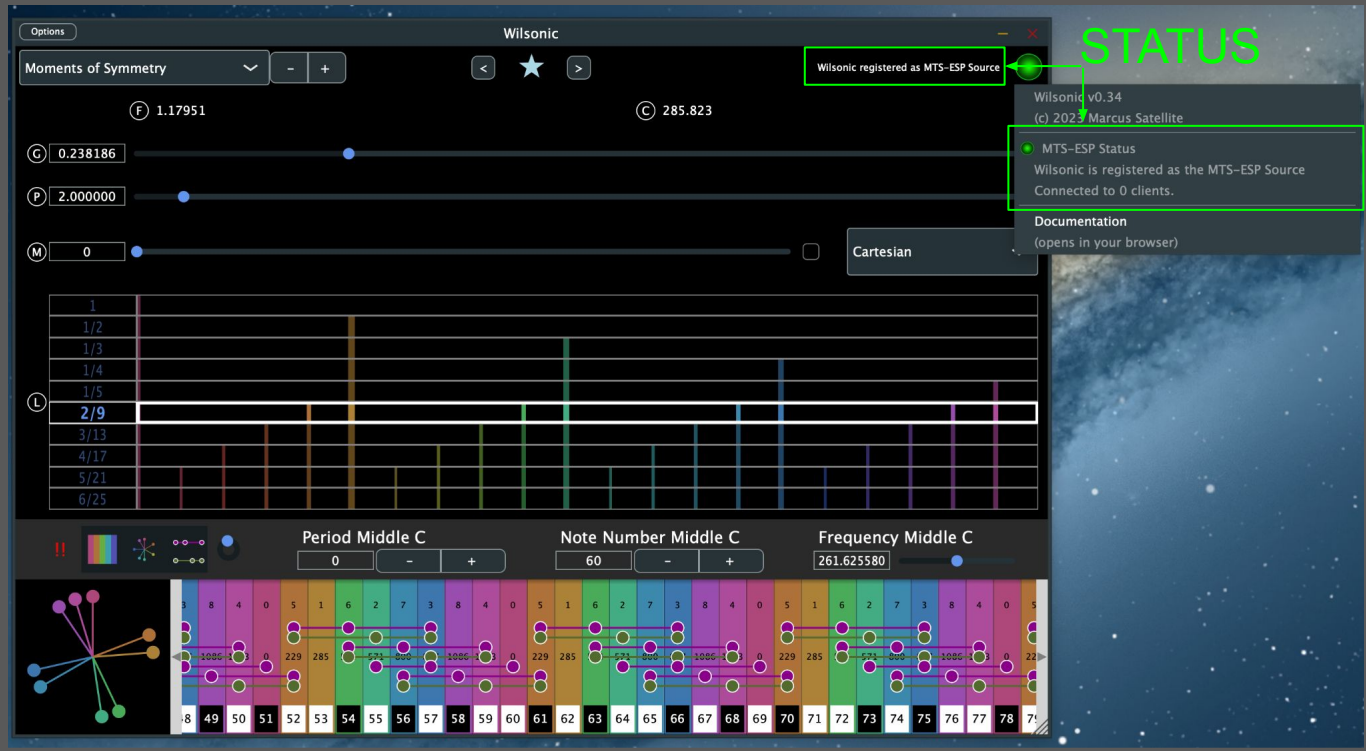
- Wilsonic should be the *only* MTS-ESP **Master** active in your DAW/Host session
- Your software synths are the “**clients**”




See [Wilsonic MTS-ESP]

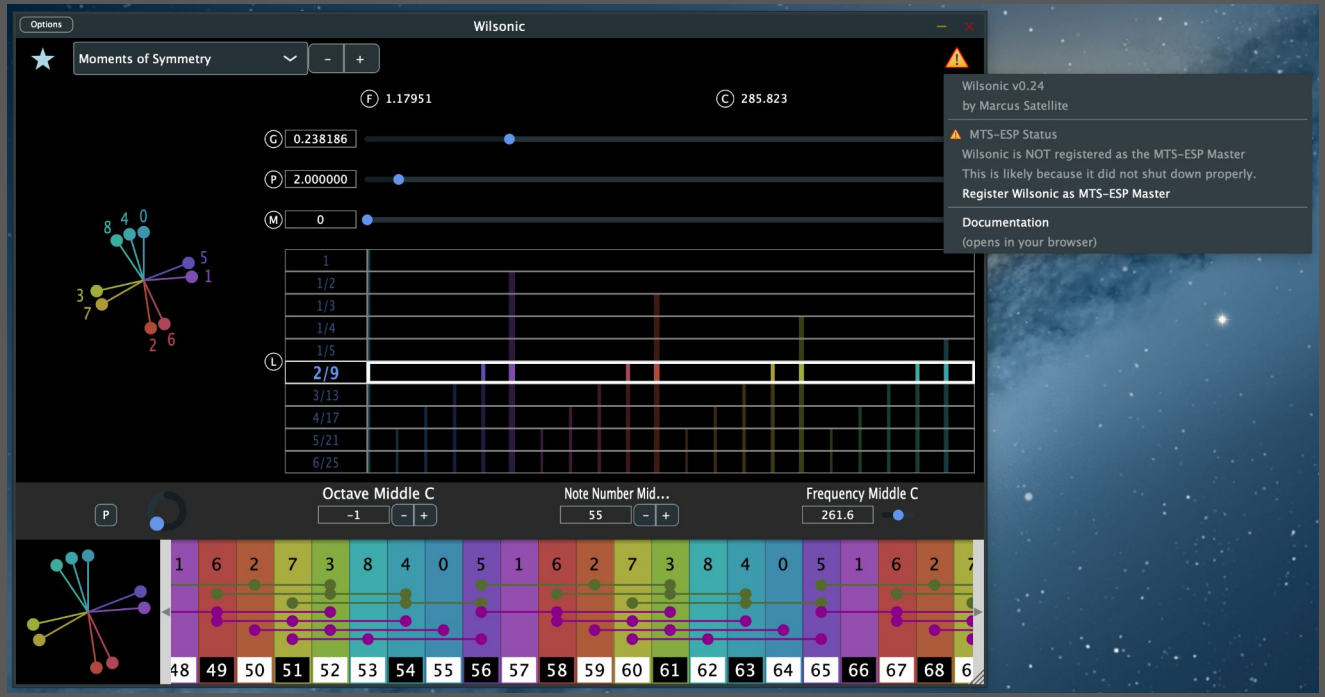
# MTS-ESP Status Indicator: Green

- Wilsonic should be the *only* MTS-ESP Master active in your DAW/Host session
- The green indicator means Wilsonic is actively managing the global tuning table
- Do not run Wilsonic and WilsonicController simultaneously–I'm still figuring out how to gracefully manage multiple apps wanting to be the Master
- Hover over status label for status history



# MTS-ESP Status Indicator: Yellow

- This status may appear if there is another plug-in already managing the global tuning table, or after a crash.
- The yellow indicator means this instance of Wilsonic is NOT actively managing the global tuning table.
- Check there is no other instance of Wilsonic or any other MTS-ESP master plug-in in use, then select “Register” from the menu to make Wilsonic the master.



# Installation

- Download installer at wilsonic.co
- Run installer
- Reboot your machine
- Run as a Plugin in your favorite DAW
  - Rescan plugins
  - Load Wilsonic as a AUv2 or VST3 on a MIDI track
  - Wilsonic's "simple synth" can be played from this track.  Check that your synths are tuned.
  - Wilsonic's DAW automation will be on this track
  - Load your soft synths in other tracks per the ODDSound client documentation
  - See next slide for more details
- Run as a standalone:
  - Standalone synths such as Surge and Pianoteq are tuned up in real-time!

# MTS-ESP Overview

- ODDSound MTS-ESP Overview
- ODDSound Client Support (DAW+Soft Synth setup)
  - Ableton
  - Bitwig
  - Cakewalk
  - Cubase/Nuendo
  - Digital Performer
  - FL Studio
  - Kontakt
  - Logic Pro
  - Reaper
  - and many more
- How To Install ODDSound Plug-ins (Mac and Windows)
- Microtuning in Ableton Live with MTS-ESP (YouTube)
- Microtuning in Bitwig Studio with MTS-ESP (YouTube)

# Microtonal Keyboard

These 3 controls define the global tuning table root frequency:

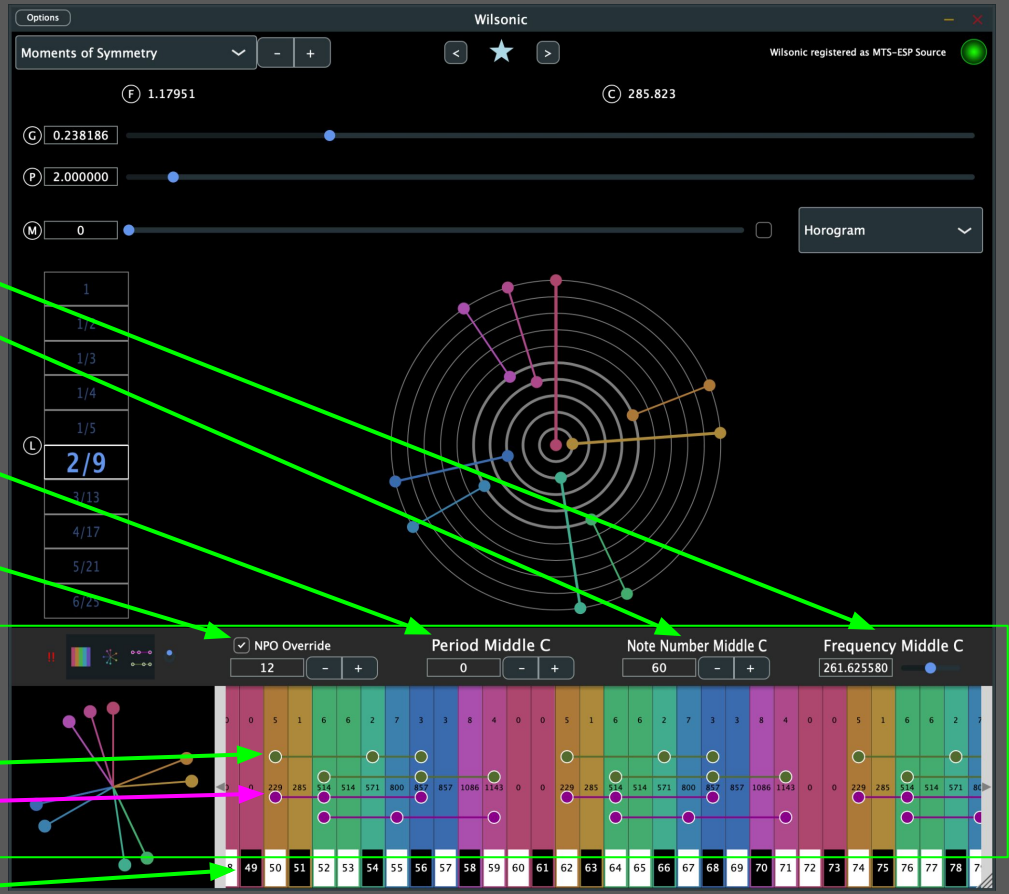
- Frequency of Middle C
- Note Number Middle C:
  - Default = 60
  - TRANSPOSE = PERFORMANCE
- Period Middle C:
  - lower/raise all notes by this octave/period
- Automatable in the DAW!

- Notes Per Octave (NPO) Override adds/removes notes
- Resize keyboard by dragging bar vertically

Real-time Major/Minor Analysis:
Pythagorean Means

- Arithmetic Mean: “Proportional Triad”
- Harmonic Mean: “Subcontrary Triad”

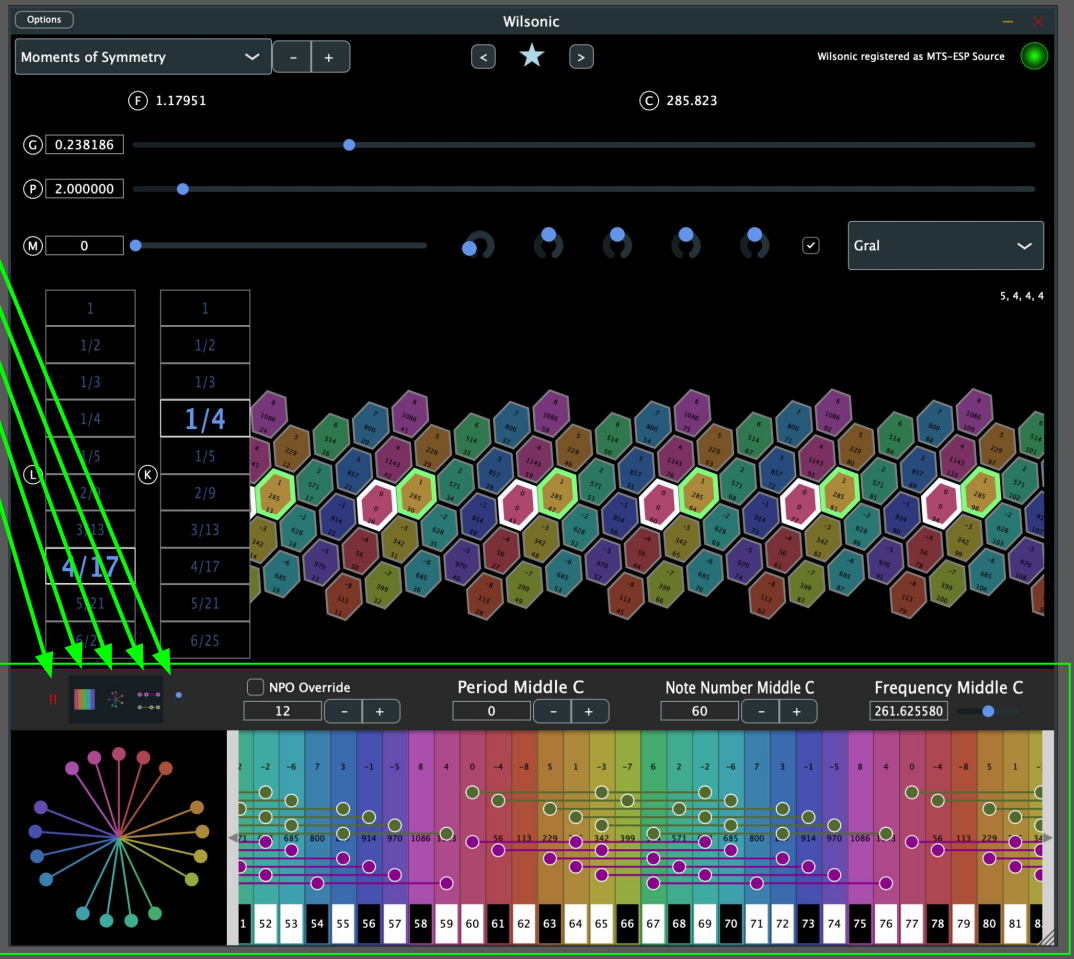
MIDI Note Number Mapping + Black and White Keys of linear keyboard




**Microtonal keyboard is updated in real-time (!)**

# Microtonal Keyboard

- Offset Pitch Wheel color at Middle C
  - Toggle Proportional Triads
  - Toggle Pitch Wheel on Keyboard
  - Toggle Microtonal Keyboard
- MIDI Panic: turns all playing notes off

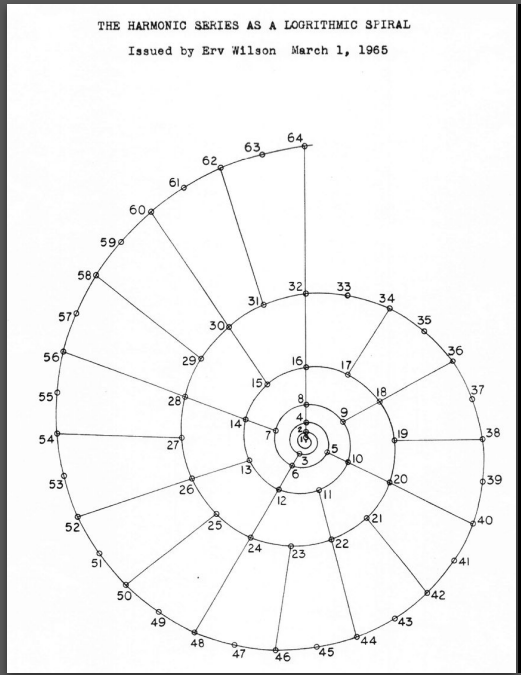


# Pitch Wheel

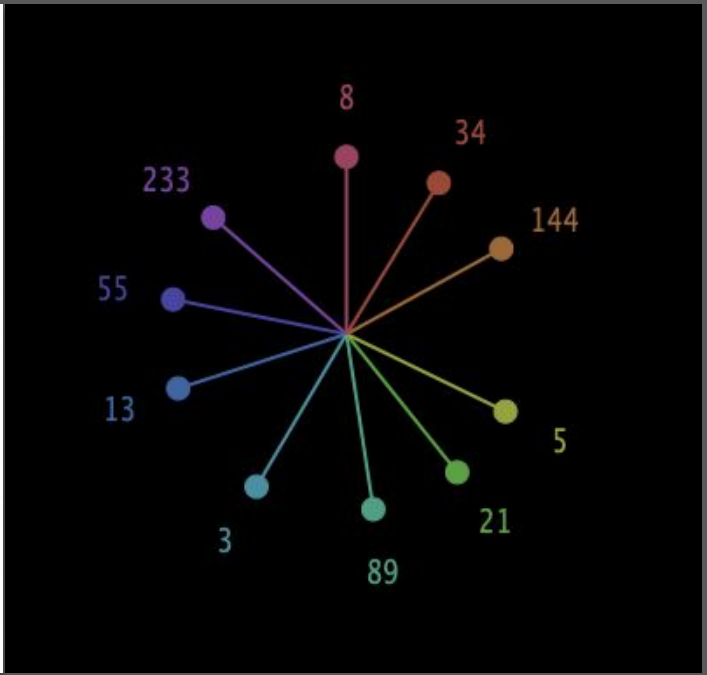
**Pitch Wheel**

- Pitch Wheels appear throughout the app
- Pitch is defined as log base-Period of Frequency
- Period = 2 = Octave: the most common period
- The Pitch Wheels also take the modulus of Period
- Period = Octave Equivalence: 1=2=4=8=16=32=64=…
- 12 o’clock = C = “1” = 2^0
- The colors of the Pitch Wheels correspond to the colors of the microtonal keyboard
- Wilsonic supports non-octave tunings such as Scala files and MOS
- When you change the Period the appearance of the Pitch Wheels do not change because by definition they are log-base-period

Log Base 2 of Frequency, drawn as a log2 spiral

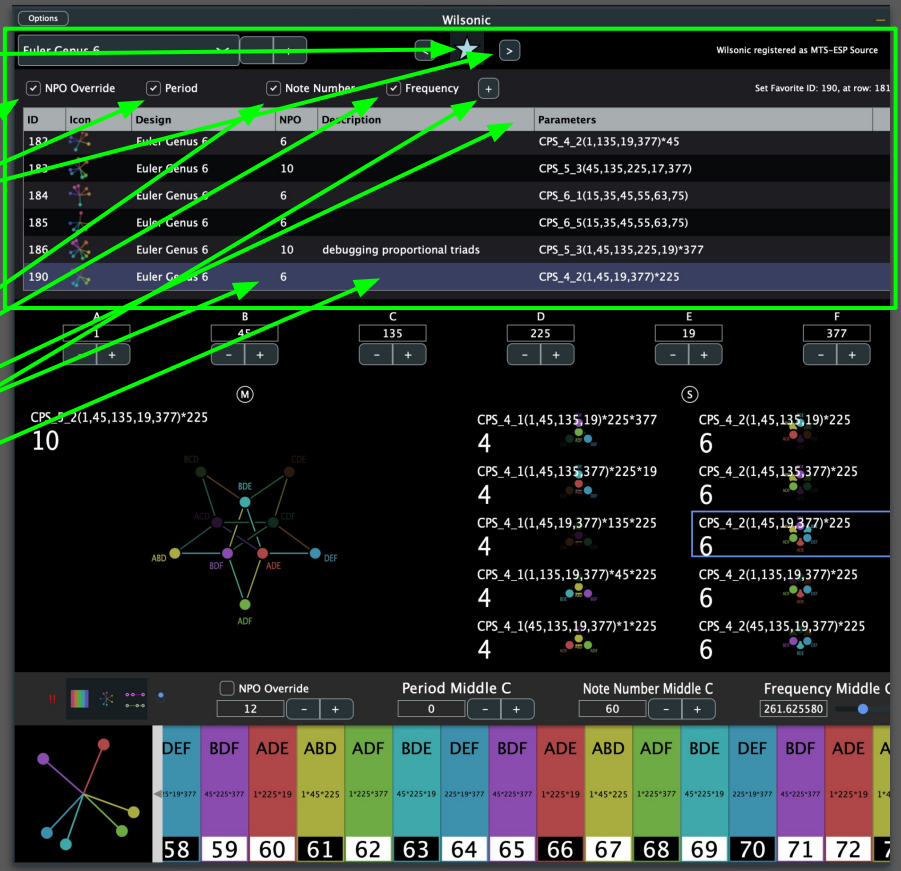



Log Base Period of Frequency, drawn as a circle



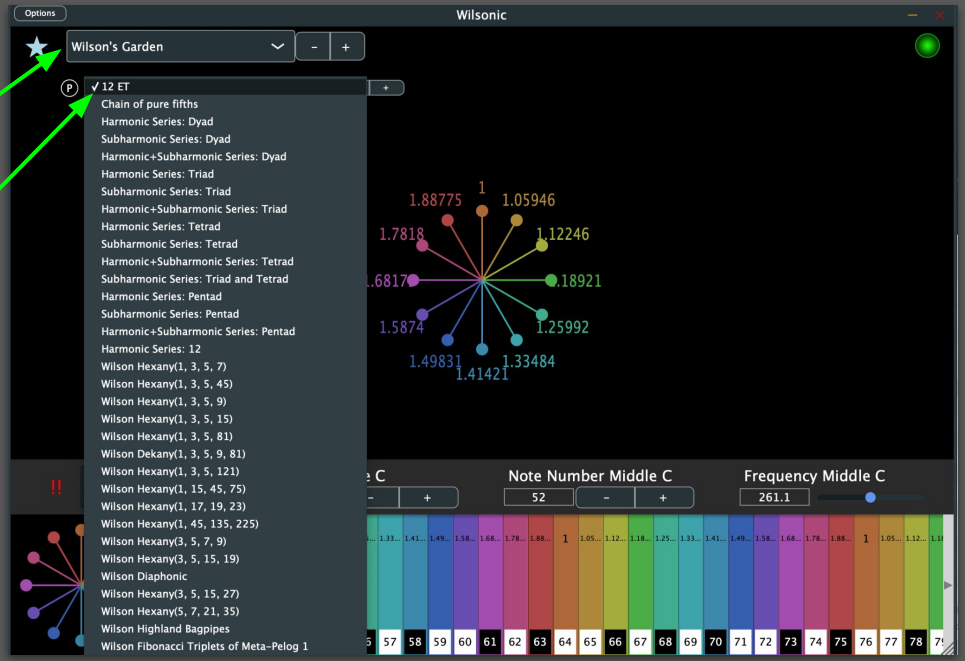
# Favorites

- Toggle Favorites panel by clicking on Favorites star icon
  - Favorites takes up 1/3 of the vertical screen space: you can resize Wilsonic to increase the height
- Navigate Favorites by hitting “<”, or “>” buttons
- Toggle to save NPO Override with Favorite
- Toggle to save Period with Favorite
- Toggle to save Note Number Middle C with Favorite
- Toggle to save Frequency Middle C with Favorite
- Save current scale as a Favorite  by hitting “+” button
- Delete a selected row by hitting “backspace”
- Double-click Description cell to edit description
- Tap column header to sort by:
  - ID
  - Design
  - NPO (“number of notes per octave”),
  - Description



# “Wilson’s Garden”

- Select “Wilson’s Garden” from the Scale Design menu
- Select a scale from the “Curated Presets” menu




Curated scales by

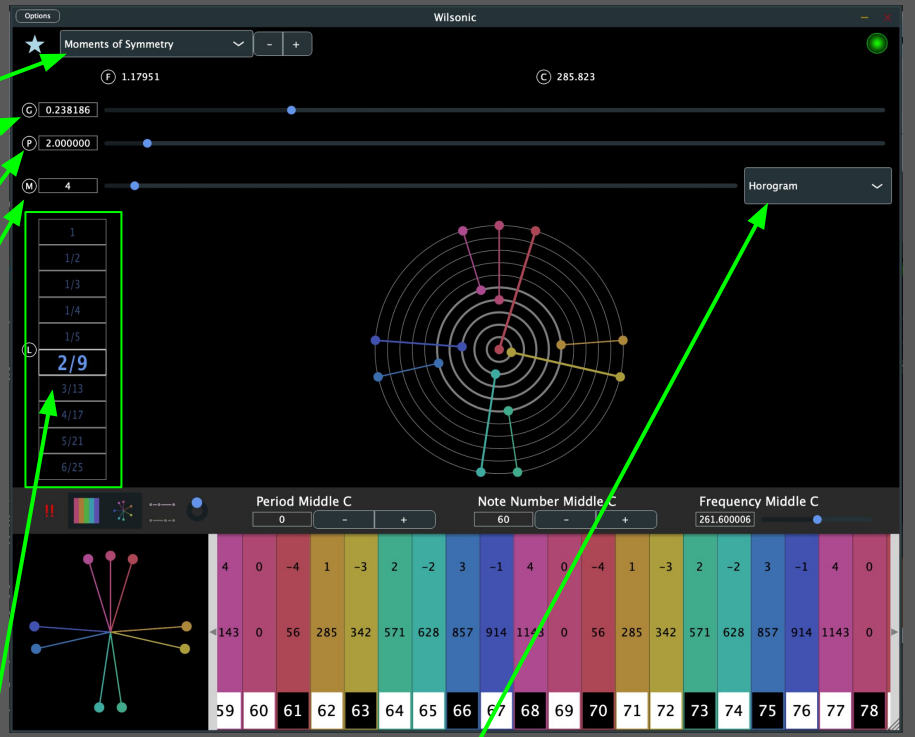
- Erv Wilson
- Kraig Grady
- Stephen James Taylor
- Jose Garcia
- Gary David
- Marcus Hobbs
- Elementary, archetypal scales

*Be sure to also explore the Scala Archives

# Moments of Symmetry

[Link to Erv Wilson's MOS papers]

- Select “Moments of Symmetry” from the Scale Design menu
- Select the Generator with the slider.
  - Units are in “Pitch space”, i.e., Log-base-Period of Frequency
    - 0 = Middle C
    - 1 = C one Period higher
  - G = 0.58333 = 7/12 = 12 tone equal temperament when Period = 2
  - The “F” label is the Generator in Frequency
  - the “C” label is the Generator in Cents
- Select the Period with the Slider
  - Units are in Frequency, default is “2”, the Octave
- Select the Murchana with the slider
  - Murchana is a type of mode, or rotation
- Select the Level by click-dragging over the Level box



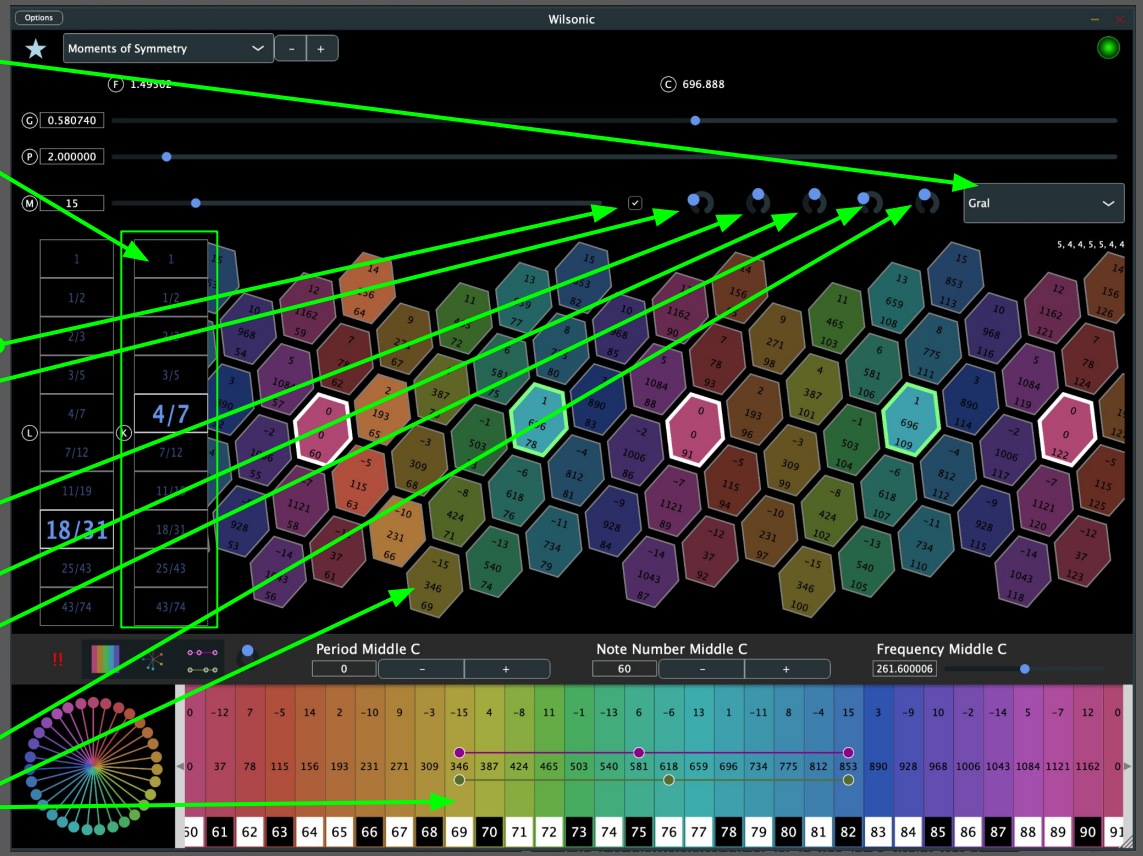

Four drawing modes:

- Cartesian
- Horogram
- Horogram Inverse
- Gral (continuum of generalized keyboards)

# Moments of Symmetry

Supports “Touch” Devices

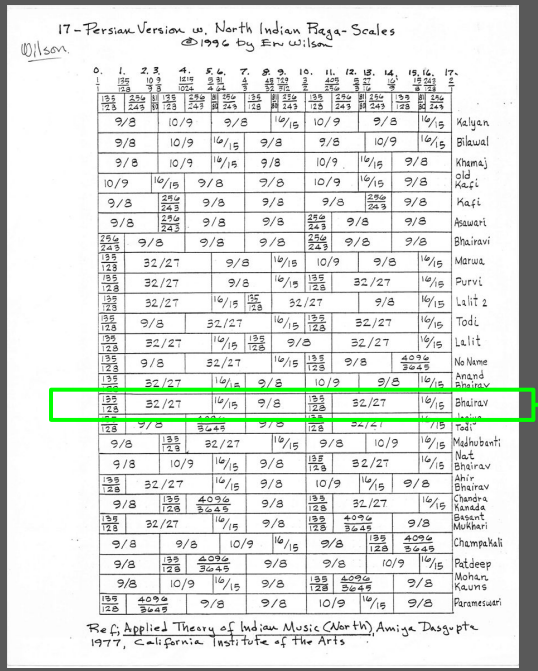
- Select “Gral” from the display mode popup
- A secondary Level box appears…this is the keyboard mapping. The denominator is the number of columns in an octave. Shown here is the 4/7 layout of the 18/31 MOS.
- The toggle will set Murchana to 0 at the center of the chain, automatable
- The first rotary is the zoom
- The second rotary is the rotation. Leave this at 0 for Wilsonic to optimize for horizontal layout
- The third rotary is “shear” which you can use to make the columns vertical
- The fourth rotary is the left-right position of the keyboard
- The fifth rotary is the up-down position
- Hex tiles have the same label as the Microtonal keyboard

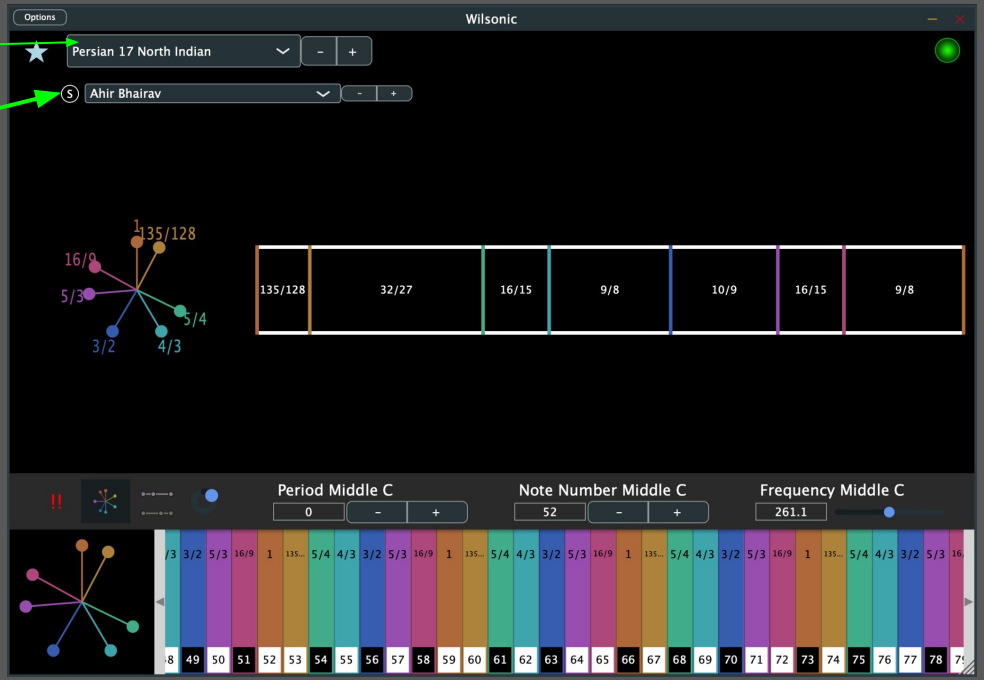


# North Indian Raga Scales

[“17-Persian Version w. North Indian Raga Scales”]

- Select “Persian 17 North Indian” from scale design menu
- Select the variant from the scale menu



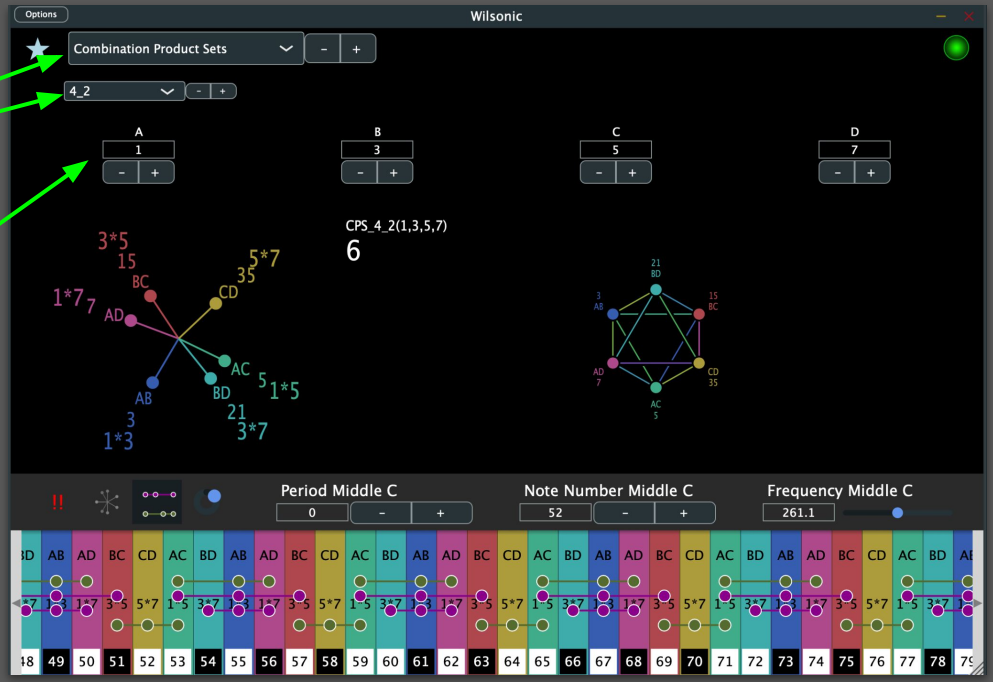



# Combination Product Sets

## Combination Product Sets

- Select “Combination Product Sets” from the scale design menu
- Select the CPS from the scale menu
  - “4_1” = “4 choose 1” = Harmonic Tetrany
  - “4_2” = “4 choose 2” = Hexany
  - “4_3” = “4 choose 3” = Subharmonic Tetrany
  - “6_3” = “6 choose 3” = Eikosany
- Set the seeds (A, B, C, D) of the master set

More CPS resources here



# Euler Genus 6

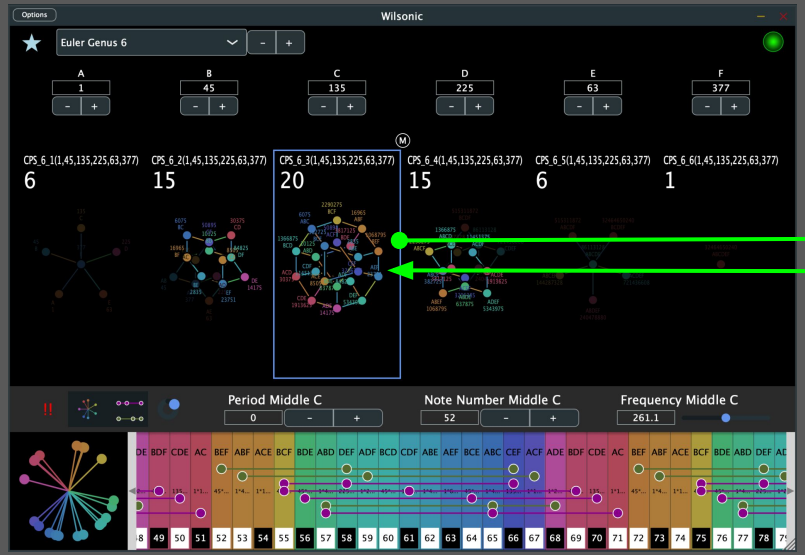
## Euler Genus 6

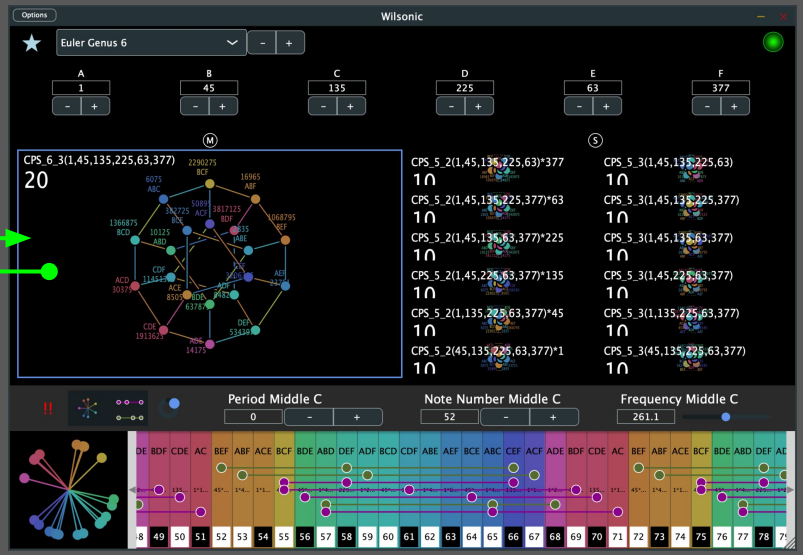
### Euler Genus 6 page

- Seeds can be changed on every page
- Selected scale is outlined in blue
- Shift-Mouse-Hover selects scale
- Cursor Left-Right selects scale
- Ctrl-Click drills into Subset page

### Euler Genus 6 Subset page

- Seeds can be changed on every page
- Selected scale is outlined in blue
- Shift-Mouse-Hover selects scale
- Ctrl-Click navigates down into subset
- Command-Click navigates up into superset
- Cursor Left-Right-Up-Down selects scale
- Superset on the left, subsets on the right



# “Subsets of Combination Product Sets”

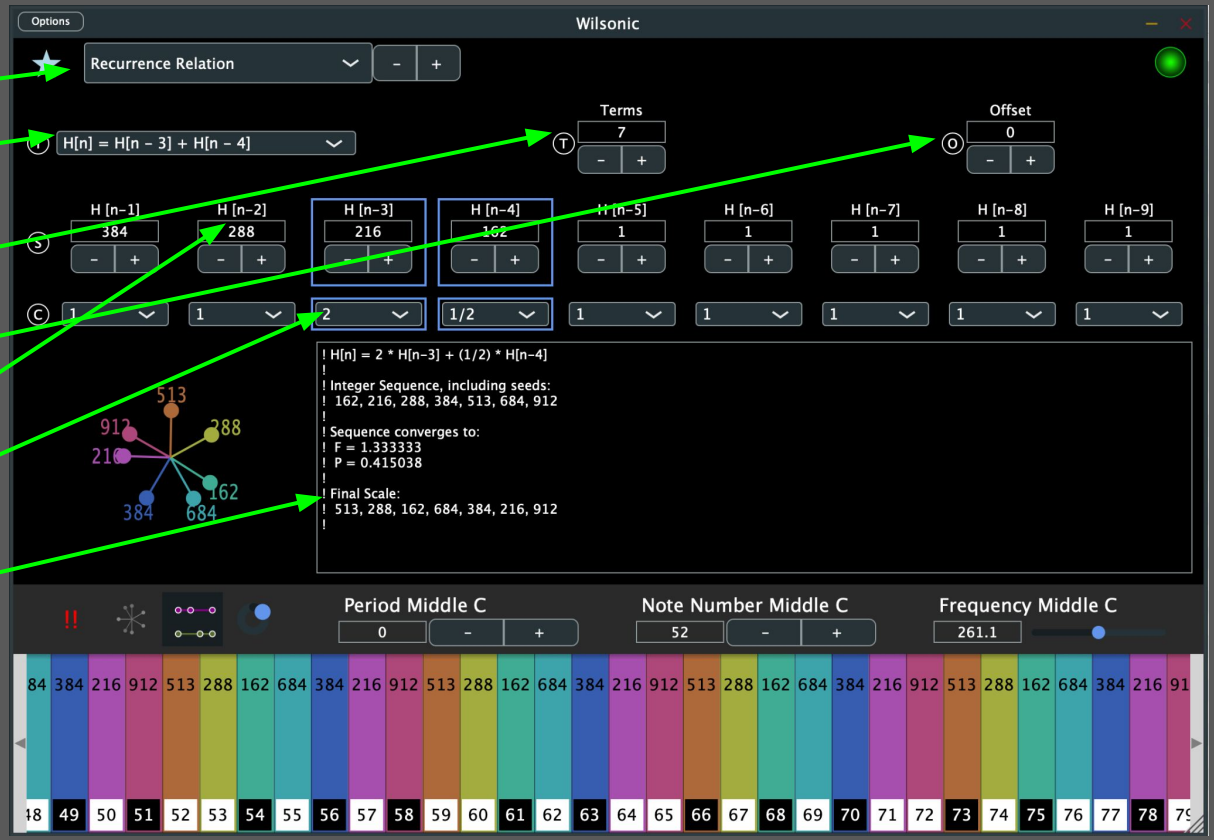
Wilsonic scale designs of “Combination Product Sets” and “Euler Genus 6” are implementations of these canonical microtonal papers:

- D’Allesandro, Like a Hurricane, Erv Wilson,
- Combination-Product Set Patterns, Kraig Grady, 1986
- THE EIKOSANY VIEWED FROM THE CENTERED PENTAD LATTICE, Kraig Grady
- THE EIKOSANY VIEWED FROM A HEXANY LATTICE, Kraig Grady
- Cycle of Hexanies in a Dekany, Kraig Grady, 1998
- Resources Of The Eikosany, Kraig Grady, 1985

# Recurrence Relation

## Recurrence Relation

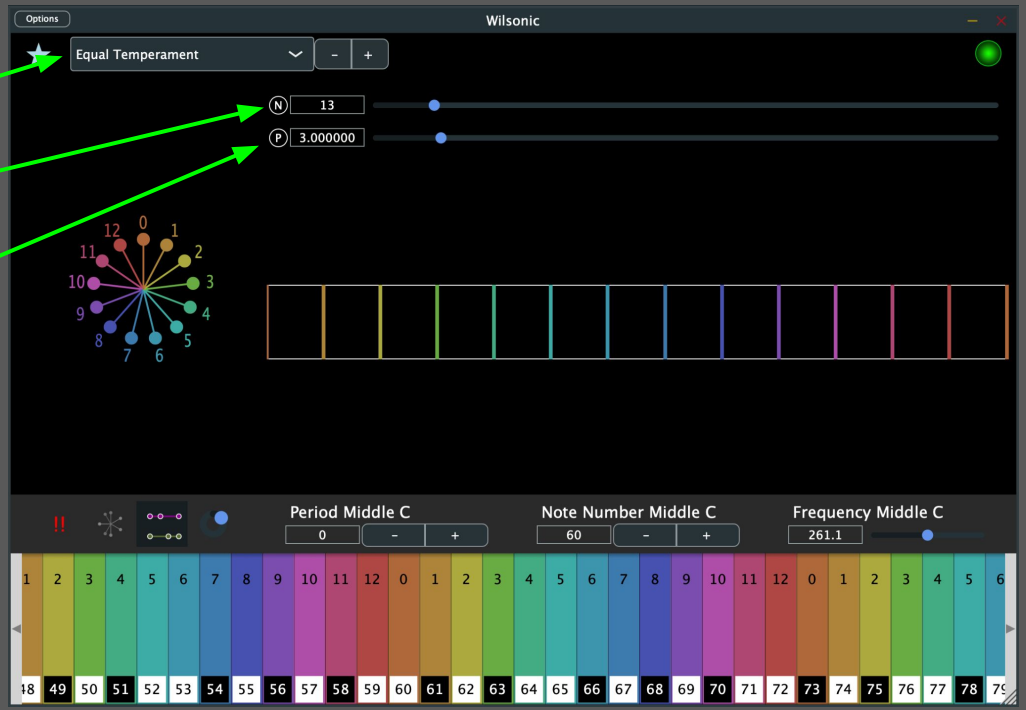
- Select “Recurrence Relation” from Scale Design menu
- Select the **terms** of the recurrence relation from the dropdown.
- Selected terms are highlighted in blue
- Select the **number** of terms to compute
- Select the **offset** (throws away previous terms)
- Set your **Seeds** for each term (initial conditions)
- Set your **Coefficients** for each term from the dropdown
- Final Scale:
  - Sorted as if octave-reduced
- Period is 2 (i.e., an octave)
- Recurrence Relations optimize for difference tones by creating an additive sequence



# Equal Temperament

**“Equal Temperament”**

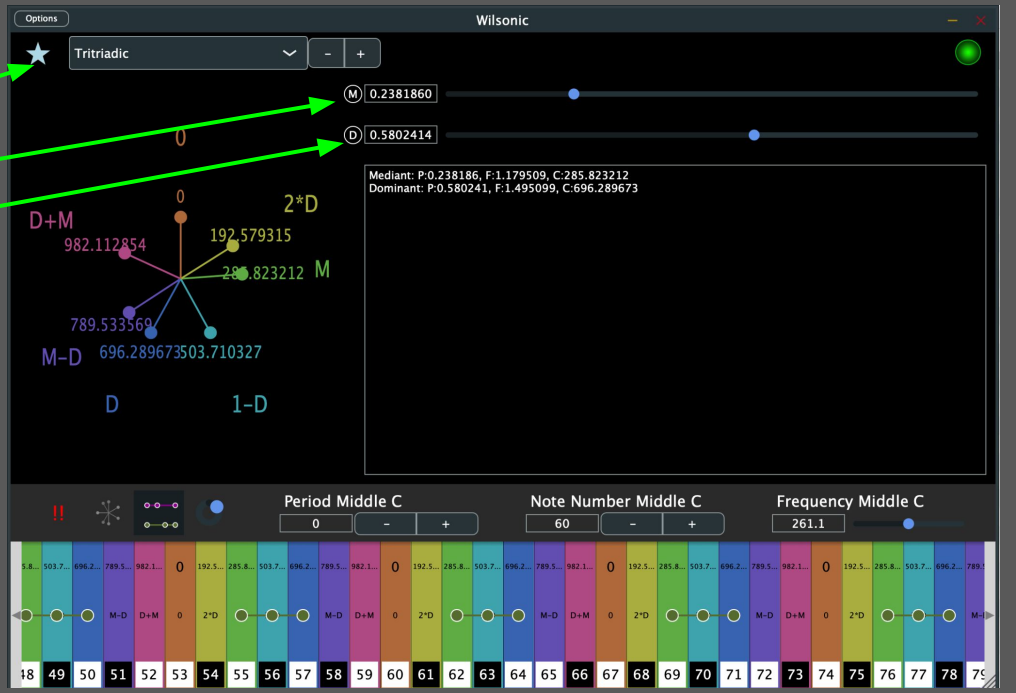
- Select “Equal Temperament” from the Scale Design menu
- Select an ET (“EDO”) from 1-128 notes per octave
- Select the period.  “Octave” = period of 2



# Tritriadic

**“Tritriadic” by John Chalmers**

- Select “Tritriadic” from the Scale Design menu
- Select the Mediant with the slider
- Select the Dominant with the slider




Tritriadics are very simple and are based on the major scale as a template. They are defined as three triads composed of a tonic, mediant and dominant interval. Let us set the tonic to 0 [in Cents], then the basic triad has the form 0, M, D. By adding a subdominant triad 1200-D, M-D, 1200 and a dominant triad, D, D+M 2*D, one gets the notes in ascending order 0 2*D M 1200-D D M-D D+M 1200 for an octave spanning scale. In ET, 0 and 1200 are the same note an octave apart, in JI 1/1 and 2/1 have the same harmonic function.

They are also definable in JI--take any triad such as 4:5:6 and write it as 1/1 5/4 3/2. The subdominant is the octave-adjusted triad obtained by dividing by D (=3/2) or more conveniently as 4/3 5/3 2/1. The dominant triad is the tonic multiplied by the dominant interval. This operation yields 3/2, 15/8 and 9/8. Hence the three triads are 4/3 5/3 2/1, 1/1 5/4 3/2 , and 3/2 15/8 9/8 (when reduced to the same octave. Symbolically written as 2/D M/D 2/1, 1/1 M D, D D*M D^2 or in ascending order 1/1 D^2 M 2/D D M/D D*M 2/1--1/1 9/8 5/4 4/3 5/3 15/8 2/1.

In both cases there are two supplementary triads which I refer to as conjugate r triads--M D D+M and M-D 1200 M. These have the form of 0 D-M D or in the JI case, 5/4 3/2 15/8 and 5/3 2/1 5/4, to be reduced to the same octave. Major and minor or more generally prime and conjugate are thus conjugates of each other

Any triad may be used--4:5:6, 4:5:7 or even irrational numbers.

–John Chalmers, May 4, 2022

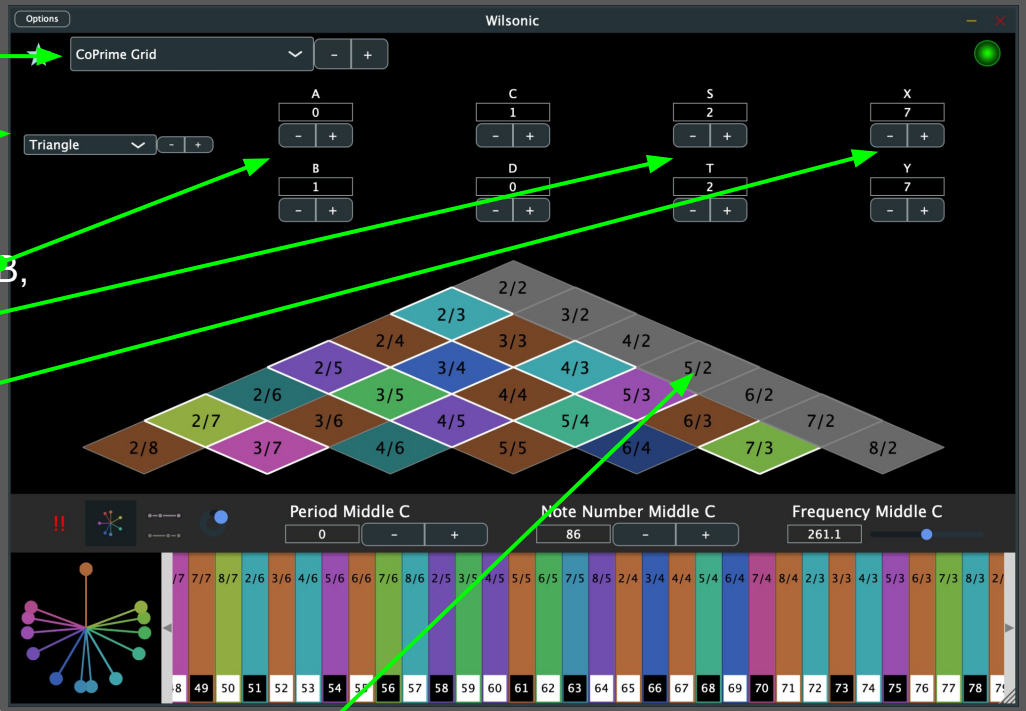
# Scala File Support

- Hover over status label for status history

- Select “Scala” from the Scale Design menu
- Select “Bundled” or “User”
- Highlight the row and hit RETURN to tune up the Microtonal Keyboard
- Supports non-Octave tunings
- Mouse-Hover over the row to see the contents of the Scala file
- Only when “User” is selected can you import/delete .scl files:
  - Drag-and-Drop files into the window
  - Click on the “+” for a File Browser
  - Select-Backspace to DELETE
- When “Bundled” is selected:
  - 5,100+ .scl files (read-only)
  - Please see [Huygens-Fokker Centre for Microtonal Music]
  - Shoutout Manuel op De Coul!
- User/Bundled is automatable
- User and Bundled IDs are automatable
- You can “Favorite” Scala files

# CoPrime Grid

- Select “CoPrime Grid” from the Scale Design menu
- Select “Harmonic”, “Triangle”, or “Subharmonic”. Same tones, just different layout
- Reseed the CoPrime Grid by modifying A, B, C, D.
- Offset by modifying S and T*
- Expand/Reduce number of terms by modifying X and Y
- Touchscreens: You can play the geometry as a keyboard!
- Best played on a 2-d keyboard such as the Linnstrument
- See Erv’s CoPrime designs on Kraig Grady’s Anaphoria website for more details on the construction and properties of this remarkable object



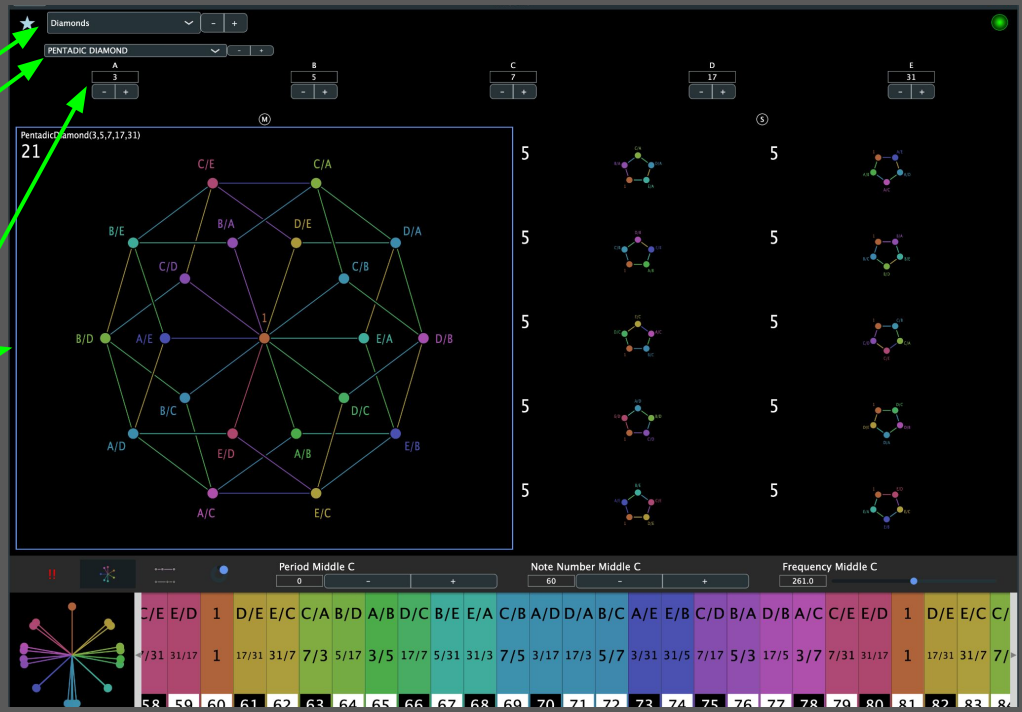

If a note is greyed out it means there is no midi note assigned to it. Use “Note Number Middle C” to lower the root note to get the notes in range

* *Wilson allowed for S and T to be zero in the construction of the*

# Diamonds

**“Reciprocal Cross-Sets”**

- Select “Diamonds” from the Scale Design menu
- Select a Diamond or one of its harmonic/subharmonic subsets
- Set the seeds of the master set, from (A,B,C) for Triadic, to (A,B,C,D,E,F,G,H) for Ogdoadic
- Selected scale is outlined in blue
  - Shift-Mouse-Hover selects scale
  - Cursor Left-Right selects scale




See next slide for the definition of “reciprocal cross-set”

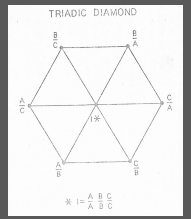
[YouTube Demo of Diamonds]

# Diamonds: Reciprocal Cross-Sets

- Rows are the harmonic series of the master set
- Columns are the subharmonic series of the master set
  - Row 0 = Harmonic series divided by A
  - Column 0 = Subharmonic series multiplied by A
  - Diagonal = 1/1

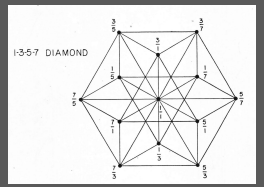
## Triadic

| | | |
|---|---|---|
| _one | B/A | C/A |
| A/B | _one | C/B |
| A/C | B/C | _one |



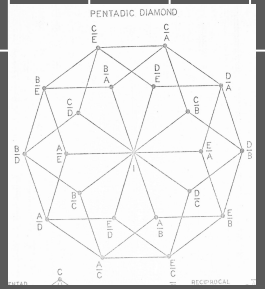

## Tetradic

| | | | |
|---|---|---|---|
| _one | B/A | C/A | D/A |
| A/B | _one | C/B | D/B |
| A/C | B/C | _one | D/C |
| A/D | B/D | C/D | _one |




## Pentadic

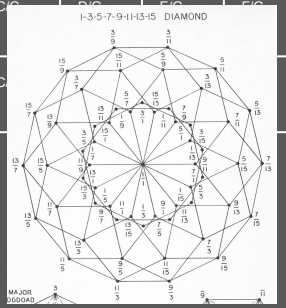
| | | | | |
|---|---|---|---|---|
| _one | B/A | C/A | D/A | E/A |
| A/B | _one | C/B | D/B | E/B |
| A/C | B/C | _one | D/C | E/C |
| A/D | B/D | C/D | _one | E/D |
| A/E | | | | _one |




...

## Ogdoadic

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| _one | B/A | C/A | D/A | E/A | F/A | G/A | H/A |
| A/B | _one | C/B | D/B | E/B | F/B | G/B | H/B |
| A/C | B/C | _one | D/C | E/C | F/C | G/C | H/C |
| A/D | B/D | C/D | _one | E/D | F/D | G/D | H/D |
| A/E | B/E | C/E | D/E | _one | F/E | G/E | H/E |
| A/F | B/F | C/F | D/D | E/E | _one | G/F | H/F |
| A/G | B/G | C/G | D/G | E/G | F/G | _one | H/G |
| A/H | B/H | C/H | D/H | E/H | F/H | G/H | _one |



# Morph

**Morph between 2 Favorites**

- Select “Morph” in Design Menu
- Left panel of Favorites are “A”
- Right panel of Favorites are “B”
- Hit “S” to swap A and B
- Top Box is A
- Middle Box is the Morph of A and B
- Bottom Box is B
- Interpolation slider morphs between A and B
- Select between Linear or Pitch Interpolation
- ID A, ID B, Interpolation, and Interpolation Type are automatable in the DAW
- You can Favorite a Morph!
  - But you cannot Morph between two Morphs
- Pitch Wheel and Microtonal Keyboard reflect the state of the Morph, and show proportional triads